

XIXth International Congress of ISAH



ISAH
2019

PROCEEDINGS



International Society for Animal Hygiene
Wrocław University of Environmental and Life Sciences

September 8th - 12th 2019, Wrocław, Poland

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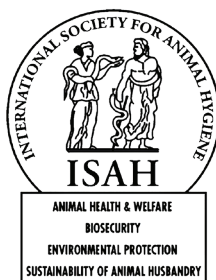




ISAH
2019

Proceedings of the XIXth International Congress of the International Society for Animal Hygiene

**“Animal Hygiene as a Fundament of One Health
and Welfare improving biosecurity, environment
and food quality”**



International Society for Animal Hygiene

Wrocław University of Environmental and Life Sciences

**Honorary patronage of the Mayor of Wrocław
The Ministry of Agriculture and Rural Development
of the Republic of Poland**



**WROCLAW UNIVERSITY
OF ENVIRONMENTAL
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ISAH 2019

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DEAR COLLEAGUES, FRIENDS AND PARTICIPANTS,

on behalf of the Organizing Committee, the Scientific Committee and the Executive Board of International Society for Animal Hygiene (ISAH), I am pleased to welcome you at the XIX International Congress of ISAH 2019 in Wrocław, which is one of the most prominent tourist destinations in Poland.

The ISAH Congress initiated in 1970 been identified as an influential conference worldwide for professionals in animal hygiene, health and welfare which provides insights into the latest research results from many areas of animal science. Congress is a unique opportunity for industry and scientists to meet and acquire new knowledge as well as to exchange experience. Carried out through many plenary meetings, poster sessions technical tours discussions about scientific achievements in the world of livestock production are also an opportunity for the application of new ideas in practice. Furthermore, there will be a focus on international research collaboration and knowledge exchange towards innovation.

All these preferences make the ISAH one of the largest animal science congresses in the world. The motto of the XIXth ISAH 2019 congress is "Animal Hygiene as a fundament of One Health and Welfare improving biosecurity, environment and food quality". The programme contains various disciplines and the latest findings regarding animal health and welfare, animal hygiene, biosecurity, safety of animal-origin food, environmental protection and sustainable production in relation to livestock production and related areas. I do hope the congress will provide to you all a unique opportunity to present your recent research results. Additionally, participation its official parts and in the after-hours, will be another great opportunity to meet with colleagues and have a interesting discussions and ponder new problems in atmosphere.

I am welcoming you in Wrocław, a city with a rich past and amazing present!

Associate Professor Dr Sebastian Opaliński
Chairman of the XIX ISAH Congress
and ISAH ORGANISING VICE PRESIDENT



WROCLAW UNIVERSITY OF ENVIRONMENTAL AND LIFE SCIENCES

WROCLAW UNIVERSITY OF ENVIRONMENTAL AND LIFE SCIENCES (WUELS)

is one of the best specialized Universities in the country. It focuses its wide-ranging activities on education and research covering agriculture and related sciences. The profile of the WUELS and its mission are directly involved in transformation programmes dealing with rural development and food quality and management, with full respect paid to social support and interaction. The knowledge acquired and the research projects carried out at the WUELS make provision for future development, regarding all aspects of environmentally sustainable development, which is friendly to human and animal welfare. At present, Wrocław University of Environmental and Life Sciences, is the only agricultural University in the south-west region of Poland. Nearly 10 thousand of students are enrolled on 5 faculties in the WUELS.

More info and videos:

https://www.upwr.edu.pl/pracownicy/46861/filmy_promocyjne.html

https://www.upwr.edu.pl/university/43918/60_years_with_a_look_to_the_future.html

WELCOME ADDRESS OF ISAH PRESIDENT

Dear colleagues, friends and participants from all over the world,

with the XIXth Congress of ISAH returns to Europe and opens the gates this year in Wrocław, Poland.

It is my great pleasure to welcome you all on behalf of the Executive Board of the International Society for Animal Hygiene (ISAH) here in Wrocław, a town full of history and with a long tradition in science. In 2016, Wrocław was European Capital of Culture. The roots of Wrocław University go back to a German foundation at the beginning of the 18th century. Today the Wrocław University of Environmental and Life Sciences belongs to the leading universities in Poland. ISAH is very grateful to Rector Professor Tadeusz Trziszka, former Rector Professor Roman Kolacz and Professor Sebastian Opaliński, chairman of the ISAH2019 organizing committee, to host the this year congress in this beautiful town with its hospitable and friendly people.

Let us share in this inspiring environment our recent scientific achievements and let us discuss measures how to keep our farm animals healthy and prevent them from disease and suffering. Let us remind ourselves that farm animals like pigs, poultry, cows, calves and all the others are sentient beings that deserve our protection, understanding and care. We raise them for our use and we determine the endpoint of their lives. Therefore, it is our responsibility to give them a life worth living – without pain, without fear and with opportunities to display their natural behaviour as fully as possible. In order to put ethical demands into practice, it is necessary to look at the animal as a whole and as an individual, and use different scientific disciplines and approaches to understand the needs of the single animal as well as the needs of an animal group or herd. ISAH enjoys the hospitality of Poland for the second time since 2005 when we held the XIth Congress in Warsaw. Poland has a long tradition in animal hygiene. Polish scientists recognized early that scientific cooperation between countries and disciplines is the only way forward to improve health and welfare of both animals and humans. Animal Hygiene is a fundament of the “One Health concept” by regarding animal health, welfare and behaviour, biosecurity concepts, public health aspects, diseases prevention and a sustainable production of food from farm animals as well as environmental protection in livestock production making optimal use of resources. Veterinarians and related professionals like agricultural engineers, biologists, epidemiologists and experts in human medicine are working closely together for that common goal.

The interdisciplinary networks of scientists working in the field of animal hygiene and related areas transfer “cutting-edge” knowledge on animals, human beings and environment to veterinarians, animal scientists, animal producers, physicians and public health professionals as well as to decision makers in agribusiness and politics. This is one of the aims of the ISAH congresses, which are particularly open for young scientists from developing countries who are supported financially by the Professor Tielen Foundation.

Today, the principle of “Prevention is better than Cure” is as actual as ever in the face of the threat of African swine fever, zoonotic diseases, environmental pollution by livestock, increasing microbial antibiotic resistance and – feeding a rising world population with protein of animal origin.

ISAH cooperates with organizations like OIE and others. It is a non-profit science organization driven by an honorary Executive Board, an Extended Executive Board composed of the ISAH country representatives in a network of 55 countries throughout the world. (see also ISAH-soc.org) and its members.

You all are invited to join ISAH as members for a small contribution fee of 20 Euro per year promoting physical and mental health of animals and improve the quality of life of animals and humans.

Prof. Dr. Dr. h. c. Joerg Hartung
President of ISAH / On behalf of the Executive Board



**INTERNATIONAL SOCIETY
FOR ANIMAL HYGIENE
(ISAH)**

is an association of veterinarians and other professional scientists, practitioners and students working or studying in the field of animal hygiene, animal health and welfare, animal husbandry, safety of food of animal origin, environmental protection in relation to sustainable animal production and related areas within the scope of the following ISAH missions. The ISAH declares the following missions:

Improve and promote scientific knowledge of:

- Both the pathogens and on the epidemiology of infectious and non-infectious diseases including those that pose a risk to human health, with particular attention being paid to measures of prevention.
- Measures which will optimise animal welfare.
- Measures to minimize the potential adverse effects of animal production on the environment including those that pose a direct and/or indirect risk to human health.

Promote the creation of interdisciplinary networks of scientists working in the field of animal hygiene and related areas.

Transfer “cutting-edge” knowledge and information on animal hygiene to veterinarians, animal scientists, agricultural engineers, animal producers, physicians and public health professionals as well as to decision makers in agribusiness and politics.

History of ISAH

https://www.isah-soc.org/userfiles/downloads/history/2017_01_history.pdf

PROGRAMME OF ISAH2019

SUNDAY, SEPTEMBER 8, 2019

12.00-20.00 REGISTRATION AND INFORMATION

Lobby next to the entrance to the Centre for Teaching and Research, pl. Grunwaldzki 24 A

19.00-21.00 WELCOME COCKTAIL

Lobby next to the entrance to the Centre for Teaching and Research, pl. Grunwaldzki 24 A

MONDAY, SEPTEMBER 9, 2019

7.30-16.00 REGISTRATION AND INFORMATION

Lobby next to the entrance to the Centre for Teaching and Research, pl. Grunwaldzki 24A

9.00-10.30 INAUGURATION CEREMONY AND GREETING ADDRESSES

Hall of John Paul II, the Centre for Teaching and Research
Chairs: Sebastian Opalinski and Ewa Popiela

- Rector of WUELS - prof. Tadeusz Trziszka
- OIE representative – Tomasz Grudnik
- Representative of the Minister of Agriculture and Rural Development of Poland
- Prof. Roman Kołacz
- President of ISAH – prof. Joerg Hartung (opening)

10.30-11.00 COFFEE BREAK AND POSTER PRESENTATIONS

11.00-12.30 PLENARY LECTURES I and II

Hall of John Paul II
Chairs: Joerg Hartung and Roman Kołacz

11.00-11.45 TOMASZ GRUDNIK, OIE-World Organisation for Animal Health
ADDRESSING THE CHALLENGES OF ANIMAL HEALTH AND WELFARE AT A GLOBAL LEVEL

11.45-12.30 KRZYSZTOF WOJTAS, Compassion in World Farming International
ENVIRONMENTAL AND SOCIAL IMPACT OF THE USE OF FISHMEAL IN AQUACULTURE

12.30-14.00 LUNCH BREAK AND POSTER PRESENTATIONS

14.00-15.30 PLENARY LECTURES III and IV

Hall of John Paul II
Chairs: Ewa Łukaszewicz and Uwe Roesler

14.00-14.45 JEAN-PIERRE VAILLANCOURT, Université de Montréal
THE INCIDENCE OF CONTAGIOUS DISEASES IN POULTRY IN THE WORLD - EPIZOOTIC HAZARDS IN EUROPE

14.45-15.30 JOSEF BACHMEIER, Veterinary Poultry Practice
FULLY INTEGRATED POULTRY PRODUCTION CHAIN

15.30-16.00 COFFEE BREAK AND POSTER PRESENTATIONS

16.00-17.00 ANIMAL HEALTH, WELFARE AND BEHAVIOUR I

Lecture room IC, the Centre for Teaching and Research
Chair: Przemysław Cwynar

16.00-16.15 **Joanna Rosenberger, Ewa Łukaszewicz, Artur Kowalczyk, Zenon Rzońca**
VIDEO MONITORING IN ENDANGERED SPECIES BREEDING CENTRES –WELFARE IMPROVEMENT AND BEHAVIOUR STUDIES ON CAPERCAILLIE AS THE EXAMPLE

16.15-16.30 **Shahbaz Bashir, Bernice Lim, Ali Youssef Ali Amer, Tomas Norton, Jan Paeshuyse**
IMAGE-BASED IMMUNOLOGICAL QUANTIFICATION OF SKIN SWELLING TEST

16.30-16.45 **Maria Soroko, Hu Jiaying, Daniel Zaborski, Heng Wei Cheng, Marisa Erasmus**
INVESTIGATION OF THE EFFECTS OF PROBIOTIC, BACILLUS SUBTILIS' ON STRESS REACTIONS IN LAYING HENS USING INFRARED THERMOGRAPHY

16.45-17.00 **Péter Hejel, Viktor Jurkovich, Péter Kovács, Endre Brydl, Laszlo Könyves**
A POSSIBLE METHOD FOR IN VIVO DETERMINATION OF THE OXIDATIVE STRESS IN DAIRY HERDS. PRELIMINARY RESULTS

16.00-17.00 ANIMAL HYGIENE, DISEASE PREVENTION, BIOSECURITY AND ANTIBIOTICS RESISTANCE I

Lecture room IIC, the Centre for Teaching and Research
Chair: Thomas Banhazi

16.00-16.15 **Julia Louisa Tetens, Sabrina Koberg, Georg-Friedrich Thimm, Charles Franz, Christina Hölzel**
SCREENING FOR BACTERIOPHAGES LYTIC TO BACTERIA CAUSING EXUDATIVE EPIDERMITIS IN PIGLETS

16.15-16.30 **Olga Makarova, Philip Ferguson, Paul Johnston, James Mason, Jens Rolff, Uwe Roesler**
BACTERIAL ADAPTATION TO SURFACTANT ANTIMICROBIALS

16.30-16.45 **Guido Di Martino, Claudia Caucci, Alessandro Dalla Costa, Manuel Santagiuliana, Monica Lorenzetto, Katia Capello, Luigi Gavazzi, Lebana Bonfanti**
BROILER HEALTH, EFFICIENCY AND ANTIMICROBIAL USAGE IN SHEDS AT DIFFERENT STOCKING DENSITIES

16.45-17.00 **Sophia Heitmann**
EFFECTS OF DIFFERENT FLOORING SYSTEMS ON ANIMAL HYGIENE AND ANIMAL WELFARE IN BROILER HUSBANDRY

17.00-18.00 PTF AND PHD STUDENT'S MEETING

Lecture room IIIC, the Centre for Teaching and Research
Chairs: Mike van der Laak (PTF), Joerg Hartung (ISAH), Representative of the M&B Gates Foundation

19.00-21.00 CONCERT, standing dinner reception, meeting with the city authorities

Old Town Hall

TUESDAY, SEPTEMBER 10, 2019

8.00-16.00 REGISTRATION AND INFORMATION

Lobby next to the entrance to the Centre for Teaching and Research

9.00-11.00 ANIMAL HEALTH, WELFARE AND BEHAVIOUR II - EQUINE SESSION

Lecture room IC
Chair: Alicja Kowalczyk

9.00-9.30 INVITED SPEAKER

ROLY OWERS
THE ROLE OF EQUINE WELFARE IN IMPROVING BIOSECURITY, THE ENVIRONMENT AND FOOD QUALITY

- 9.30-9.45** **Shahbaz Bashir, Marlies Reusen, Aline Visser, Annelies Bogaerts, Jan Paeshuyse**
ISOLATION OF WEST NILE VIRUS SPECIFIC MONOCLONAL ANTIBODIES USING ANTIBODY PHAGE DISPLAY
- 9.45-10.00** **Magdalena Szklarz**
EQUINE WOBBLER SYNDROME - DIAGNOSTIC AND TREATMENT
- 10.00-10.15** **Natalia Siwińska, Agnieszka Żak, Malwina Słowikowska, Remigiusz Bachor, Zbigniew Szewczuk, Artur Niedźwiedź, Urszula Paślawska**
THE PRESENCE OF PODOCIN IN URINE IN HEALTHY HORSES AND HORSES WITH KIDNEY DYSFUNCTION – A PRELIMINARY STUDY
- 10.15-10.30** **Magdalena Senderska-Płonowska, Adrianna Prochownik, Tadeusz Stefaniak**
CORRELATION BETWEEN METAL SHOES AND HEEL CONTRACTION
- 10.30-10.45** **Wanda Górniak, Maria Soroko, Mariusz Korczyński**
ACCELEROMETER-BASED LAMENESS DETECTION OF HORSES
- 10.45-11.00** **Maria Soroko, Daniel Zaborski, Krzysztof Dudek, Kelly Yarnell, Wanda Górniak, Ricardo Vardasca**
EVALUATION OF TEMPERATURE RELATED TO PRESSURE DISTRIBUTION IN SADDLES USING INFRARED THERMOGRAPHY (IRT)

9.00-11.00 ANIMAL HYGIENE, DISEASE PREVENTION, BIOSECURITY AND ANTIBIOTICS RESISTANCE II

Lecture room IIC
Chair: Laszlo Könvyes

9.00-9.30 INVITED SPEAKER

MARCIN FORKAJM
NUTRITIONAL STRATEGIES TO REDUCE ANTIMICROBIAL USE IN POST-WEANING PIGLETS

- 9.30-9.45** **Lorine Derongs, Céline Druilhe, Laure Martin, Caroline LE MARECHAL, Martine Denis, Anne-Marie Pourcher**
IMPACT OF MESOPHILIC ANAEROBIC DIGESTION ON CLOSTRIDIUM PERFRINGENS

- 9.45-10.00** **Olakunle Tiamiyu, Gbolahanmi Oladosu**
PATHOGENICITY AND ANTIBIOTICS SENSITIVITY PROFILE OF AEROMONAS BESTIARUM USED IN EXPERIMENTAL INFECTION OF DIFFERENT DEVELOPMENTAL STAGES OF CLARIAS GARIEPINUS

- 10.00-10.15** **Latifat Adekunle, Idris SY, Enam SJ, Jubril JA, Adamu S, Esievo KAN**
EFFECT OF NEWCASTLE DISEASE VIRUS (KUDU-113 STRAIN) INFECTION ON CALCIUM METABOLISM IN RESPONSE TO ENDOCRINOLOGICAL CHANGES IN COMMERCIAL LAYERS

- 10.15-10.30** **Thorben Schilling, Rashmi Aiyar, Ludwig E. Hoelzle**
INFLUENCE OF THE BIOGAS-PROCESS ON MYCOBACTERIUM AVIUM SSP. AVIUM

- 10.30-10.45** **Hanna Kronfeld, Christina Hölzel, Nicole Kemper**
THE UTERINE MICROBIOME AND RESISTOME OF DAIRY COWS

- 10.45-11.00** **Rafael Hernan Mateus Vargas, Nicole Kemper, Nina Volkmann, Manfred Kietzmann, Jessica Meissner, Jochen Schulz**
EFFECTS OF LOW-FREQUENCY ELECTROMAGNETIC FIELDS ON WATER MICROORGANISMS AND BIOFILM FORMATION IN WATERLINES USED IN POULTRY PRODUCTION

9.00-11.00 APICULTURE AND PROBLEM OF BEEKEEPING

Lecture room IIIC
Chair: Ewa Popiela

9.00-9.30 INVITED SPEAKER

KASPAR BIENEFELD
HYGIENIC BEHAVIOUR: THE CRUCIAL ISSUE FOR DISEASE RESISTANCE IN THE HONEY BEE

- 9.30-9.45** Aleksandra Langowska, Monika Fliszkiwicz, Bożena Chuda-Mickiewicz, Paweł Chorbiński, Weronika Banaszak-Cibicka, Karol Giejdasz
NORMAL REPRODUCTIVE PARAMETERS IN HONEY BEE DRONES MATURING UNDER UNFAVOURABLE CONDITIONS
- 9.45-10.00** Anna Gajda, Andrzej Bober, Robert Paxton
AN OUTLOOK ON ONE HEALTH WITH RESPECT TO THE SECOND-MOST-IMPORTANT INSECT POLLINATORS IN POLAND: BUMBLEBEES
- 10.00-10.15** Paweł Migdał, Adam Roman, Agnieszka Murawska, Ewa Popiela
BEHAVIORAL CHANGES IN HONEY BEE EXPOSED ON THE ELECTROMAGNETIC FIELD – LABORATORY RESEARCH
- 10.15-10.30** Jakub Wilk, Beata Bąk, Jerzy Wilde, Maciej Siuda, Andrzej Szczurek, Monika Maciejewska
THE USE OF SEMICONDUCTOR SENSORS OF VOLATILE ORGANIC COMPOUNDS (VOCS) IN CLASSIFICATION OF BEE BROOD INFESTATION AFFECTED WITH VARROA DESTRUCTOR MITE
- 10.30-10.45** Ihor Dvylyuk, Sarah Wood, Ivanna Kozii, Colby Klein, Roman Koziy, Igor Moshynskyy, Igor Medici de Mattos, Elemir Simko
THE INFLUENCE OF PROBIOTIC MICROORGANISMS ON THE GROWTH AND DEVELOPMENT OF APIS MELLIFERA WORKER HONEY BEES LARVAE IN VITRO
- 10.45-11.00** Paweł Migdał, Adam Roman, Agnieszka Murawska, Ewa Popiela
IMPACT OF VARIOUS PESTICIDE COMPOSITIONS ON THE HONEY BEE

11.00-11.30 COFFEE BREAK AND POSTER PRESENTATIONS

11.30-13.00 ANIMAL HEALTH, WELFARE AND BEHAVIOUR III

Lecture room IC
Chair: Maria Soroko

11.30-12.00 INVITED SPEAKER

JOERG HARTUNG
CAN PRECISION LIVESTOCK FARMING CREATE VALUE FOR ANIMALS, FARMERS AND CONSUMERS?

12.00-12.15 Michał Bednarski, Małgorzata Bednarska, Robert Kupczyński
CALF MORTALITY DURING THE FIRST 4 WEEKS OF LIFE: EVALUATION OF INFECTIOUS AGENTS

12.15-12.30 Roxane Feller
THE ROLE OF VETERINARY MEDICINES IN ENSURING ANIMAL HEALTH AND ANIMAL WELFARE

12.30-12.45 Valentina Macchi, Alejandra Suanes, Ximena Salaberry, Federico Fernandez, Cyntia Moreira, Stella Huertas, José Piaggio, Andrés Gil
SEROPREVALENCE AND FACTORS ASSOCIATED TO NEOSPORA CANINUM ON URUGUAYAN DAIRY HERDS

12.45-13.00 Frank van Eerdenburg, Tessa Hof, Benthe Doeve, Lars Ravesloot, Rebecca Nordquist, Franz Josef Van Der Staay
RELATION BETWEEN HAIR-CORTISOL CONCENTRATION AND WELFARE ASSESSMENT PROTOCOLS IN DAIRY COWS

11.30-13.00 ANIMAL HYGIENE, DISEASE PREVENTION, BIOSECURITY AND ANTIBIOTICS RESISTANCE III

Lecture room IIC
Chair: Christelle Fablet

11.30-12.00 INVITED SPEAKER

KRZYSZTOF CHUDZIK
SALMONELLOSIS: EPIZOOTIC SITUATION, AVAILABLE METHODS OF ERADICATION IN FACE OF PRESENT REGULATIONS AND CONSUMER EXPECTATIONS AS CHALLENGE FOR THE POULTRY INDUSTRY

12.00-12.15 Simon Carlton
NEW TECHNOLOGY TO CONTROL SALMONELLA IN FEED

- 12.15-12.30** **Jochen Schulz, Marius Fillmer, Istvan Szabo, Nicole Kemper**
SALMONELLA OCCURRENCE IN ROOMS OF A FATTENING PIG BARN TREATED WITH COLD
FOGGED PERACETIC ACID
- 12.30-12.45** **Judith Pöppe, Katrin Bote, Uwe Roesler, Olga Makarova**
RESISTANCE INDUCTION TO ROUNDUP, A COMMON HERBICIDE,
IN ENTEROBACTERIACEAE IN VITRO
- 12.45-13.00** **Katrin Bote, Judith Pöppe, Olga Makarova, Roswitha Merle, Uwe Roesler**
MINIMUM INHIBITORY CONCENTRATIONS FOR GLYPHOSATE AND A GLYPHOSATE-CONTAINING
FORMULATION IN LIVESTOCK-ASSOCIATED ENTEROBACTERIACEAE

11.30-13.00 FOOD QUALITY AND FOOD SAFETY OF ANIMAL ORIGIN

Lecture room IIIC
Chair: Andres Aland

11.30-12.00 INVITED SPEAKER

MAŁGORZATA KORZENIOWSKA
MEAT AS A SOURCE OF ANTIOXIDANTS

- 12.00-12.15** **Monika Dzieciol**
FUNGAL COMMUNITY IN AUSTRIAN VORARLBERGER HARD CHEESE DURING RIPENING

- 12.15-12.30** **Fadi Alhomoch, Christian Ammon, Muhi El-Dine Hilali, Susanne Demba, Sandra Rose, Reiner Brunsch**
THE MECHANICAL EFFECT OF DIFFERENT COMPONENTS IN THE AUTOMATIC MILKING SYSTEMS
ON THE FREE FATTY ACIDS FFA IN MILK

- 12.30-12.45** **Krzysztof Lipiński, Magdalena Mazur-Kuśnirek, Zofia Antoszkiewicz,
Sylvia Kotlarczyk, Daniel Korniewicz**
THE EFFECT OF POLYPHENOLS AND VITAMIN E ON THE PERFORMANCE,
MEAT QUALITY AND ANTIOXIDANT STATUS OF MONOGASTRIC ANIMALS UNDER
NORMAL AND STRESS CONDITION

- 12.45-13.00** **Jan Paeshuyse**
FIGHTING VIRUSES WITH ANTIBIOTICS: A WORD OF CAUTION

13.00-14.00 LUNCH BREAK AND POSTER PRESENTATIONS

14.00-16.00 ANIMAL HEALTH, WELFARE AND BEHAVIOUR IV

Lecture room IC
Chair: Dorota Witkowska

14.00-14.30 INVITED SPEAKER

Carsten Cruse
MEASUREMENT OF ANIMAL WELFARE INDICATORS IN SLAUGHTERHOUSES BY IMAGE PROCESSING

- 14.30-14.45** **Mikolt Bakony, Levente Kovács, Luca F. Kézér, Viktor Jurkovich**
HEAT TOLERANCE OF DAIRY CALVES IN SUNNY AND SHADED ENVIRONMENTS

- 14.45-15.00** **Brabara Kosińska-Selbi, Tomasz Suchocki, Magdalena Frąszczak, Christa Egger-Danner,
Schwarzenbacher Hermann, Hermann Schwarzenbacher, Joanna Szyda**
GENETIC VARIANTS UNDERLYING HOOF DISEASES IN BRAUNVIEH AND FLECKVIEH CATTLE

- 15.00-15.15** **Jan Hultgren, Charlotte Berg, Bo Algiers**
STOCKPERSON ACTIONS AND ANIMAL STRESS AT MOBILE AND STATIONARY
SLAUGHTER OF CATTLE

- 15.15-15.30** **Triin Rilanto, Kaari Reimus, Toomas Orro, Arvo Viltrop, Kerli Mõtus**
WHY ARE COWS CULLED IN ESTONIAN DAIRY HERDS

- 15.30-15.45** **Torun Wallgren, Anne Larsen, Stefan Gunnarsson**
STRAW IMPACT ON PEN AND PIG HYGIENE

15.45-16.00 Sofia Wilhelmsson, Jenny Yngvesson, Paul H. Hemsworth, Maria Andersson, Jan Hultgren
RELATIONSHIPS BETWEEN DRIVER HANDLING AND PIG BEHAVIOUR DURING
LOADING AND UNLOADING

14.00-16.00 ANIMAL HYGIENE, DISEASE PREVENTION, BIOSECURITY AND ANTIBIOTICS RESISTANCE IV

Lecture room IIC
Chair: Endong Bao

14.00-14.30 INVITED SPEAKER

R.K. RAO
PHYTOGENIC LIVER TONIC LIV.52® PROTEC - EFFICIENCY AS LIVER TONIC, ON PERFORMANCE,
CARCASS YIELD AND ABDOMINAL FAT IN BROILERS

14.30-14.45 Corinna Thomas, Christine Idler, Christian Ammon, Christiane Herrmann, Thomas Amon
INACTIVATION OF ESBL/AMPC-PRODUCING ESCHERICHIA COLI IN CHICKEN MANURE DURING
AERATION AND ANAEROBIC DIGESTION

14.45-15.00 Jil Waade, Fanny Ebert, Uwe Seibt, Evelin Ullrich, Alexander Starke,
Walther Honscha, Uwe Truyen, Stephanie Speck
IDENTIFYING A LINK BETWEEN ESBL-PRODUCING ENTEROBACTERIA IN DAIRY
CALVES AND FARM MANAGEMENT

15.00-15.15 Eyke Lühken, Jochen Schulz, Nicole Kemper
HYGIENE IN FREE FARROWING PENS FOR SOWS: ANALYSES WITH SPECIAL
EMPHASIS ON AIR HYGIENE

15.15-15.30 Christina Hölzel, Robert Fux
VIRUS-LIKE BOVINE MEAT AND MILK FACTORS - ASSOCIATED WITH HUMAN DISEASE?

15.30-15.45 Caroline Robé, Katrin Daehre, Sophie Fiedler, Christa Ewers,
Sebastian Guenther, Uwe Roesler
STRAIN- DEPENDENT REDUCTION OF BROILER COLONISATION WITH ESBL
AMPC- PRODUCING E. COLI USING ALTERNATIVE HYGIENE- AND MANAGEMENT MEASURES

15.45-16.00 Joanna Żebrowska, Dorota Witkowska
ANTIMICROBIAL ACTIVITY OF ESSENTIAL OILS AGAINST SELECTED BACTERIA
ISOLATED FROM TURKEYS

14.00-16.00 NUTRITION, FEED AND ADDITIVES AND ZOOSES, VECTOR BORNE AND EMERGING DISEASES

Lecture room IIIC
Chair: Stefan Gunnarsson

14.00-14.30 INVITED SPEAKER

PAULINA ABRAMOWICZ-PINDOR, Henryk Rózański, Karolina Chodkowska
THE IMPACT OF EUBIOTICS ON THE PERFORMANCE OF BIRDS AND CHEMOTHERAPEUTIC
USE IN BROILER CHICKEN

14.30-14.45 Viktor Jurkovich, Laszlo Könyves, Mikolt Bakony
THE EFFECTS OF FEED SORTING ON THE OCCURRENCE OF KETOSIS
AND ACID LOAD IN DAIRY COWS

14.45-15.00 Valeriya Zhabinskaya, Natalia Trubchaninova, Grigoriy Pokhodnya
ZOOTECNICAL AND ECONOMIC EFFICIENCY USING OF FODDER
ADDITIVE "GIDROLAKTIV" IN PIGLETS' RATIIONS

15.00-15.15 Andrzej Jarynowski, Vitaly Belik
COMPARISON OF BIOSECURITY IN PIG FARMS AND STANDARD PRECAUTIONS
IN HOSPITALS - CONTACT NETWORK ANALYSIS PERSPECTIVE FOR INFECTION CONTROL

15.15-15.30 Arvo Viltrop, Kaari Reimus, Tarmo Niine, Kerli Mõtus
DOES BIOSECURITY REALLY MATTER? BIOSECURITY IN ASF OUTBREAK HERDS VERSUS OTHERS

15.30-15.45 **Britta Magsig, Kerstin Rosen, Uwe Roesler**
CONTAMINATION AND DECONTAMINATION OF MEDICAL EQUIPMENT WITH AEROSOLIZED
CLINICAL RELEVANT PATHOGENS

15.45-16.00 **Andrey Kossarev, Jan Paeshuyse**
ROLE OF THE N-TERMINAL DOMAIN OF THE BOVINE VIRAL DIARRHOEA VIRUS POLYMERASE

16.00-18.00 **COFFEE BREAK AND POSTER PRESENTATIONS**

WEDNESDAY, SEPTEMBER 11, 2019

8.00-16.00 **REGISTRATION AND INFORMATION**

Lobby next to the entrance to the Centre for Teaching and Research, pl. Grunwaldzki 24A

9.00-11.00 **PRECISION LIVESTOCK FARMING: TECHNIQUES, RISKS AND BENEFITS
AND INTERACTIONS BETWEEN ENVIRONMENT AND ANIMAL PRODUCTION**

Lecture room IC
Chair: Andres Aland

9.00-9.30 **INVITED SPEAKER**

THOMAS BANHAZI
COMPARISON OF MEASURED GROWTH RATES ON AUSTRALIAN PIG FARMS
AND CONSEQUENCES OF THE MEASURED DIFFERENCES

9.30-9.45 **Matias Vanotti**
IMPROVED HEALTH AND PRODUCTIVITY OF SWINE WITH TREATMENT
OF AMMONIA FROM MANURE

9.45-10.00 **Agnieszka Grzelka, Anna Pielichowska, Marcin Pawnuke, Yaroslav Bezyk, Izabela Sówka**
APPLICATION OF FIELD OLFACTOMETRY AND QUESTIONNAIRE SURVEYS TO ASSESS
ODOR NUISANCE FROM REARING OF POULTRY

10.00-10.15 **Christine Ziebal, Martine Denis, Céline Druilhe, Lorine Derongs, Sophie Michel-Leroux,
Elisabeth Repérant, Lorette Heurtevent, Evelyne Boscher, Bérengère Nagard, Laure Martin,
Anne-Marie Pourcher**
QUANTIFICATION OF PATHOGENIC BACTERIA IN MANURES AND RAW DIGESTATES
OF BIOGAS PLANTS

10.15-10.30 **Ivan Kochish, Vladimir Smolensky, Olga Myasnikova, Vladimir Galkin, Maxim Korenyuga**
ASSESSMENT ROOSTERS-PRODUCERS BY THE ADAPTIVE ABILITIES OF THE OFFSPRING

10.30-10.45 **Benjamin Reichelt, Vanessa Szott, Katrin, Anika Friese, Uwe Roesler**
EMISSIONS OF CAMPYLOBACTER SPP. FROM BROILER FARMS AND PERSISTENCE
IN THEIR ENVIRONMENT

10.45-11.00 **Michael A. McGinley, Grzegorz Piętoski**
MEASURING ODOURS

9.00-11.00 **ANIMAL HYGIENE, DISEASE PREVENTION, BIOSECURITY AND ANTIBIOTICS
RESISTANCE V AND ANIMAL HEALTH, WELFARE AND BEHAVIOUR V**

Lecture room IIC
Chair: Nicole Kemper

9.00-9.30 **INVITED SPEAKER**

Darem Tabbaa
ROLE OF VETERINARIANS IN INTEGRATED CRISES MANAGEMENT (ICM) EXPERIENCED IN SYRIA

9.30-9.45 **Kerstin Rosen, Friederike Ebner, Anika Friese, Uwe Roesler**
INFLUENCE OF THE IMMUNE SYSTEM ON THE AIRBORNE LA-MRSA COLONIZATION OF PIGLETS

9.45-10.00 **Christelle Fablet, Fabrice Bidan, Virginie, Florent, Eric Eveno, Nicolas Rose**
AIR QUALITY IN PIG BUILDINGS: A STUDY IN 128 NURSERY ROOMS

- 10.00-10.15 Jacek Koziel**
NON-INVASIVE ANIMAL DISEASE DETECTION
- 10.15-10.30 Laszlo Könyves, Viktor Jurkovich, Péter Hejel, Péter Kovács, Endre Brydl**
ON-FARM MONITORING OF HYPOCALCEMIA IN DAIRY HERDS. PRELIMINARY RESULTS
- 10.30-10.45 Lisa Eisenlöffel, Mario Reinhardt, Dana Rüster, Tobias Reutter, Uwe Truyen, Stephanie Speck**
IMPACT OF UV-C-COMBINED INDOOR AIR-FILTRATION ON AIR-BORNE BACTERIA AND LUNG HEALTH
- 10.45-11.00 Patrycja Waclawik, Dominika Grabolus**
USAGE OF ENVIRONMENTAL ENRICHMENTS IN AMERICAN MINK (NEOVISON VISON) FARMING

9.00-11.00 HUSBANDRY OF FARMED ANIMALS, FISH AND AQUACULTURE

Lecture room III C
Chair: Sujate Chaunchom

9.00-9.30 INVITED SPEAKER

Jacek Koziel
SOLVING LIVESTOCK ODOR PROBLEM AND IMPROVING INDOOR AIR QUALITY
– AN AMERICAN PERSPECTIVE

- 9.30-9.45 Stefan Gunnarsson**
PRE-TESTING OF A NEW HOUSING SYSTEM FOR BREEDING BIRDS OF LAYER STRAINS IN SWEDEN

- 9.45-10.00 Konrad Wojnarowski**
SEX STEROID EXPOSURE EFFECTS ON DECHORIONATED COMMON CARP
(CYPRINUS CARPIO) EMBRYOS

- 10.00-10.15 Susan Christine Shifflette**
THE USE OF TECHNOLOGY TO DRIVE IMPROVEMENTS TO HUMANE HANDLING
AND ANIMAL WELFARE

- 10.15-10.30 Gerda Kiss, Eszter Losonczi, Laszlo Könyves, Csaba Pribenszky**
ENHANCING THE GENETIC PROGRESS OF DAIRY FARMS BY A COMPLEX ASSISTED REPRODUCTIVE
TECHNOLOGIES (ART) STRATEGY

- 10.30-10.45 Marta Michalak, Paulina Cholewińska, Katarzyna Czyż, Piotr Nowakowski, Deta Łuczycka**
APPLICATION OF ELECTRICAL PROPERTIES TESTING IN THE DETECTION OF DIFFERENCES
BETWEEN ALPACA WOOL AND POLYACRYLONITRILE (PAN)

- 10.45-11.00 Paul Siller, Katrin Daehre, Uwe Roesler**
HOW LIKELY IS AN ENVIRONMENTAL SPREAD OF ESBL-PRODUCING E. COLI OUT OF MANURE?

11.00-11.20 COFFEE BREAK AND POSTER PRESENTATIONS

11.20-13.30 SPECIAL SESSION ENTITLED: EPIZOOTIC THREATS IN THE WORLD AND PRINCIPLES OF BIOSECURITY AND ANIMAL WELFARE WHILE ERADICATING OUTBREAKS OF CONTAGIOUS DISEASES (PART I)

Hall of John Paul II
Chairs: ZYGMUNT PEJSAK AND BOGDAN KONOPKA

- 11.20-11.30 ROMAN KOŁACZ**
CEREMONIAL OPENING OF THE SESSION

- 11.30-12.10 ALBERT OSTERHAUS**
ONE HEALTH APPROACH IN COMBATting EMERGING INFECTIONS

- 12.10-12.50 NADAV GALON**
INFECTIOUS DISEASES IN CATTLE IN EUROPEAN COUNTRIES – CURRENT STATUS AND THREATS

- 12.50-13.30 ZYGMUNT PEJSAK**
EPIZOOTIC SITUATION OF SWINE DISEASES IN POLAND AS COMPARED TO EUROPE
AND OTHER PARTS OF THE WORLD

13.30-14.30 LUNCH BREAK AND POSTER PRESENTATIONS

14.30-16.30 SPECIAL SESSION ENTITLED: EPIZOOTIC THREATS IN THE WORLD AND PRINCIPLES OF BIOSECURITY AND ANIMAL WELFARE WHILE ERADICATING OUTBREAKS OF CONTAGIOUS DISEASES (PART II)

Hall of John Paul II

Chairs: JOERG HARTUNG AND HERMANN SCHOBESBERGER

14.30-15.10 UWE ROESLER
ZOO NOTIC DISEASES – STILL HAZARDOUS TO FOOD SAFETY

15.10-15.50 KRZYSZTOF JAŹDŹEWSKI
ANIMAL WELFARE PROTECTION IN COMBATING OUTBREAKS OF INFECTIOUS DISEASES

15.50-16.30 HANNA BALCERAK
METHODS FOR THE DISPOSAL OF ANIMALS KILLED FOR REASONS OF INFECTIOUS DISEASES CONTROL

16.30-16.45 COFFEE BREAK

16.45-18.00 GENERAL ASSEMBLY

Lecture Room IIIc

Chair: Joerg Hartung

19.00-23.00 GALA DINNER AND CLOSING CEREMONY
The IASE Hall, next to the Wrocław Fountain (special screenings) and The Centennial Hall

THURSDAY, SEPTEMBER 12, 2019

8.00-12.00 REGISTRATION AND INFORMATION
Lobby next to the entrance to the Centre for Teaching and Research

8.00-16.00 TECHNICAL TOURS
Gathering at the entrance to the Centre for Teaching and Research

POSTER PRESENTATIONS

SESSION ONE

ALL POSTERS SHOULD BE PLACED IN THE INDICATED PLACES FROM 9.00 A.M. ON MONDAY, 9TH OF SEPTEMBER TILL 1.30 P.M. ON TUESDAY, 10TH OF SEPTEMBER.

A. ANIMAL HEALTH, WELFARE AND BEHAVIOUR

A1. Nadiia Magrelo

INFLUENCE OF ABIOTIC FACTORS OF THE AREA ON THE DISFUNCTION OF LIVER FUNCTION IN COWS

A2. Ivana Novotná, Lucie Langová, Zdeněk Havlíček

SIDE PREFERENCE OF DAIRY COWS IN THE ENTRANCE MILKING PARLOR

A.3 Zdeněk Havlíček, Monika Klimešová, Lucie Langová, Ivana Novotná, Lucie Kratochvílová

ASSOCIATION OF GENES CXCR1 AND CD4 WITH WITH SOMATIC CELL SCORES AND MILK PRODUCTION TRAITS

A.4 Nataliia Ohorodnyk, Volodymyr Snitynskyi, Bohdan Krektun

IMMUNE STATUS OF THE PIGLETS ORGANISM AND ITS CORRECTION BY THE LIPOSOMAL PREPARATION «VITARMIN» IN CONDITION OF STRESS

A.5 Martha Onyskovets, Volodymyr Snitynskyi, Bohdan Krektun

EFFECTS OF LEAD ON THE LEVEL OF HEAT SHOCK PROTEINS EXPRESSION IN THE BLOOD CELLS AND VARIOUS ORGANS OF SCALY CARP

A.6 Jakub Pacoň

ANALYSIS OF THE INFLUENCE OF EGG INCUBATION TEMPERATURE ON LEOPARDS GECKO BEHAVIOR (EUBLEPHARIS MACULARIUS)

A.7 Paweł Podobiński

DEFINING FISH LEARNING ABILITY BASED ON INSTRUMENTAL CONDITIONING

A.8 Dominika Grabolus, Patrycja Waclawik

THE WELFARE OF FERRETS (MUSTELA PUTORIUS FURO): HOUSEKEEPING VARIANTS

A.9 Shu Tang

ROSEMARY REDUCES HEAT STRESS BY INDUCING CRYAB AND HSP70 EXPRESSION IN BROILER CHICKENS

A.10 Gabriela Mala, Pavel Novak, Pavlina Jiroutova, Josef Knizek, David Prochazka, Martina Slavikova

THE EFFECT OF HOUSING SYSTEM ON BEHAVIOUR OF DAIRY CALVES

A.11 Omar Bennoune, Fehat Nouicer, Khawla Ben alia

FOOT-PAD DERMATITIS: POTENTIAL PARAMETER FOR POULTRY WELFARE

A.12 Pavel Novak, Gabriela Mala, Alzbeta Jarolimkova

ANIMAL, HOUSING AND NUTRITION AS PREREQUISITE FOR HEALTH, REPRODUCTION AND PRODUCTION IN DAIRY CATTLE

A.13 Mona Franziska Giersberg, Birgit Spindler, Nicole Kemper

DETERMINATION OF BODY WIDTH IN CONVENTIONAL LAYER HYBRIDS AND DUAL-PURPOSE HENS

A.14 Przemysław Cwynar, Roman Rapała, Robert Kupczyński, Anna Burek, Krystyna Pogoda-Sewerniak, Klaudia Wlazlak

HEALTH STATUS OF POLISH RED DEER IN KARKONOSZE NATIONAL PARK – FINAL REPORT

A.15 Klaudia Wlazlak, Przemyslaw Cwynar, Katarzyna Krok, Anna Mucha

GREY WOLF POPULATION TRENDS IN POLAND

A.16 Klaudia Wlazlak, Przemyslaw Cwynar

ANALYSIS OF EURASIAN LYNX QUANTITY IN POLAND

A.17 José Antonio Aguilar Quiñonez, Leonel Avendaño Reyes, Miguel Angel Gastélum Delgado, Juan Eulogio Guerra Liera, Arnulfo Vicente Perez, Ulises Macias Cruz
EFFECT OF SHADE ON BODY SURFACE TEMPERATURE OF PELIBUEY LAMBS UNDER HEAT-STRESS

A.18 Alejandro Cordova
EFFECT OF ANAPLASMOSIS ON OPEN DAYS IN COWS

A.19 Alejandro Cordova
NUTRITIONAL CAUSES THAT MAY CAUSE INFERTILITY IN COWS

A.20 Rimvydas Falkauskas, Bronius Bakutis, Violeta Baliukoniene, Jurgita Jovaisiene, Gintarė Kasperavičiūtė, Gediminas Gerulis, Indrė Falkauskienė
FEED THAT IS POLLUTED BY ZEARALENONE AND OTHER MYCOTOXINS IMPACT QUALITY ON MILK

A.21 Damian Konkol, Mariusz Korczyński
ENRICHMENT OF THE BREEDING ENVIRONMENT AS A FACTOR CONDITIONING THE IMPROVEMENT OF WELFARE OF LAYING HENS MAINTAINED IN A CAGE SYSTEM

A.22 Anna Budny-Walczak, Robert Kupczyński, Dominika Macalik
EVALUATION OF WELFARE OF THERAPY DOGS WORKING IN ANIMAL-ASSISTED THERAPY - PRACTICAL EXAMPLES

A.23 Paulina Cholewińska, Anna Wyrostek, Katarzyna Czyż, Damian Konkol, Piotr Nowakowski
EXAMINATION OF THE OCCURRENCE OF ENDOPARASITES IN MOUFLONS (OVIS MUSIMON) IN THE KSIĄŻAŃSKI LANDSCAPE PARK (WAŁBRZYCH, POLAND)

A.24 Barbara Bognar, Viktor Jurkovich
MAJOR RISK FACTORS FOR ENVIRONMENTAL AND FARMING TECHNOLOGY INVOLVED IN THE SPREAD OF PARATUBERCULOSIS IN HUNGARIAN DAIRY HERDS

A.25 Gediminas Gerulis, Bronius Bakutis, Andrius Vasiliauskas, Violeta Baliukoniene, Jurgita Jovaisiene, Rimvydas, Gintarė Kasperavičiūtė
EFFECT OF STRUCTURED ALKALINE WATER IN MINK WELLNESS AND FUR QUALITY

A.26 Jan Broucek, Michal Uhrincat, Peter Kisac, Antont Hanus, Miloslav Soch, Lubos Zabransky
EFFECT OF WATER DELIVERY METHOD ON GROWTH AND FEED INTAKE OF DAIRY CALVES

A.27 Miguel Angel Gastélum Delgado, Juan Eulogio Guerra Liera, José Antonio Aguilar Quiñonez, Leonel Avendaño Reyes, Ulises Macias Cruz, Samuel J. Castro Camacho, Miguel Antonio Cardenas Contreras, Jose Manuel Hernández
EFFECT OF SHADE ON PHYSIOLOGICAL AND PRODUCTIVE VARIABLES IN PELIBUEY LAMBS UNDER HEAT-STRESS

A.28 Arnulfo Vicente-Pérez, Leonel Avendaño-Reyes, Ulises Macías-Cruz, Abelardo Correa-Calderón, Jose Antonio Aguilar-Quiñones, Emiliano Corrales-Navarro, Juan Eulogio Guerra-Liera
EFFECT OF SEASON ON STRESS PHYSIOLOGY PARAMETERS OF HOLSTEIN HEIFERS IN A DESERT CLIMATE

A.29 Dorota Witkowska, Bartosz Chojnowski, Mariusz Korczyński, Janina Sowińska
GAS ADMIXTURES CONCENTRATIONS IN DAIRY BARNs ESTIMATED BY FOURIER TRANSFORM INFRARED SPECTROSCOPY

A.30 Igor Zhirkov
PREVENTION OF THE CATTLE BLINDNESS WITH THE RETRO BULBAR NOVOCAIN BLOCKADES IN VOLGOGRAD REGION"

A.31 Janina Sowińska, Stanisław Milewski, Zenon Tański, Anna Wójcik, Dorota Witkowska, Katarzyna Ząbek, Tomasz Mituniewicz
EFFECT OF DIET SUPPLEMENTATION WITH β -HYDROXY- β -METHYLBUTYRATE (HMB) ON STRESS RESPONSE IN SLAUGHTER KIDS

A.32 Anna Bartosik, Damian Knecht, Anna Jankowska-Mąkosza
THE EFFECT OF EIMERIA SPP. INFECTION ON THE RESULTS OF REPRODUCTIVE PERFORMANCE OF SOWS

A.33 Anna Zielak-Steciwo, Małgorzata Roszak, Marzena Kęsek, Edyta Wojtas, Andrzej Zachwieja
TYPE OF BEDDING MATERIAL AND SOMATIC CELL COUNT IN BOVINE MILK

A.34 Maria Kucheruk, Roman Dymko
WELFARE AND DISEASE PREVENTION IN ORGANIC POULTRY

A.35 Xiaohui Zhang, Endong Bao
EGB 761 IMPROVED ANTI-HEAT-STRESS RESPONSES IN CHICKENS IN VIVO VIA REGULATION OF HSPTS EXPRESSION AND DISTRIBUTION

B. ANIMAL HEALTH, WELFARE AND BEHAVIOUR – EQUINE SESSION

B.1 Martyna Stakonaite, Zoja Mikniene, Zulkija Abilova

EVALUATION OF FLUNIXIN MEGLUMINE EFFECT IN PAIN MANAGEMENT AFTER CASTRATION IN HORSES

B.2 Maja Rokita, Magdalena Szklarz, Maciej Janeczek

LAMINITIS IN HORSES

B.3 Magdalena Szklarz, Maja Rokita, Maciej Janeczek

PLACENTITIS IN MARES

C. APICULTURE AND PROBLEM OF BEEKEEPING

C.1 Yekaterina Zonova, Adam Roman, Paweł Migdał

TRANSFER OF TOXIC TRACE ELEMENTS FROM ORGANISM OF HONEYBEE TO HONEY

C.2 Paweł Migdał, Adam Roman, Ewa Popiela, Agnieszka Murawska

ACTIVITY OF CABBAGE (BRASSICA OLERACEA) EXTRACT ON NOSEMA SPP. UNDER LABORATORY CONDITIONS

C.3 Beata Madras-Majewska, Lucja Skonieczna, Rajmund Sokół, Maria Michalczyk

BEEHIVES AND LOGS LOCATED IN THE FOREST DISTRICTS OF NORTH-EASTERN POLAND

C.4 Beata Madras-Majewska, Elżbieta Rosiak

EVALUATION SELECTED HONEYS MICROBIAL ACTIVITY

C.5 Jakub Gąbka, Joanna Trzeciecka

EFFECT OF AMITRAZ FUMIGATION ON QUEEN BEE LARVAE AND ADULT BODY WEIGHT

C.6 Jakub Gąbka

ONSET OF OVIPOSITION BY VIRGIN HONEY BEE QUEENS

C.7 Beata Bąk, Jakub Wilk, Jerzy Wilde, Maciej Siuda

THE EFFICIENCY COMPARISON OF THE IN VIVO AND POST MORTEM DIAGNOSTIC METHODS FOR ESTABLISHING THE LEVEL OF VARROA DESTRUCTOR MITE INFESTATION OF BEE SAMPLES FROM PARASITIZED BEE COLONIES

C.8 Mykhailo Leshchyshyn, Ihor Dvylyuk

MODERN ASPECTS DISINFECTION OF WOODEN BEEHIVES IN UKRAINE

C.9 Agnieszka Murawska, Paweł Migdał, Barbara Zajdel, Ewa Popiela, Adam Roman

RED MASON BEE COCOONS AS AN ALTERNATIVE SOURCE OF DIETARY FIBER

C.10 Giga Akopashvili

THE CASE OF MORTALITY OF HONEYBEE – APIS MELLIFERA CAUCASICA COLONIES IN WESTERN GEORGIA LINKED TO CHEMICAL CONTROL OF INVASIVE STINK BUG -HALYOMORPHA HALYS

D. FOOD QUALITY AND FOOD SAFETY OF ANIMAL ORIGIN

D.1 Daniela Takáčová, Peter Korim, Alena Nagyová, Nada Sasáková, Andrej Bugarský

NON-TRADITIONAL ANIMAL PRODUCTS ON THE SLOVAKIAN MENU

D.2 Daniela Takáčová, Peter Korim, Nada Sasáková, Alena Nagyová

CONSUMPTION OF MEAT DIFFERENT FROM FARMED ANIMALS

D.3 Christina Zuebert, Ludwig E. Hoelzle

SCREENING OF RAW MILK FOR BACTERIAL PATHOGENS

D.4 Zofia Sokołowicz, Anna Augustyńska-Prejsnar, Maciej Kluz

MICROBIOLOGICAL CONTAMINATION OF SHELL EGGS PRODUCED IN VARIOUS HOUSING SYSTEMS

D.5 Ivona Kožárová, Zuzana Poláková, Daniela Juščáková

MICROBIOLOGICAL SCREENING OF ANTIBIOTIC RESIDUES IN TARGET MATRICES OF FOOD-PRODUCING ANIMALS

D.6 Lynda Mezali, Siham Nouichi, Taha Mossadak Hamd

RISK FACTORS RELATED TO SALMONELLA CONTAMINATION ON POULTRY CARCASSES SLAUGHTERED IN ALGIERS, ALGERIA

E. NUTRITION, FEED AND ADDITIVES

E.1 Tomasz Półbrat, Mariusz Korczyński

OPTIMIZATION OF PH-VALUE REGULATION IN DOCOSAHEXAENOSIC ACID PRODUCTION FROM MICROALGAE

E.2 Anna Wyrostek, Bożena Patkowska- Sokoła, Katarzyna Czyż, Wiesław Bielas, Paulina Cholewińska, Damian Konkol, Robert Bodkowski

CHANGES IN OMEGA-6 AND OMEGA-3 FATTY ACIDS CONTENT IN THE BLOOD OF DOGS AS A RESULT OF LINSEED OIL ETHYL ESTERS SUPPLEMENTATION

E.3 Martyna Wilk, Barbara Król, Wojciech Łaba

ASSESSMENT OF THE NUTRITIONAL VALUE OF FEATHER KERATIN HYDROLYSATES

E.4 Anna Szuba-Trznadel, Tomasz Hikawczuk, Bogusław Fuchs

EFFECT OF SOURCE AND LEVEL OF ZINC ON DIARRHEA IN PIGLETS

E.5 Anna Szuba-Trznadel, Tomasz Hikawczuk, Bogusław Fuchs

PHYTOGENIC SUPPLEMENT TO REDUCE AMMONIA IN PIGGERY

E.6 Kinga Śpitalniak-Bajerska, Robert Kupczyński

THE EFFECTS OF POLYUNSATURATED FATTY ACID ON THE EFFECTIVENESS OF REARING AND PHYSIOLOGICAL INDEXES OF CALVES

E.7 Łukasz Wlazło, Bożena Nowakowicz-Dębek, Anna Czech, Anna Korzeniowska, Marek Kułczyński, Marcin Łukaszewicz, Anna Krasowska

STABILIZATION OF GASTROINTESTINAL MICROFLORA OF ANIMALS THROUGH NUTRITION USING FERMENTED RAPESEED MEAL

E.8 Anna Zwyrzykowska-Wodzińska, Renata Nowaczyk, Piotr Kuroпка, Robert Kupczyński, Antoni Szumny

INFLUENCE OF ILEX MESERVAE INFUSION AND ITS POLYPHENOL FRACTION ON INTESTINES STRUCTURE AND GOBLET CELLS SECRETION

E.9 Samuel J. Castro Camacho, Juan Eulogio Guerra Liera, Luciano Abelino Lopez Juarez, Miguel Angel Gastélum Delgado, Hugo De Jesus López Inzunza, Ruben Barajas

RUMEN DEGRADATION (NYLON BAG) OF FIVE NATIVE TREES FROM MEXICAN DRY TROPIC

E.10 Jurgita Jovaisiene, Violeta Baliukoniene, Bronius Bakutis, Gediminas Gerulis, Gintarė Kasperavičiūtė, Rimvydas Falkauskas

FEED HYGIENIC QUALITY CHANGES FROM FEED MATERIALS TO ANIMAL

E.11 Karla Paola Figueroa Girón, Jorge Alberto Saltijeral Oaxaca, Gustavo Ruiz Lang

EVALUATION OF THE EFFECT OF FEED ADDITIVES IN THE GROWN OF LAMBS"

E.12 Jorge Saltijeral, Juan Eulogio Guerra Liera, Luciano Abelino Lopez Juarez

PALATABILITY TESTS OF 5 LEAVES OF PLANTS IN DAIRY GOATS

F. ZONOSSES, VECTOR BORNE AND EMERGING DISEASES

F.1 Nadir Alloui, Barberis Abdelheq, Naouel Hamoudi, Amine Boudaoud

IDENTIFICATION AND DENOMBREMENT OF SOME SPECIES OF MIGRATORY BIRDS VECTORS OF AVIAN INFLUENZA VIRUSES

F.2 Vanessa Szott, Benjamin, Katrin Daehre, Uwe Roesler

ASSESS THE IMPACT OF NON-BIOSECURITY BASED MEASURES ON CAMPYLOBACTER SPP. PREVALENCE

F.3 Abdelheq Barberis, Angelina Gorrill, Jousianne Loupias, Abdeljelil, A., Jihen Lachhebe, Amine Boudaoud, Nadir Alloui, Mariette Ducatez

VIRUSES RESPONSIBLE OF FIRST OUTBREAKS OF AVIAN INFLUENZA IN THE EAST OF ALGERIA ARE GENETICALLY RELATED TO H9N2 G1-LIKE LINEAGE

SESSION TWO

ALL POSTERS SHOULD BE PLACED IN THE INDICATED PLACES
FROM 1.30 P.M. ON TUESDAY, 10TH OF SEPTEMBER
TILL 2.30 P.M. ON WEDNESDAY, 11TH OF SEPTEMBER.

G. PRECISION LIVESTOCK FARMING: TECHNIQUES, RISKS AND BENEFITS

G.1 Archana Sarangi, Mayukh Ghosh, Subhasish Sahu, Subhash Chand Gahalot, Ashok K Mohanty, Sushil K. Phulia, Rakesh K. Sharma, Ashok K. Balhara

NMR-BASED METABOLOMICS APPROACH TO UNVEIL POTENTIAL BIOMARKERS OF HEALTHY PREGNANCY IN MURRAH BUFFALOES

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ADDRESSING THE CHALLENGES OF ANIMAL HEALTH AND WELFARE AT A GLOBAL LEVEL

Tomasz Grudnik

OIE-World Organisation for Animal Health, Sub-Regional Representation in Brussels, Belgium

ABSTRACT

The World Organisation for Animal Health (OIE) is an international organisation with a mandate from its 182 Member Countries to improve animal health and welfare worldwide. It is responsible for ensuring transparency of the animal disease situation worldwide, for the publication of disease prevention and control methods as well as for safeguarding the sanitary safety of world trade in animals and animal products, and ensuring food safety from their production phase.

The OIE collects, analyses and publishes scientific information on control methods for animal diseases, including those transmissible to humans. It shares updates on the situation and the evolution of these diseases worldwide. With a network of 301 Reference Laboratories and Collaborating Centres and 12 Regional and Sub-regional Representations, the OIE manages the world animal health surveillance and alert system and plays a key role in veterinary scientific research and information.

As the international reference organisation for animal health within the framework of the World Trade Organization SPS Agreement, the OIE develops sanitary standards that safeguard world trade in animals and animal products and ensure animal production food safety. In a spirit of solidarity with all its Members, the OIE supports Veterinary Services in improving their good governance and compliance with OIE quality standards.

The OIE is also the leading world organisation for animal welfare with the vision of a world where the welfare of animals is respected, promoted and advanced, in ways that complement the pursuit of animal health, human well-being, socioeconomic development and environmental sustainability.

The OIE's missions also include activities aimed at animal production, food security and poverty reduction, impact of climate and environmental changes on animal disease emergence and occurrence, disaster management and global reduction of biological risks. For the future, the OIE will continue to fulfil its mandate by carrying out the missions detailed above. It will strengthen activities aimed at consolidating the "One health" concept in collaboration with FAO and WHO to prevent, control and eradicate diseases existing at the interface between animals and humans, to address the challenges of antimicrobial resistance.

ENVIRONMENTAL AND SOCIAL IMPACT OF THE USE OF FISHMEAL IN AQUACULTURE

Krzysztof Wojtas

Compassion in World Farming International
Wroclaw University of Environmental and Life Sciences,

ABSTRACT

Aquaculture is the most rapidly growing food industry in the world. Half of the global seafood consumed comes from aquaculture farms. Fish farming is often presented as a possible solution to ocean over-fishing and declining fish populations. An important claim considering the alarming statements of some scientist who warn that 90% of commercial fish stocks are fully exploited and if nothing changes by 2050 we might hit a global fish crisis.

Unfortunately many of farmed fish species are carnivorous. They require a high quality feed rich in proteins and fats. To meet that demand a lot of fish-meal and oil is used. Those are commonly produced by processing large amounts of small wild caught marine fish (e.g. anchovies sandeel, sprat etc.)

This creates a large pressure on those species and results in Aquaculture contributing to ocean overfishing. Moreover this practice has a big socioeconomic impact. According to some calculations 90 percent of fish that is used for fishmeal could be used to feed humans instead. Fishing for fishmeal species often happens in developing countries where local fisherman can't compete with big commercial vessels. Those fish are then processed to fishmeal that is later used in farming of high value fish or seafood that are sold in more developed parts of the world.

Industry and various governmental funded research is focused on mitigating those impacts. Some of suggested solutions include using fish trimmings to produce fishmeal and oil or using plant based substitutes. More structural changes include shifting to farming species that can sustain a plant based diet.

THE INCIDENCE OF CONTAGIOUS DISEASES IN POULTRY IN THE WORLD - EPIZOOTIC HAZARDS IN EUROPE

Jean Pierre Vaillancourt¹, Jean-Luc Guérin²

¹Faculty of Veterinary Medicine, Université de Montréal, Canada

²École Nationale Vétérinaire de Toulouse, France

ABSTRACT

In commercial poultry production, infectious diseases can have a major economic impact. Since the late 70's, we have identified each year at least one significant emerging (new) or reemerging infectious disease. There is particularly an increased incidence of viral diseases such as Newcastle disease, avian influenza, infectious bronchitis, laryngotracheitis and reovirus. Bacterial pathogens such as *Mycoplasma gallisepticum*, *Mycoplasma synoviae*, *Clostridium perfringens* and some strains of *Escherichia coli* remain a substantial problem. In some parts of the world, ecto- and endoparasites also have a major impact on poultry health. Coccidiosis remains today a condition requiring constant attention. Several factors may be associated with the rise of contagious diseases. An increase in regional farm density has been shown to be one of the most significant factor. Climate change is also suspected of playing an increasing role in the incidence of certain conditions, including avian influenza. Europe is just recovering from a series of highly pathogenic avian influenza viruses (e.g., H5N8). But others, in particular low pathogenic

H9N2, are very much present and could constitute the next threat to the poultry industry. The greater diversity of poultry species in Europe (ducks, geese, chickens, turkeys, etc.) compared to North America may be a factor of increased risk of contagious disease spread. Societal pressure for free-ranging birds may also contribute to a change in incidence of contagious diseases due to the increased risk of direct contact between domestic birds and wildlife. Finally, consumers and public health officials demand a more prudent use of antibiotics. This implies that hatcheries can no longer use antibiotics and growth promoters have been banned, favouring the emergence of colibacillosis and enteric necrosis. In order to face these challenges, we need to improve biosecurity not only at the farm but also at the regional level.

FULLY INTEGRATED POULTRY PRODUCTION CHAIN

Josef Bachmeier

Veterinary Poultry Practice and Whole Chain Chicken Consulting, Germany

ABSTRACT

Vertical integration is a long used business strategy under which a single company owns or controls various aspects of the whole supply chain like breeders, hatchery, fattening farms, processing plant and feed mill.

In Europe integrated production started in 1950's with the development of the industrialized chicken production.

Targets are a standardized production according the requirements of the market to produce a uniform meat quality. First priority is to fulfill the requirements for food safety as a food business operator. Further priorities are animal welfare, responsible use of antibiotics, environmental protection and sustainability. Production programs are compulsory for the whole chain.

Examples for these programs like responsible use of antibiotics, how to minimize myopathies as a deficiency in meat quality or the cycle of sustainable production chain are demonstrated.

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ANIMAL HEALTH, WELFARE AND BEHAVIOUR

KEYNOTE LECTURES

CAN PRECISION LIVESTOCK FARMING CREATE VALUE FOR ANIMALS, FARMERS AND CONSUMERS?

Joerg Hartung

Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour
University of Veterinary Medicine Hannover, Foundation

ABSTRACT

Since the advent of modern livestock production systems about 50 years ago, the numbers of animals per farm increased dramatically and worldwide livestock production has grown by a factor of four. The production of pig and poultry meat doubled in the last 30 years following the demand of a fast growing world population for food of animal origin. This increase was accompanied with significant breeding progress, development of specialized farms with intensive indoor systems and high stocking rates in order to make best use of the animal's selected genetic qualities that enable them under appropriate housing, feeding, hygiene, management and veterinary control to reach high growth rates and high feed efficiencies in the shortest possible time. As a result, prices for food of animal origin stagnated or fell and less people worked in agriculture. For the first time in human history, Europeans do not need to worry about sufficient food supply. Increasing progress of production, cheap food and less work experience in livestock farming resulted in an alienation of society and livestock production. Concerns were rising about food safety and quality because of the massive use of antimicrobial drugs. Air and water pollution were criticised by air borne, liquid and solid effluents from farming. Increasing concerns were voiced about poor animal welfare under many modern production conditions. Consequently, an increasing number of people asked for better animal protection laws without losing the rich and affordable food supply. Solutions are rare. In recent years, with the arrival of new digital techniques a new discipline was born: Precision Livestock Farming (PLF), and it seems that these 4.0 technologies can mark the beginning of a new age in animal farming after the earlier periods of mechanization and intensification.

This paper describes examples of new PLF technologies such as intelligent sensors and robot-like instruments. Such systems have the potential to help the farmer to survey his animals continuously in real time. Recognizing diseases early can help to reduce both suffering of animals and the use of drugs such as antibiotics. PLF technology has the potential to help farmers protecting health, welfare and performance of his animals, reduce losses and may possibly raise acceptance of animal products deriving from modern farming systems also in critical parts of the society by transparency of production. Examples are given for heat and lameness detection in cows by movement and video analysis, early detection of respiratory problems in pigs by sound monitoring, permanent monitoring of health and behavior of broilers by analysis of feces, litter, drinking nipples, detection and location of dead birds on the floor. PLF can add value by monitoring and evaluating animal behavior help the farmer to better understand his animals and their requirements for improving their quality of life. Necessary is a closer cooperation between veterinarians, agricultural engineers, farmers, retailers, the industry involved, consumers and also NGOs. For this purpose, knowledge must be shared and education intensified across borders and continents. PLF will go globally for a better quality of life of animals and farmers, protect consumers and raise a sound economy.

MEASUREMENT OF ANIMAL WELFARE INDICATORS IN SLAUGHTERHOUSES BY IMAGE PROCESSING

Carsten Cruse

CLK GmbH, Bildverarbeitung & Robotik, Germany

ABSTRACT

The first official animal welfare indicator that can be automatically detected by image processing for millions of animals per day is the poultry footpad dermatitis which can be detected by system „CLK ChickenCheck“. In the talk we give an idea of how such a system works. This is much more than just the exact classification of good and bad foot. When evaluating the images, also other criteria such as harsh environmental conditions, different evaluation systems in different countries and even different evaluations between human experts are taken into account. We show what are the experiences made since 2011 to make the systems stable for everyday work. Next, we give an overview of the existing indicators for poultry and pigs and estimate of which indicators will probably come in the years ahead. We explain some of the critical technical points that need to be solved: e.g. image acquisition in different wavelengths and the stable acquisition of 3D data in harsh environmental conditions.

The important points of constant monitoring and calibration of camera systems are also evaluated, which is an important step to unify all indicator measurement systems across Europe.

ORAL PRESENTATIONS

VIDEO MONITORING IN ENDANGERED SPECIES BREEDING CENTRES –WELFARE IMPROVEMENT AND BEHAVIOUR STUDIES ON CAPERCAILLIE AS THE EXAMPLE

Joanna Rosenberger¹, Ewa Łukaszewicz¹, Artur Kowalczyk¹, Zenon Rzońca²

¹Wrocław University of Environmental and Life Sciences, Institute of Animal Breeding, Division of Poultry Breeding

² Forestry Wisła Division, Capercaillie Breeding Centre in Wisła Forest District

ABSTRACT

Multiplication of wild animals in breeding centres in order to release offspring into natural environment is one of the methods of endangered species protection. As a non-domestic species, keeping capercaillie in aviaries may cause reproductive problems and behavioural disorders. In Capercaillie Breeding Centre in the Wisła Forestry birds are kept in family groups consisting of two males located in separate boxes and four-six females. Thanks to nests 24 hours video monitoring, females behaviour and interactions between them during egg laying and incubation were observed. In four cases two females laid eggs into one nest: in one it resulted in attempts to pull out eggs from the nest and fight between the females (one egg was broken), in two nests were abandoned and eggs were taken away by keepers to be incubated in incubator; in the last, despite the change of incubating female, the chicks were hatched successfully. Manifestation of aggressive behaviour while another female appears near the nest could be often notice. Usually aggression was limited to the aggressive attitude with raised head and raised feathers on the throat, only occasionally pecking or attempts to push out the individual from the nest. Aggressive behaviour and competition for nest sites negatively affected the breeding success and may induce stress. The frequency of these behaviours increased with the number of birds in family. According to experience of breeding centre keepers and birds observer of the behaviour, there should not be more than four females in one family. The use of video monitoring allows to learn more about problems occurring in captive breed wild animals, and if necessary, to take appropriate decisions. Moreover, it contributes to the improvement of birds welfare (females reduction in groups, increase the number of potential nesting sites, trapping and transferring “problem” birds that disturb incubating females).

IMAGE-BASED IMMUNOLOGICAL QUANTIFICATION OF SKIN SWELLING TEST

Shahbaz Bashir¹, Bernice Lim¹, Ali Youssef Ali Amer², Tomas Norton², Jan Paeshuyse¹

¹Laboratory of Host Pathogen Interaction in Livestock, Division of Animal and Human Health Engineering, Department of Biosystems, Faculty of Bioscience Engineering, Kasteelpark Arenberg 30, 3001 Heverlee, KU Leuven University, Belgium;

² Laboratory for Measure, Model and Manage Bioresponses (M3-BIORES), Division of Animal and Human Health Engineering, Department of Biosystems, Faculty of Bioscience Engineering, Kasteelpark Arenberg 30, 3001 Heverlee, KU Leuven University, Belgium;

Correspondence: jan.paeshuyse@kuleuven.be

ABSTRACT

Ecoimmunology addresses the biological organization at the level of an individual's immune system and its evolution in a given ecological and life history context. In this context, the skin swelling test is considered as a useful tool in the assessment of an individual's immune response following a pro-inflammatory stimulant injection. However, given the complexity of the immune response, the mechanism behind local immunological process stimulated by phytohemagglutinin (PHA) is not well understood. In our study, we used an image-based platform to quantify the inflammatory response of the skin swelling test, performed twice 5 month apart, provoked by PHA in a cow. After shaving properly, the neck region of the cow was injected intradermally with PHA-P, while histamine and PBS were used as positive and negative control, respectively alongside a needle prick to assess needle induced inflammatory response. A FLIR One™, Commercial infrared thermal camera for a smartphone, was used to measure the thermal dynamics of inflammation. In addition to thermal imaging, skin measurements were performed using a digital vernier caliper. In the first swelling test, histamine caused the maximum skin swelling and skin fold thickness increment as compared to those of PHA and PBS. In the 2nd skin swelling test post sensitization, PHA showed a higher immune response in terms of skin swelling and skin fold thickness as compared to those of histamine, PBS and needle prick. Thermal imaging of the swollen skin area revealed that maximum surface area with increased temperature was achieved by histamine within first 1.5 hours with a more spreading outward trend from the site of injection. In contrast to this, the delayed reaction of PHA and PBS was observed at 6 hours post injection with mostly localized reaction with more intense temperature increase. This study demonstrates the quantification of immune response with infrared thermal imaging to assess a temperature increment as a practical tool in understanding the skin swelling response.

INTRODUCTION

Ecoimmunology deals with the core concept of shaping a complex, multifaceted and ever evolving host immune system at multiple levels of biological organization throughout one's ecological and life-history contexts. In spite of availability of large number of immunological tests, measurement of individual's immune system still remains a central conundrum [3] and requires further exploration in understanding the underlying mechanisms. In the field of ecoimmunology and ecotoxicology, a skin swelling test emerges as a cheap and simple approach to evaluate individual's cell mediated immune responsiveness following mitogen injection. In this regards, phytohaemagglutinin (PHA), a plant lectin extracted from *Phaseolus vulgaris*, is considered as a universal mitogen of choice [8]. Furthermore, skin swelling response of PHA has mostly been studied in birds [1], amphibians [4], and reptiles [7]. In contrast, the pro-inflammatory response of PHA has rarely been explored in mammals, particularly cow. Inflammation is the basic principle behind skin swelling test. Inflammation is scored on the basis of five cardinal signs namely; swelling, redness, pain, loss of function and warmth. Although, swelling is perceived as a useful cardinal sign by the clinician

in the field for convenience, but it is highly subjective and mainly rely on the technical expertise of the clinician[6]. The objective of the study at hand is to use an image-based platform to investigate and quantify the inflammatory response and underlying thermal dynamical changes at the site of PHA injection in a cow.

MATERIALS AND METHODS

The study was approved by University Ethical Committee for Animal Experimentation KU Leuven and conducted on Holstein cow at TRANSfarm KU Leuven. The study was performed twice in the same animal 5 months apart. In this study, Both sides of the neck were shaved properly and pricked intradermally with 2.5 mg/ml PHA-P (Sigma-Aldrich, L8754) in DPBS (Sigma-Aldrich, D5652), 5 mg/ml Histamine ((Sigma-Aldrich, H7125) in DPBS as positive and DPBS alongside needle prick as negative control.

Infrared thermography of the injection sites was performed by using a cost-effective portable commercial infrared thermal camera FLIR One™ (Fig. 1) powered by an android based smartphone. Digital thermographs were retrieved through a free app software released by FLIR® systems and processed in MATLAB R2016b. A special camera frame of 15×15×20cm dimensions was built to ensure the constant distance between camera and the injection site at all times (Fig. 2).



Fig. 1. FLIR One™ infrared thermal

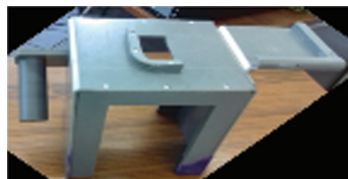


Fig. 2. Camera frame

Intensive thermographic imaging with FLIR One™ and physical measurements with digital vernier caliper (POWERFIX®, Lidl) were performed at 0 hour pre-injection and every 15 minutes during the first hour of post injections, every half an hour until 15 hours post injections and then at 19, 21, 24, 30 and 48 hours post injection to notice the thermal and physical dynamics of inflammation. At both instances, The diameter of the skin swelling area and double skin fold thickness were measured as a part of physical measurements.

RESULTS AND DISCUSSION

In humans, the use of infrared thermography is increasing with each passing day with its wide applications in diagnostics conditions revolving around skin such as diabetes mellitus of diabetes, arthritis and other inflammatory skin disorders [2]. In ecoimmunology, skin swelling test is a routine procedure being performed to evaluate immunocompetence of the animal. However, swelling is not the only sign of inflammation, heating/warmth at the site of inflammation is also amongst the cardinal signs. In the first trial, histamine caused the maximum skin swelling diameter (80.58mm) followed by DPBS (35.36mm) and PHA (34.98mm), respectively (Fig. 3). Rapid and aggressive swelling was elicited by histamine as compared to the gentle swelling of PHA. the maximum diameter was achieved at 3 hours post DPBS injection and at 5 hours post histamine and PHA injection. Double fold skin thickness is considered as the most common method for the estimation of skin swelling response. Histamine caused the maximum double fold thickness (26.78mm) with almost 350% increment, while PHA and DPBS (15.65 and 15.04 mm) showed similar trend in double skin fold thickness with just 150% increment (Fig. 4).

In the second trial being conducted 5 months post first trial, PHA caused the maximum skin swelling (44.33mm) at 6 hours post injection as compared to histamine (43.37mm) at 5 hours and DPBS (14.61mm) at 1.5 hours (Fig. 5). In terms of double skin fold thickness, PHA induced the maximum double fold thickness (27.58mm) with 260% increment at 4 hours post injection as compared to histamine (21.84mm) and PBS (8.7mm) achieving maximum double thickness at 1.5 hours post injections with 225% and 13% increment, respectively (Fig. 6).

Thermal imaging revealed that intradermal injection of histamine (Fig. 8B) and DPBS (Fig. 7B) caused a quick reaction and achieved a maximum total surface area of temperature increment with in first 1.5 hours post-injection as compared to the delayed reaction shown by PHA (Fig. 9B) 6 hours post injection. The area of temperature increment caused by PHA was larger than that of achieved by histamine, despite of the fact that histamine cause larger skin swelling and thickness. Another interesting feature observed was the fact that PHA swelling showed localized temperature increment (Fig. 9), while histamine (Fig. 8) and PBS (Fig. 7) swelling showed a spread outward trend of temperature increment from the site of injection with almost being at the border of the thermal images at 30 hours post injection. Our study utilizes the proinflammatory potential of PHA to understand the thermal dynamics of inflammatory response. Skin swelling and double fold thickness are in in line with the studies conducted previously [5, 7]. In the first injection trial, Low swelling response in our study to PHA might be due to the fact that cow was not sensitized to PHA previously. Observation localized temperature increment trend in case of PHA and disseminated trend in case of histamine and PBS is an interesting point to look for. To better understand the temperature increment and dissemination mechanism in skin swelling test for different mitogens, it is necessary to apply FLIR system thermal camera powered by smartphone on larger scale in skin swelling tests.

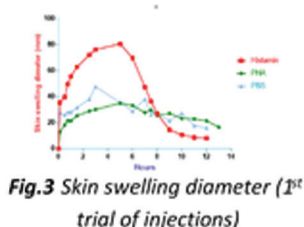


Fig.3 Skin swelling diameter (1st trial of injections)

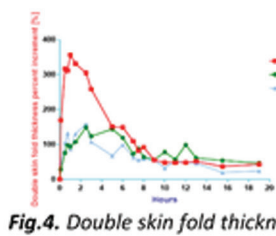


Fig.4. Double skin fold thickness

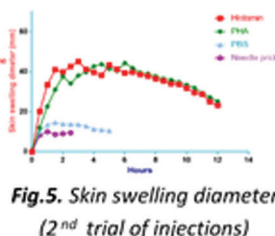


Fig.5. Skin swelling diameter (2nd trial of injections)

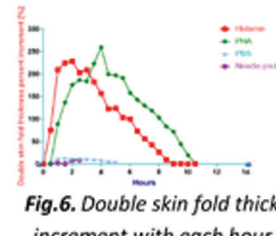


Fig.6. Double skin fold thickness increment with each hour (2nd)



Fig. 7. Area of temperature increment (yellow spots) processed in MATLAB R2016b provoked by I/D DPBS injection: A) immediate post-injection, B) maximum at 1-hour post injection and C) 30-hours post injection



Fig. 8. Area of temperature increment (yellow spots) processed in MATLAB R2016b provoked by I/D Histamine injection: A) immediate post-injection, B) maximum at 1.5-hour post injection and C) 30-hours post injection



Fig. 9. Area of temperature increment (yellow spots) processed in MATLAB R2016b provoked by I/D PHA-P injection: A) immediate post-injection, B) maximum at 6-hour post injection and C) 48-hours post injection

CONCLUSION

This study shows that observation of temperature increments, as a result of increased blood flow to the site of mitogen injection, could be a practical tool in quantifying and understanding the immune response of skin swelling test.

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INVESTIGATION OF THE EFFECTS OF PROBIOTIC, BACILLUS SUBTILIS' ON STRESS REACTIONS IN LAYING HENS USING INFRARED THERMOGRAPHY

Maria Soroko¹, Hu Jiaying², Daniel Zaborski³, Heng Wei Cheng⁴, Marisa Erasmus²

¹Wroclaw University of Environmental and Life Sciences

²Purdue University

³West Pomeranian University of Technology

⁴USDA-Agricultural Research Service, Livestock Behavior Research Unit

ABSTRACT

The goal of the study was to assess whether tonic immobility (TI) - induced stress reactions in laying hens can be reduced by probiotic supplementation and if the change in body temperature, as a stress indicator, is genetically dependent and can be detected using infrared thermography (IRT). Seventy two Hy-Line W-36 White Leghorn and seventy two Hy-Line Brown hens were used in this study. Hens of each line were randomly assigned to three treatments: beak trimmed and fed a regular diet; non-beak trimmed and fed a regular diet; and non-beak trimmed and fed a diet supplemented with probiotics, *Bacillus subtilis*. Hens in the probiotics group received a probiotics-supplemented diet since day-old. At 40 weeks of age, hens were tested for TI reactions and eye and face temperatures were measured with IRT immediately before and after TI testing. Eye temperature and face temperature were plotted to examine temperature changes. Results revealed that left and right eye temperatures increased by 0.26 °C and 0.14 °C, respectively, while right face temperature tended to increase following TI testing. Right eye (32.60 for white, and 32.35 for brown, $P=0.01$) and face (39.51 for white, and 39.36 for brown, $P=0.04$) temperatures differed significantly among genetic lines. Probiotic supplementation did not affect hens' stress responses to TI testing as measured using IRT. There was a positive correlation between TI duration and the changes of left and right eye temperatures after TI testing in white hens but not brown hens ($r_s=0.36$ and 0.34 , $P = 0.002$ and 0.004). Based on these results, hens experience stress-induced temperature changes resulting from TI testing can be detected using IRT. However, supplementation with *Bacillus subtilis* does not attenuate hens' reaction to TI testing. Consistent with other studies, white hens experience greater stress reactions in response to handling and TI than brown hens.

A POSSIBLE METHOD FOR IN VIVO DETERMINATION OF THE OXIDATIVE STRESS IN DAIRY HERDS. PRELIMINARY RESULTS

Péter Hejél, Viktor Jurkovich, Péter Kovács, Endre Brydl, Laszlo Konyves

University of Veterinary Medicine, Budapest, Hungary

ABSTRACT

Preliminary data of the investigation of applicability of FRAS4 equipment (H & D srl., Parma, Italy) for in vivo measurement of oxidative stress (OS) and antioxidant capacity of animals in dairy herds. In blood, dROM (Reactive Oxygen Metabolites), PAT (Plasma Antioxidant Capacity) and calculated OSI (Oxidative Stress Index) refer to the redox status. Bovine reference values have not yet been reported. The study was performed in large-scale dairy herds among close-up group: cows <14 days before calving ($n = 121$); calving and maternity cows: days in milk (DIM) <7 ($n = 66$), fresh cow group: DIM 8 to 30 ($n = 139$) and in peak lactation group: DIM 41 to 240 ($n = 248$). In DIM <7 days group, the dROM was the highest (u.Carr 139, sd 34) and the PAT was the lowest in the (u.Cor 2530, sd 226). The lowest dROM (u.Carr 104, sd 28) were found during peak lactation. The highest PAT (u.Cor 2550, sd 240) was detected in DIM 8 to 30 group. The OSI value was the highest in calving & maternity group (4.9 sd 1.2) and lowest in high producing group (4.1 sd 1.1). Preliminary results indicate that it is justified to continue the study. OS monitoring in different physiological or production stages may be a potential tool for early detection of imbalance between reactive oxygen species and antioxidant defence of the body.

INTRODUCTION

An animal is subject to oxidative stress (OS) when the concentration of reactive oxygen metabolites in the body fluids reaches or exceeds the capacity of the body's antioxidant defence systems.

Metabolic stress plays a primary role in development of diseases during the periparturient period (metritis, mastitis, retained placenta, displaced abomasum, ketosis), meanwhile the increased NEFA concentrations may induce OS (Bernabucci et al., 2005; Shi et al., 2014; Xu et al., 2014). The metabolic stress affecting the animals is actually the combined effect of the negative energy balance (NEB), the immunological dysfunction and the OS (Sordillo and Mavangira, 2014; Talukder et al., 2015).

Heat stress is a potential predisposing factor in development OS. Higher antioxidant enzyme activity was detected in the red blood cells of cows during heat stress, indicating that the animals are subject to significant OS in summer during the periparturient period (Bernabucci et al., 2002; Lacetera et al., 2003).

Mycotoxin contamination poses an increasing risk to animal health, with public health implications through food production chain. Certain mycotoxins induce OS by increasing cytochrome P-450 isoenzyme activity (Miller et al., 1993).

The few examples above highlight the fact that physiological and/or environmental stressors affecting dairy cows may induce OS either directly or indirectly, threatening their health and compromising productivity. Timely detection of increased reactive oxygen species (ROS) production or decreased antioxidant capacity allows for an efficient intervention and restoration of the balance. In this regard normal ranges characteristic for specific species, ages, physiological states and production groups have to be determined.

A number of methods are available to determine the presence of oxidative stress on an individual level but generally these are not suitable for herd level monitoring. There is great demand for practical, cheap and reliable herd level diagnostic methods that fit into the framework of preventive veterinary medicine, so this might be a possible direction for future developments (Leblanc, 2006; Sordillo and Mavangira, 2014).

Our aim was to investigate the applicability of the FRAS4 method in dairy herds in multiple phases: 1) determining biological variance of cows in different physiological- and production stages; 2) determining the normal ranges for dROM, PAT and OSI

MATERIALS AND METHODS

The investigations were carried out in Hungarian large-scale dairy herds. The contacted farms were included on a voluntary basis to ensure random participation and to exclude possible bias due to the effect of the farm. All of the involved farms work in similar management-, housing- and nutritional conditions and represents the Hungarian large-scale dairies. All animals were clinically healthy at the sampling time.

Blood samples were taken 2 to 3 hours after the morning feeding. Blood samples were collected from the vena epigastrica superficialis into tubes with heparin anticoagulant and were transported and stored in cooling equipment. Samples were tested for the biochemical markers with the FRAS4 (H&D srl, Parma, Italy) within 12 hours. The dROM, PAT values and the calculated OSI are indicative of the redox balance in an organism (Celi, 2011; Celi et al., 2011; Abuelo et al., 2013). The test-method has been validated by electron spin resonance (Alberti et al., 2000).

RESULTS AND DISCUSSION

Descriptive statistics of investigated parameters are shown in Tab. 1. In DIM <7 days group, the dROM was the highest (u.Carr 139, sd 34) and the PAT was the lowest in the (u.Cor 2530, sd 226). The lowest dROM (u.Carr 104, sd 28) were found during peak lactation. The highest PAT (u.Cor 2550, sd 240) was detected in DIM 8 to 30 group. The OSI value was the highest in calving & maternity group (4.9 sd 1.2) and lowest in high producing group (4.1 sd 1.1). The results of the study are comparable to published data (Celi et al., 2011).

Significant differences were observed (Tab. 2) when comparing the average dROM, PAT and OSI values of the different groups using a linear mixed model ($P < 0,05$).

The dROM values were highest in cows in the calving & maternity group, which might be explained by the OS inducing effect of calving (Gaál et al., 2006). The PAT values were lowest also in the calving & maternity group, presumably due to high antioxidant demand of body at this physiological stage. It is assumed that the antioxidant capacity of the organism is depleted by this time. Energy balance normally is restored by the time of peak lactation. This was the period when the lowest dROM and the lowest OSI values were measured. (Fig. 1, 2, 3) Results revealed trends among the groups, but not all of differences were significant.

CONCLUSION

OS monitoring in different physiological or production stages may be a potential tool for early detection of imbalance between reactive oxygen species and antioxidant defence of the body. Due to serious harmful effects of OS, with an early detection and a well-timed support of animals by AO additives might be essential in prevention of further diseases and losses in productivity. Preliminary results indicate that it is justified to continue the study. Further research may reveal the predictive potential of this novel monitoring tool.

ACKNOWLEDGEMENTS

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Table 1.: Mean values of variables (Results from 581 blood samples collected until October

2018)

Production group/OS parameter	Close up cows <14 days to calving (n=121)	Calving and Maternity coes DIM<7 (n=66)	Fresh cows DIM ⁴ 8-30 (n=139)	Peak lactation cows DIM ⁴ 41-270 (n=248)
dROM [u.Carr] ¹	112 (sd23)	139 (sd 34)	114 (sd 28)	104 (sd 28)
PAT[u.Corr] ²	2533 (sd 256)	2530 (sd 226)	2550 (sd 240)	2538 (sd 187)
OSI ³	4.4 (sd 0.9)	5.5 (sd 1.4)	4.5 (sd 1.2)	4.1 (sd 1.1)

¹1 U.Car=0,08mg/100ml H₂O₂, ²1 U.Cor=1.4 μmol/l Vit C, ³OSI= dROM/PATx100 ⁴DiM=days in milk

Table 2: Results of testing significance among groups

	CU ¹ - FC ²	CM ³ - FC	PL ⁴ - FC	CU - CM	CM - PL	CU - PL
	P value					
dROM [u.Carr] ¹	0.9987	<0.01	0.0111	<0.01	<0.01	0.0870
PAT[u.Corr] ²	0.99404	0.99498	0.99712	1	0.99998	1
OSI ³	0.9999	<0.001	0.0154	<0.01	<0.01	0.0683

¹CU: Close-up; ²FC: Fresh cow; ³CM: Calving & Maternity; ⁴PL: Peak-Lactation; Bold numbers means significant differences (P<0.05)

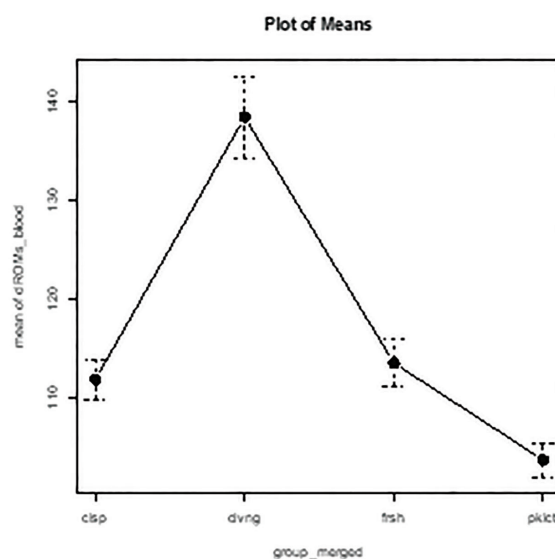


Figure 1: Means of dROMs in groups groups (clsp: close-up; clvng: calving & maternity; frsh: fresh; pklct: peak lactation)

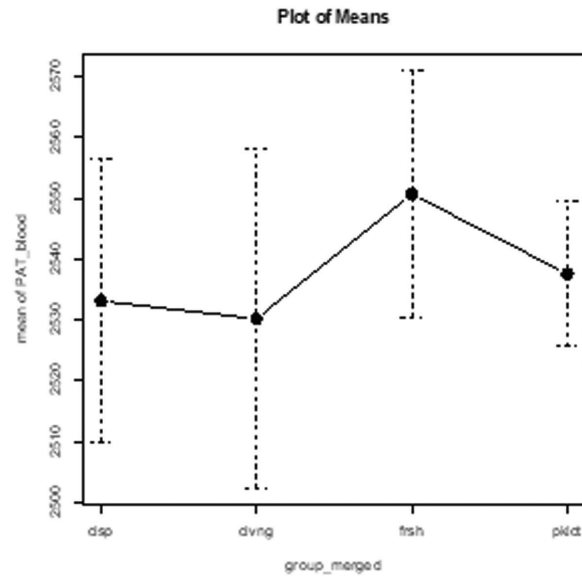


Figure 2: Means of PAT in groups groups (clsp: close-up; clvng: calving & maternity; frsh: fresh; pklt: peak lactation)

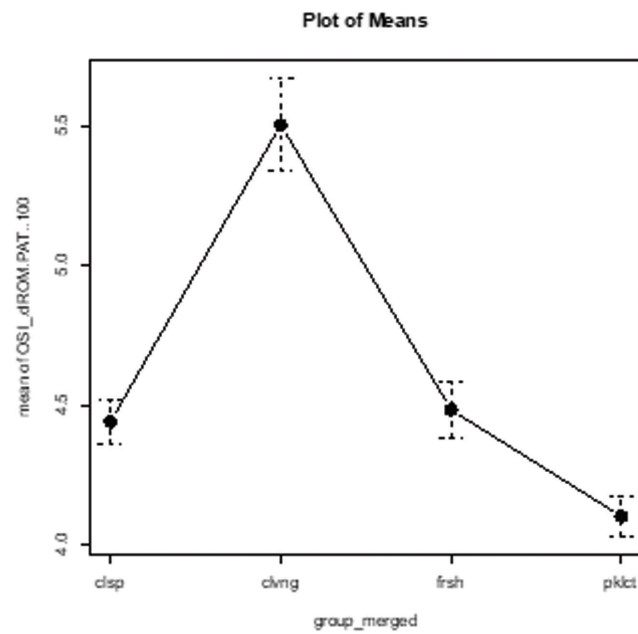


Figure 3: Means of OSI in groups groups (clsp: close-up; clvng: calving & maternity; frsh: fresh; pklt: peak lactation)

CALF MORTALITY DURING THE FIRST 4 WEEKS OF LIFE: EVALUATION OF INFECTIOUS AGENTS

Michał Bednarski, Małgorzata Bednarska, Robert Kupczyński
Wrocław University of Environmental and Life Sciences

ABSTRACT

The productivity of the herd can be negatively affected by high mortality rate of calves, in fact it increases veterinary costs, limits genetic selection and increases the need for acquisition of replacement dairy animals. High mortality rate of calves can be related to the larger number of calves in a herd, employee performance, severe weather, and the neonatal period covering the first 4 weeks of life. Diarrhea of calves is a commonly reported disease and is attributed to both infectious and noninfectious factors. In addition, early-life enteric disease among calves might have influence on calf raisers' ability to detect respiratory disease later in life. Mortality in the cattle industry is not only relevant with regard to animal health and welfare but also to economic losses. This study is aimed at evaluation of the infectious agents in the neonatal dairy calf mortality in south-western Poland farm. The study included 250 carcasses of calves, aged between 2 and 28 days from farms located in Poland in 2013-2018. A full necropsy of all animals was performed. Samples of organs were taken for the microbiological examination. Standard set of organs (liver, spleen, lung and intestine) were examined to presence of bacteria (general microbiology, isolation of Salmonella, Campylobacter), faeces (or rectal swap) for enteropathogen (rota-, coronaviruses and C. parvum) and Candida. Isolated strains of E. coli were evaluated for virulence genes. The results obtained from research indicate that the main cause of mortality of examined calves was diarrhea, septicemia, pneumonia, abomasums ulceration and abomasitis.

THE ROLE OF VETERINARY MEDICINES IN ENSURING ANIMAL HEALTH AND ANIMAL WELFARE

Roxane Feller

Secretary General at AnimalHealthEurope

ABSTRACT

We all depend on animals in our daily lives – for companionship, assistance, leisure and our food. No matter how well we care for our animals, they can still get sick and may need medicines. But treating sick animals is only part of the story. While treatment will always be important, the focus is increasingly shifting to disease prevention and animal resilience as well as earlier diagnosis to facilitate better interventions to improve animal health.

By protecting the health and welfare of more than a billion animals across Europe – from cod to cats and ponies to piglets – the animal health industry improves the quality of life for animals and humans, contributing to safe, affordable and sustainable food production. We safeguard public health by preventing disease outbreaks in animals and enhance Europe's preparedness against emerging diseases, as well as those which are transferable from animals to humans. We believe that animal health is an essential precondition to animal welfare, a growing concern for Europe's citizens and consumers. Our industry plays a key role in:

- Animal health - Veterinary medicines ensure the safety of close contact with pets as well as farm animals and allows cross-border travel through health protection programmes
- Public health - Of the nearly 1,500 infectious diseases we know affect people, a little over 60% can pass between animals and humans. Protecting animals also means protecting our health.
- Animal welfare - Veterinary medicines reduce the occurrence of disease and suffering in animals, hereby contributing to the overall well-being and protection.
- Food security - Diseases in food-producing animals globally amount to a loss of 20% in production
- Food safety - Healthy animals enable farmers to produce high quality food in an efficient and sustainable way, minimising the impact on the environment and allowing farmers to sustain a livelihood and making our food safe to eat.

The animal health sector is science-driven and highly regulated, meaning it delivers products that are safe, qualitative and efficacious. They are invaluable tools for farmers, veterinarians and animal owners alike. The sector strives for a more harmonised legislation to increase innovation and ensure availability of all veterinary medicines across Europe.

SEROPREVALENCE AND FACTORS ASSOCIATED TO NEOSPORA CANINUM ON URUGUAYAN DAIRY HERDS

Valentina Macchi¹, Alejandra Suanes², Ximena Salaberry², Federico Fernandez²,
Cynthia Moreira², Stella Huertas¹, José Piaggio¹, Andrés Gil¹

¹Facultad de Veterinaria, UdelaR

²Dirección General de Servicios Ganaderos, Ministerio de Agricultura y Pesca

ABSTRACT

Neosporosis is responsible for large economic losses in cattle worldwide, since it is one of the most important causes of abortion. The aim of this study was to determine the seroprevalence and associated factors with Neospora caninum (N. caninum) in dairy cattle in Uruguay. In the second semester of 2015, a cross-sectional study was developed with a two steps random sample: in the first step dairy herds were divided into three strata according to the bovine population size (from 1 to 50, 51 to 250 and more than 250 cattle). In the second step, 60 dairy cows were sampled within each herd. A total of 4223 serum samples from 102 herds were analyzing by indirect ELISA test. Also, a survey and a study population was made to the owners of the herds. To determine the associated factors

a multivariate logistic regression model was performed. Dairy cow seroprevalence of *N. caninum* was $22.3 \pm 1.8\%$ (95% confidence interval (CI), 18.7-25.9%), and at herd level was $96.0 \pm 1.9\%$ (95% CI, 92.1-99.8%). The number of dogs in the dairy farms was found associated with infection levels, for each additional dog present in the farm the risk of having seroprevalences higher than 20% increased 1.43 times (OR = 1.43, $p = 0.04$), with an IC 95 of 1.02 to 2.03. These results show that although the individual seroprevalence has remained stable over the years, infection with *N. caninum* is widespread in Uruguayan dairy cattle. Despite this study showed that the number of dogs in the dairy herds increases the risk of having high intra-herd seroprevalences, it is considered necessary to continue with this line of research, with more targeted studies. Taking into account the great spread of the disease in the country and the overpopulation of existing dogs.

RELATION BETWEEN HAIR-CORTISOL CONCENTRATION AND WELFARE ASSESSMENT PROTOCOLS IN DAIRY COWS

Frank van Eerdenburg, Tessa Hof, Benthe Doeve, Lars Ravesloot, Rebecca Nordquist, Franz Josef Van Der Staay
Department of Farm Animal Health, Faculty of Veterinary Medicine, Utrecht University

ABSTRACT

Many protocols have been developed to assess farm animal welfare. However, the validity of these protocols is still inconclusive. This study aimed to validate the welfare assessment protocols Welfare Quality®, an modified version of Welfare Quality, KoeKompas, WelzijnsWijzer, a new Welfare Monitor, Continue Welzijns Monitor, Cow Comfort Scoring System and the Welfare Index by correlating them to hair cortisol concentrations in cows. All the protocols were executed at 58 dairy farms spread over the Netherlands. Hair samples were taken from 10 randomly selected cows from each farm. The mean cortisol concentrations in the hairs were correlated with the welfare assessment protocols outcomes. Because cortisol is a stress indicator and could therefore be a welfare indicator, a negative correlation between cortisol and the result of the welfare protocol scores was expected. KoeKompas was the only protocol that showed a significant negative correlation ($R = -0.27$) with cortisol. Besides, the welfare protocols parameters feeding ($R = -0.32$), housing ($R = -0.29$), health ($R = -0.32$), milk yield ($R = -0.38$) and mastitis ($R = -0.28$) had negative correlations with cortisol. Because only five out of all the parameter scores from the welfare assessment protocols showed a negative correlation with cortisol, the protocols might not be reliable and should be re-evaluated. Or cortisol levels, as measured in hairs, are not a good indicator for stress in dairy cattle.

HEAT TOLERANCE OF DAIRY CALVES IN SUNNY AND SHADED ENVIRONMENTS

Mikolt Bakony¹, Levente F. Kézér², Luca Kovács^{2,3}, Viktor Jurkovich¹

¹University of Veterinary Medicine, Department of Animal Hygiene, Herd Health and Mobile Clinic, Budapest, Hungary

²MTA-SZIE Large Animal Clinical Research Group, Üllő, Hungary

³Research Institute for Animal Breeding, Nutrition and Meat Science, Herceghalom, Hungary

ABSTRACT

Associations and correlations between ambient, skin surface and core body temperatures and respiratory rates were studied in dairy calves kept in individual hutches either exposed to sun or shaded with greenhouse nets. Skin surfaces temperatures measured at different body regions were found not to be a good indicator rectal temperature as they showed weak correlation to rectal, but high correlation to ambient temperatures. Ambient (dry bulb) temperatures showed rather small, while respiratory rates showed considerable differences between sunny and shaded environments, suggesting that mean radiant temperature is more informative in outdoor conditions. Evaporative heat loss through respiration is sufficient to maintain physiological core temperature during hot summer days in a continental climate.

INTRODUCTION

Heat stress is not a well-defined and researched area in dairy calf rearing. The few number of research studies available have not detected reduced weight gain or poorer health due to prolonged exposure to high solar radiation in outdoor calf rearing, it is therefore an overlooked area in calf management [7]. Pre-weaning calf welfare can be impaired in hot weather without providing shade [3, 4]. Skin temperature measured by infrared thermography can be used to evaluate the well-being of the animals in heat stress [13]. In the present study we aimed at describing the differences in heat load experienced by calves as well as the predictive value of skin temperatures on different body regions to assess rectal temperature of dairy calves in sunny and shaded environments.

MATERIAL AND METHODS

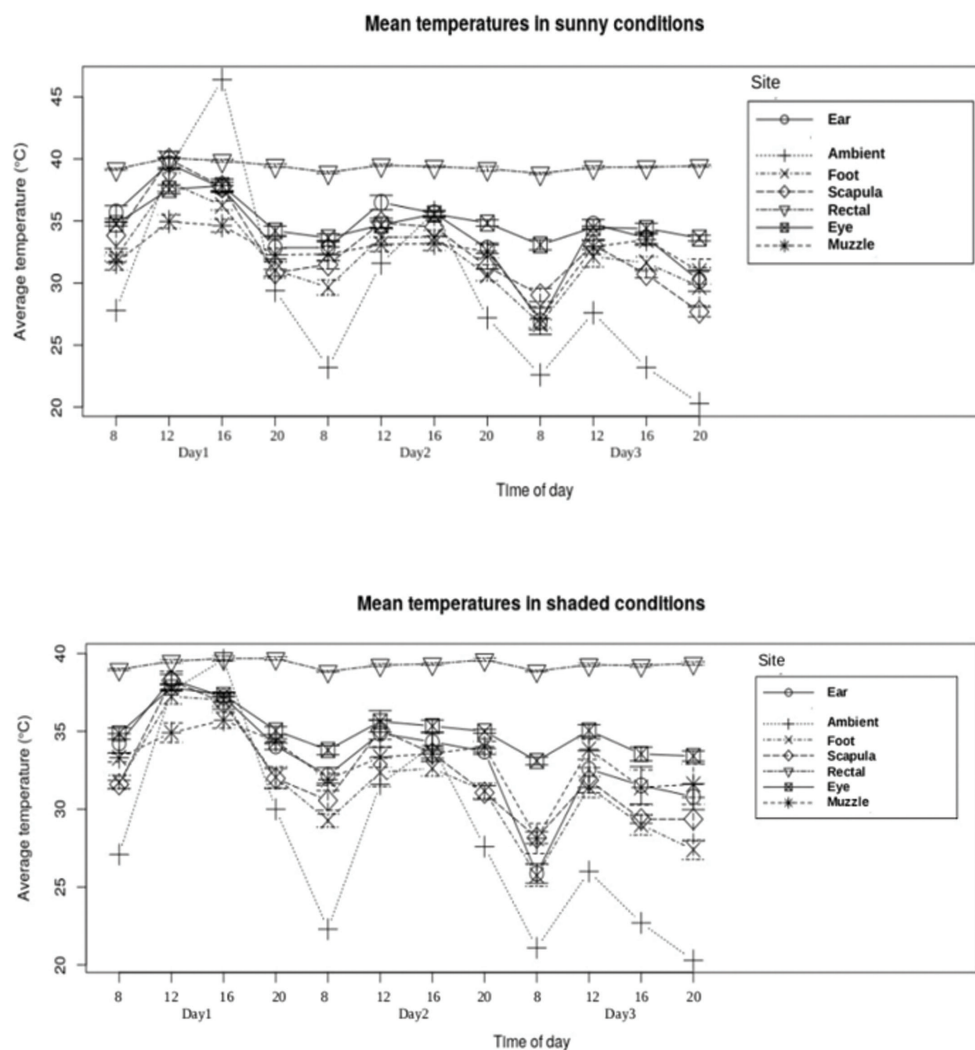
As part of a larger study focusing on the heat stress response of dairy calves in shaded vs. sunny environments, data on ambient, body and skin temperatures and respiratory frequencies were measured in 4h-intervals during 3 hot days (average 27 °C, max 41 °C) on 16 pre-weaned calves kept outdoor in individual plastic hutches with a small pen in the front. 8 hutches were exposed and 8 were shaded by means of greenhouse nets (shade rate 85%) installed at approximately 2 meters above the ground, providing shade to both the hutch and the pen area. Ambient temperature and relative humidity in the pen area were recorded every 10-min using VOLTcraft DL-181THP (Conrad Electronic SE, Hirschau, Germany). Respiratory rate was recorded with a 4-h sampling frequency by counting flank movements per minute. Rectal temperature was measured at the time of respiratory rate with a 10-sec digital thermometer (Digi-Vet SC 12; Jørgen Kruuse A/S, Langeskov, Denmark). Skin temperature was measured immediately after rectal temperature with the Testo 830 T2 infrared thermometer (Testo SE & Co. KgaA, Lenzkirch, Germany) on the ear, the muzzle, the eyebulb, the scapula and the foreleg.

Daytime (between 8:00-20:00) temperature data were analysed with regard to correlation using the repeated measures correlation [1]. Summary measures (area under the curve [AUC], overall mean, maximum and amplitude

of changes) of rectal and surface temperatures and respiratory rate were compared with respect to sunny or shaded conditions [5]. Comparisons were made using the Welch two-sample test. Level of significance was set at $p \leq 0.05$. All statistical analyses were performed using the R statistical software [8].

RESULTS AND DISCUSSION

The following plots (Figure 1. and 2.) illustrate the average of temperature data recorded over the 3 days, and their daily variance, in sunny and shaded conditions respectively



Despite the obvious differences in the amount of solar radiation, ambient temperatures differed by only 5°C at most (at the hottest time of day) between sunny and shaded hutches. The correlations between rectal and skin temperatures were significant but weak in the shaded group ($r = 0.15 - 0.31$) and slightly stronger in the sunny group ($r = 0.42 - 0.53$). The explanatory power of surface temperatures were inadequately low in the measured temperature range for predictions.

However, skin temperatures showed a very strong correlation to ambient temperature in both groups ($r = 0.68 - 0.84$ and $r = 0.75 - 0.89$ in sunny and shaded groups, respectively, $p < 0.001$). In hot weather, due to the dilatation of blood vessels in the skin the surface temperature is closer to the core temperature [12] but it is often biased by external conditions, e.g. humidity and wind speed [11]. Studies comparing surface temperatures – measured by no contact sensors – and rectal temperatures have found eye temperature to be a good indicator of core body temperature in cows [9, 10] but not in horses [2]. In our study, eye temperature showed weaker correlation to rectal temperature than the scapula. The fact that infrared thermometry only measures radiative heat loss and not total evaporative heat loss limits its suitability.

Summary measures of temperatures did not differ between animals in sunny and shaded environments, with the exception of clinically less relevant differences between maximal rectal (40.2°C vs. 39.9°C) and scapula skin temperatures (39.7°C vs. 38.3°C) and amplitude of changes in rectal (1.43°C vs. 1.15°C) and ear skin temperatures (13.5°C vs. 11.3°C). The average and maximal respiratory frequency was elevated in both groups, but much higher in calves exposed to sun (71.8/min vs. 58.3/min, $p < 0.01$ and 139/min vs. 100/min, $p < 0.0001$), as expected.

The results suggest that the efficiency of evaporative heat loss through respiration and presumably the heat storing capacity of the body shell in dairy calves is sufficient to maintain physiological core temperature even in prolonged exposure to solar radiation. However, small difference in ambient temperatures despite large differences in respiratory frequencies suggest that commonly used environmental indices that take only ambient but not mean radiant temperature into account might not be appropriate to assess the impact that high radiant heat load actually has on calf welfare.

ACKNOWLEDGEMENTS

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GENETIC VARIANTS UNDERLYING HOOF DISEASES IN BRAUNVIEH AND FLECKVIEH CATTLE

Brabara Kosińska-Selbi¹, Tomasz Suchocki¹, Magdalena Frąszczak¹, Christa Egger-Danner², Schwarzenbacher Hermann², Joanna Szyda¹

¹Wrocław University of Environmental and Life Sciences

²ZuchtData EDV-Dienstleistungen GmbH

ABSTRACT

The aim of the study was to analyse the genetic background underlying hoof diseases in Braunvieh and Fleckvieh cattle breeds. 985 Braunvieh and 1,999 Fleckvieh cows with phenotypes on the total number of hoof disorders scored during the first 300 days of lactation were genotyped using the GeneSeek® Genomic Profiler™ HD oligonucleotide microarray. This resulted in 76,932 SNPs available for each individual after editing. Instead of measured phenotypes, breeding values representing phenotypes pre-corrected for parity, calving year-season, percent of non-Holstein-Friesian genes and hoof status were used in the genome-wide analysis model:

$$y = a + bX + g + e,$$

where, y is the breeding value of a cow, a is the general mean, b is the fixed additive effect of a single SNP to be tested for association, X is the corresponding design matrix coded as 0, 1 or 2 for a homozygous, heterozygous and the alternative homozygous genotypes respectively, g is the random additive polygenic effect and an individual captured by all remaining SNPs, and e represents a random residual term. The normal distribution is pre-imposed on the polygenic effect with $g \sim N(0, G)$, where G corresponds to the covariance matrix between SNPs multiplied by the polygenic variance as well as on the residual effect $e \sim N(0, R)$, where R is the identity matrix multiplied by the residual variance.

The SNPs that show significant values were annotated to Bos taurus reference genome (ARS-UCD1.2 available on www.ensembl.org). Those SNPs were found on chromosomes 1, 4, 14, and 16. One of the markers was located to OLIG2 and OLIG1 genes which for Bos taurus and Homo sapiens are oligodendrocyte transcription factor 2 and 1. Another SNP was found in close location to ABRA genes, which regulates function of striated muscle activator of Rho signalling.

STOCKPERSON ACTIONS AND ANIMAL STRESS AT MOBILE AND STATIONARY SLAUGHTER OF CATTLE

Jan Hultgren, Charlotte Berg, Bo Algers

Swedish University of Agricultural Sciences, Department of Animal Environment and Health

ABSTRACT

On-farm slaughter may have the potential to reduce animal stress. We investigated relationships between animal handling and stress-related animal behaviours in connection with slaughter at two Swedish slaughter plants: a small-scale on-farm mobile abattoir and a relatively large-scale stationary slaughterhouse. Data were collected during processing of 298 animals at each plant during one year. Stockperson actions and animal behaviours were observed in the driveway (2.4 to 7.3 m long) to the stun box. Data on season, hour of day, air temperature, animal breed, animal category, animal age, carcass weight and stockperson category (plant or farm) were also collected. We used principal-component factors analysis, confirmatory factor analysis, and generalised structural equation modelling. The final model contained six variables representing observed animal backing, turning, slipping, eliminating, vocalising and violent behaviour, regressed on a latent variable representing animal stress level. Stress level and behaviours were also regressed on five variables representing observed stockperson actions (touching, patting or hitting with hand or tool, pushing, tail-twisting and using an electric goad) and on background variables including plant identity. The behaviours were modelled as counts per driveway length, clustered on farm identity. Marginal effects of stockperson actions and predictive margins of plants were calculated. Backing and violent behaviour occurred at significantly higher frequencies at the stationary plant than at the mobile one. All considered stockperson actions were significantly associated with animal behaviours. The associations were positive, i.e. an increased action was associated with a more frequent behaviour, except that goad use was negatively associated with animal turning. Stockperson moving with tool, pushing and using goad were indirectly significantly associated with all animal behaviours via animal stress level. This study shows the importance of adequate cattle handling to limit pre-slaughter stress at both mobile and stationary slaughter plants.

WHY ARE COWS CULLED IN ESTONIAN DAIRY HERDS

Triin Rilanto, Kaari Reimus, Toomas Orro, Arvo Viltrop, Kerli Mõtus

Estonian University of Life Sciences, Institute of Veterinary Medicine and Animal Sciences

ABSTRACT

Increasing involuntary culling is a concern to dairy farmers in economic and animal wellbeing aspect. The aim of this study was to determine the reasons and risk factors for dairy cow culling in Estonia. Data for a study period between January 1, 2013 and December 31, 2015 were collected from the Estonian Agricultural Registers and Information Board and Estonian Livestock Performance Recording, Ltd. Cows from herds with ≥ 20 cow-years were included. Analyses included data of 86,373 primiparous cows from 409 herds and 109,295 multiparous cows with 177,561 lactations from 410 herds. The observation period started since calving and lasted until culling (exit of a cow due to death, euthanasia or slaughter) or until selling of the cow, new parturition or end of the study period (right censoring). Associations between risk factors and mortality were analysed using Weibull proportional hazard models. The overall culling rate (CR) was 16.0 and 31.8 per 100 cow-years in primiparous and multiparous cows, respectively. The culling risk was highest during early lactation period. The main farmers' stated reasons for dairy cow culling were "Udder disorders", "Feet/claw disorders" and "Fertility problems". The culling reasons differed by parities, lactation stage and type of exit (slaughter versus death/euthanasia). Common risk factors for culling in primiparous and multiparous cows were Holstein breed, higher age, lower milk yield breeding value, assisted calving, birth of twins/triplets or

stillbirth, larger herd size, decrease of herds size of more than 15% during the study period and lower herd average number of lactations per cow. Also, lower milk yield, somatic cell count $\geq 200,000$ cells/ml and milk fat/protein ratio ≥ 1.5 in first milk-testing after calving were associated with a higher culling risk during the lactation. Results of this study could be used to improve cow longevity entailing improvement of farm economy and cow wellbeing.

STRAW IMPACT ON PEN AND PIG HYGIENE

Torun Wallgren, Anne Larsen, Stefan Gunnarsson

Department of Animal Environment and Health
Swedish University of Agricultural Sciences (SLU)

ABSTRACT

A major challenge in pig production is rearing pigs with intact tails without developing tail biting, and a key element for prevention is the provision of manipulable material, e.g. straw. However, straw has been suggested to affect pen and pig hygiene negatively. The impact of straw on pen and pig hygiene was studied in three growing and four finishing pig units. The pens (grower=92, finishers = 131) in each unit were divided into control (C) and extra straw (ES). C got the same straw ration as normally provided on each farm and ES got a doubled C-ration. The straw rations ranged from ~50-1000g/pen/day for growers and 60-265g/pen/day for finishers. Each pen had on average 23% slatted flooring and 9-12 pigs. Every second week each pen was scored for cleanliness on the solid and slatted floor separately on a 5 grade scale (0-4) corresponding to 0-100% soiling of the solid or blockage of the slatted floor. Each pig was scored for cleanliness on a three graded (0-2) scale corresponding to; up to 20%, 20-50 % or $\geq 50\%$ soiled body surface. The median of pig, slatted and solid hygiene was 0 for both treatments in growers and finishers. To analyse treatment effect Wilcoxon Mann Whitney U and t-test was used on both age group (grower and finisher) and farm level. To compensate for repeated measurements, a mean per pen/production period was used. There were no statistical difference in pig nor pen hygiene on age group level. On farm level, ES had significantly cleaner solid floor hygiene on one grower and one finishing pig farm. On another finishing pig farm, C had significantly cleaner slatted floors and ES significantly fewer pigs scored 3. These preliminary results indicate straw usage not altering pen nor pig hygiene, even at increased straw rations.

RELATIONSHIPS BETWEEN DRIVER HANDLING AND PIG BEHAVIOUR DURING LOADING AND UNLOADING

Sofia Wilhelmsson¹, Jenny Yngvesson¹, Paul H. Hemsworth², Maria Andersson¹, Jan Hultgren¹

¹Swedish University of Agricultural Sciences, Department of Animal Environment and Health

²University of Melbourne, Animal Welfare Science Centre, Faculty of Veterinary and Agricultural Sciences

ABSTRACT

Moving finishing pigs from farm to abattoir can be very stressful for both pigs and humans. Pig behaviour is affected by previous on-farm handling, the design of the loading facilities and the handling behaviour of the transport drivers loading and unloading the pigs. We investigated possible relationships between driver attitudes, handling behaviour, working conditions and stress-related pig behaviour during loading and unloading. Observational data were collected in the autumn of 2018. Abattoirs, trucking companies, drivers and farms were selected by first mapping large pig abattoirs in Sweden, and prioritising practical convenience in data collection. The abattoirs provided information about trucking companies which were approached and asked about participation. Farms were selected by the trucking companies based on their normal working schedule and logistics. Finally, the farmers were contacted shortly before the intended data collection. Fifteen transport drivers were each observed handling at least 50 pigs during loading at a farm and unloading at an abattoir. The study was conducted in the northern/middle, western and southern regions of Sweden. Direct observations of handling behaviour including the use of driving tools, pig behaviour, and speed of loading/unloading were carried out. Each driver filled in two questionnaires about attitudes and working conditions. Human-animal interactions were analysed for differences between geographical regions and production conditions. Preliminary results will be presented. This interdisciplinary study is likely to provide practical knowledge on how to improve pig handling and transport drivers work conditions and reduce stress-related behaviours in pigs at loading and unloading.

NON-INVASIVE ANIMAL DISEASE DETECTION

Jacek Koziel

Iowa State University

ABSTRACT

Development of novel analytical methods for finding possible biomarkers of animal diseases using minimally-invasive approaches for bovine health. This interdisciplinary area uses highly advanced concepts and technologies from analytical chemistry. A review of an in-vivo sampling of gases released by infectious microorganisms and searching for biomarkers of bovine respiratory diseases in samples of breath, nasal swabs, feces, and serum will be presented.

ON-FARM MONITORING OF HYPOCALCEMIA IN DAIRY HERDS. PRELIMINARY RESULTS

Laszlo Konyves, Viktor Jurkovich, Péter Hejel, Péter Kovács, Endre Brydl

University of Veterinary Medicine Budapest

ABSTRACT

Hypocalcemia is a common metabolic disorder that may lead to clinical milk fever or death. The subclinical form of the hypocalcemia may predispose to other fresh cow diseases and has negative effect on milk production and

reproduction. The diagnosis of the hypocalcaemia based on the determination of the total Ca and/or ionised Ca (iCa) concentration of the blood. The hypocalcemia diagnosed when the iCa concentration – the active form of Ca for metabolic processes- is <1.05 mmol/l. The aim of the work is to develop a practical protocol for the on-farm monitoring of hypocalcemia and those metabolic risk factors may contribute to the development of the disease. Clinically healthy cows selected randomly from close up period (n=39; 1-2 weeks prepartum) and from fresh cows group (n=72; 0-6 days postpartum) at examined (n=11) herds. Blood and urine samples were taken for metabolic analysis. The heparinised, room temperature whole blood samples were analysed on-farm by the iSTAT Handheld (ABBOTT) analyser equipment with the usage of iSTAT Chem-8 one way test cartridge. Parameters were analysed: iCa, Na, K, Cl, Glucose, BUN, TCO₂, Creatinine, %PCV, Hgb and AnGap. The urine pH were measured on-farm by a calibrated pH analyser. The blood plasma total Ca, Mg and urine Net Acid Base Excretion (NABE) were determined in laboratory. On the day of sampling a farm- and herd visit was performed to check the management and nutrition related risk factors may contribute to the development of the hypocalcemia. According to our preliminary results the prevalence of hypocalcemia in fresh cows may exceed 50% in Hungarian dairy herds. The blood level of iCa correlated with the DIM, lactation number, and the metabolic parameters of acid-base and Mg metabolisms. The on-farm monitoring of the parameters may contribute in the development of hypocalcemia may be a practical element of the preventive strategies.

IMPACT OF UV-C-COMBINED INDOOR AIR-FILTRATION ON AIR-BORNE BACTERIA AND LUNG HEALTH

Lisa Eisenlöffel¹, Mario Reinhardt¹, Dana Ruster¹, Tobias Reutter², Uwe Truyen¹, Stephanie Speck¹

¹Universität Leipzig/Institute of Animal Hygiene and Veterinary Public Health

²Reventa GmbH

ABSTRACT

Airborne transmission of pathogens in pig housings gains more and more interest in biosecurity matters. Supply air filtration has been demonstrated to efficiently reduce pathogens but filtering indoor air is still a new concept in pig production. In a previous study recirculating air filtration in intensive pig husbandry showed positive impact on lung health but failed to significantly reduce total airborne bacteria. The germicidal effect of UV-C irradiation was already discovered in the 19th century. Combined with recirculating air filtration a reduction of dust and airborne pathogens, as well as an impact on animal health was expected and has been objective of this study.

Materials and Methods

In an experimental facility with two identical barns (separate entry, fully slatted floor, separated air ventilation systems) one barn was additionally equipped with a recirculating air-filter module (air flow rate approximately 400 m³/h) containing a mechanical coarse particle air filter and four 254 nm UV-C tubes. Experiment 1 included 10 pigs/barn, experiment 2 included 11 pigs/barn. Over two fattening periods, weekly measurements were carried out including dust, airborne bacteria, air temperature, relative humidity, ammonia, and CO₂. Moreover, lung health was assessed at slaughter.

RESULTS

In the barn with the air-filter module air-borne bacteria were >60% lower while air-borne dust was up to 40% less compared with the reference barn. Measurements in front of and behind the air-filter module revealed a reduction of >99% (bacteria) and >92% (dust), respectively. So far only one pig of the reference group revealed lung lesions of pneumonia at slaughter.

DISCUSSION

In our experimental setup with a small number of animals a distinct germ and dust reduction was achieved, but further research on the optimal technical setup is necessary to achieve similar results under field conditions.

USAGE OF ENVIRONMENTAL ENRICHMENTS IN AMERICAN MINK (NEOVISON VISON) FARMING

Patrycja Waclawik, Dominika Grabolus

Wrocław University of Environmental and Life Sciences

ABSTRACT

Fur farming has been a significant part of the global economy for decades, providing high quality furs of many species. Among fur bearing animals kept on farms the carnivorous species prevail, whose easy adaptation to various environmental conditions allowed their widespread distribution in many countries. American mink is the most popular carnivorous fur animal nowadays (50 million pelts annually). Mink have been farmed for fur for over a century in the United States. The species was brought to Europe at the beginning of twentieth century, the first farms being set up in Germany in 1926. An increase in the interest in mink was observed in the thirties, probably because of the fashion for short haired furs. After the second world war mink farming has intensified. Presently Denmark is the leading mink-producing country, other major producers include Poland, China, and U.S.. The primary goal for every breeder is to obtain highest quality pelts from the animals they are keeping. To achieve this goal the breeders prioritize keeping the animals in the best possible conditions to allow maximum use of their genetic potential. Mink are mostly kept in wire mesh cages, in Poland the minimal measurements of said cages are set by regulation of the Minister of Agriculture and Rural Development. Majority of the breeders additionally take part in the WelFur project that provides further standards for fur animals welfare. Unfortunately, there are no guidelines for enriching the environment of fur animals, so many breeders experiment on their own to provide their animals with some sort of toys to prevent their boredom and developing stereotypic behaviour. This research aimed to study the variety of environmental enrichments used in American mink farming and how their presence affected the animals welfare. The research based on surveying the breeders from the Greater Poland Voivodeship.

INFLUENCE OF ABIOTIC FACTORS OF THE AREA ON THE DISFUNCTION OF LIVER FUNCTION IN COWS

Magrelo Nadiia

Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies Lviv, Ukraine

Preserving animal health and obtaining livestock products of high veterinary and sanitary quality is one of the most important tasks of veterinary medicine. Particular importance is acquired in unfavorable environmental conditions. One of the environmentally dangerous objects of the national level in Lviv region is the Lvivvugillya State Enterprise. The industrial emissions of these enterprises form a special ecological situation that affects the development and management of the branches of plant growing and livestock in this area.

The ecological features of the location of the farms where research was conducted (the content of heavy metals in soils, water, feed) was studied; technological conditions for the maintenance of bovine animals (sanitary-hygienic assessment of water, feed quality and level of feeding, microclimate of the premises); clinical condition of animals; influence of seasonal, ecological and technological factors of retention on hematological indicators of cows; the influence of environmental and technological factors on the histological structure of the liver

The presence of toxic elements (Cu, Mn, Ni, Cd, Pb) has been established in the soil and water of the economy, located in the area of activity of the Lviv-Volyn coal basin. The physical parameters of water samples met the sanitary standards.

It was established that the feed used in farms, and the level of feeding do not meet the hygienic requirements and norms of feeding, and hence the physiological needs of animals. The conditions for keeping animals and microclimatic indices in the premises were within the sanitary norm.

The basic clinical indices in the experimental cows were within the limits of the physiological norm. Studies have shown that cows from both farms experienced a clear-cut seasonal dynamics of morphological and biochemical blood parameters.

In cows which are kept in the farm, which is situated near coal mine, it was found out the disfunction of functional state of the organism, and first of all liver. By the results of histological investigations it was fixed that prolonged hyperemia, granular dystrophy were developing in the liver of these animals and because of long keeping proliferative inflammation and cerosis.

SIDE PREFERENCE OF DAIRY COWS IN THE ENTRANCE MILKING PARLOR

Ivana Novotná, Lucie Langová, Zdeněk Havlíček

Department of Animal Morphology, Physiology and Genetics, Mendel University, Czech Republic

ABSTRACT

The aim of this study was to investigate if cows prefer the left or right side at the entrance to the milking parlor. Side preference is important because of the installation of thermocamera for early detection of hoof lesions. We have only one thermocamera, so it is necessary to find out the side, where cows entering more often. The research was carried out on a farm with 397 Holstein cows. 30 cows (7.56%) preferred one side (left or right) and 367 cows (92.44%) did not prefer any side. Every two days 91.65% of cows at least once entered one side. There was no statistically significant difference ($P \geq 0.05$) between using the left and right side.

INTRODUCTION

Dairy cows can enter to milking parlor through the left or right side [4]. There are differences in side preferences between dairy cows [7]. Some cows prefer entrance at milking parlor by only one side [4, 5, 7]. The side of the milking parlor is quite consistent for dairy cows [3]. Preferring one side can be a consequence of individual characteristics, routine, position in social hierarchy [6]. Environmental factors can prevent a cow from choosing a side. And it can bring stress during milking [4].

MATERIAL AND METHODS

The experiment was performed on a dairy farm in České Petrovice where 397 Holstein cows were kept in free-stall barns. Cows were milked 3 times a day (4:00 AM, 12:00 PM, 8:00 PM) in side by side milking parlor. In milking parlor were 32 places, 1-16 situated on the right side and 17-32 on the left side. Before milking the stockman herded cows into the waiting room in front of the milking parlor. In the waiting room, cows were pushed by pneumatically operated gates. While waiting, the cows had the opportunity to choose the milking parlor side. After entering milking parlor, number of cow and milking position (left or right side) were recorded by an electronic gate. Data were collected for 7 days (21 milkings/cow) and then every two days evaluated separately (6 milkings). We chose the 2 day interval to capture the possible beginning of the hoof diseases. The use of the right and left side of the parlor and the percentage of cows entering only one side was determined. The data were evaluated statistically by t-test.

RESULTS AND DISCUSSION

Places 1-16 (right side) and 17-32 (left side) cows used almost equally (50.27% and 49.73%). There was no statistically significant difference ($P \geq 0.05$) between using the left and right side. In other experiment found that 47.55% of cows preferred left side but no cow used only one side [1]. This result is comparable to ours, but in our experiment, we found 30 cows (7.56%) entering only one side. 16 cows (53.33%) preferred only right side and 14 cows (46.67%) preferred only left side. 367 cows (92.44%) did not prefer any side. Other authors observed 2 groups of dairy cows. In the first group, 28.3% preferred right side and 71.7% did not prefer any side. In the second group, 10.1% entered by the right side and 12.7% by the left side. 77.2% did not prefer any side [3]. In other researchers found 50.2% [8], 39.5% [2] and 47% of cows preferred one side [7]. It does not correspond to our results. If we include cows that

went 20 times on one side and once on the second side to the group entering only one side, which could be due to external influences, the percentage of these cows is 18.64%. This result is also not comparable to previous studies. A much lower percentage of cows that prefer only one side may be due to favourable conditions at the milking parlor and minimal stressful effects that could affect the dairy cow. The hierarchy is consistent because there are minimal changes in groups of cows. For our experiment is most important that on average 91.65% enter milking parlor at least once by one side. First two days it was 91.27%, second two days it was 91.24% a last two days it was 92.45% cows.

CONCLUSIONS

None of the studies included as many cows as ours, so the results could be different. Probably cows prefer only one side, but they may not be successful because of hierarchical status. The result shows that 91.65% enter milking parlor at least once by one side and there was no statistically significant difference between the use of the right and left side of the milking parlor. Thermocamera can be placed on the left even on the right side.

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OCCURRENCE OF DERMATITIS DIGITALIS AND DERMATITIS INTERDIGITALIS IN DAIRY COWS THROUGHOUT THE YEAR

Lucie Langová¹a, Ivana Novotná¹, Zdeněk Havlíček¹, Miroslav Macháček²

¹Department of Animal Morphology, Physiology and Genetics, Mendel University, Czech Republic;

²Department of Animal Husbandry and Animal Hygiene, University of Veterinary and Pharmaceutical Sciences, Palackého trida 1

ABSTRACT

Infectious hoof diseases are a worldwide problem in dairy cattle and affect the welfare of animals and eventually the production of the herd. Dermatitis is a contagious disease with lesions and is very painful for cows. This study was important due to the very high incidence of dermatitis digitalis and interdigitalis in different countries. The aim of this study was to determine the prevalence of dermatitis digitalis (DD) and interdigitalis (DI) throughout the year 2017. The research was carried out on a farm with 800 Holstein dairy cows. Our team diagnosed dermatitis in 150 cows (DD in 187 cases; DI in 515 cases), relapse was in 57 cows. The highest incidence of dermatitis digitalis was in November, October and September. The highest incidence of dermatitis interdigitalis was in November, May and October. Significantly higher incidence of dermatitis, digitalis and interdigitalis, occurred on the digits of the hind limbs (82.5%).

INTRODUCTION

Dermatitis is a very serious infectious disease that occurs in all cattle categories. Prevention is the maintenance of hygiene in the stable, regular adjustment and care of hooves [1]. Infectious diseases most commonly found in dairy cows are dermatitis digitalis, dermatitis interdigitalis and necrobacillosis [2, 4, 7]. Dermatitis is shown mostly in hind limbs but can also appear in front limbs. Prevalence of dermatitis depends on temperature and humidity [3]. Dermatitis occurs throughout the whole year but the prevalence increase in cold and wet months [5].

MATERIAL AND METHODS

The herd with 800 Holstein cows was regularly treated by a veterinary doctor and data were collected, treatment started if necessary. Our team created a database with all possible hoof diseases, however, this study was focused on dermatitis. Check up was performed as needed. Dermatitis digitalis and interdigitalis were diagnosed and the incidence throughout the year 2017 (from January to December) was detected.

RESULTS AND DISCUSSION

Dermatitis has been reported in 150 dairy cows out of 800 in the herd. Dermatitis digitalis was diagnosed in 187 cases (26.64%) and dermatitis interdigitalis in 515 cases (73.36%). In other study was found the incidence of DD 17.6% and DI 83.1% [6]. In our study, it was a higher incidence of DD, but a lower of DI. It can cause installed preventive footbaths

with floor tracks which urge the cow to spread digits. The hind limbs were affected significantly higher (82.5%) than front limbs which correspond with other studies. The highest incidence of DD was recorded in November (22.46%), in October (8.02%) and in September (6.95%). The highest incidence of DI was found in November (14.37%), in October (5.83%) and in May (5.83%) there was the same number of new cases (5.83%). In the different study was determined the incidence of DD 15.00% in the winter and 28.25% in the summer of the same year [3]. They recorded about 80.60% increase. The second year was the incidence of 35.17% in the winter and decreased to 30.78% in the summer [3]. In our study, the prevalence of DI was 10.49% in the winter and 11.07% in the summer. The incidence was higher in autumn with 25.05%. The prevalence of DD was 37.43% in the winter and 12.30% in the summer. The other researchers found an increased number of DD between the 3rd and 5th months. They also found out that dermatitis has a seasonal character, with wet and cold months being the most dangerous, especially from October to January, while the lowest occurrence was in hot months [5]. In our research, we determined a higher prevalence of DD at the end of summer, but the highest was in autumn. For dermatitis interdigitalis, it was in November, May and October. Our results correspond with the previous study which claims that dermatitis has seasonal character, but autumn seems to be the most dangerous month.

CONCLUSIONS

None of the studies included as many animals, therefore data could differ. The probability of occurrence of dermatitis digitalis and dermatitis interdigitalis is higher in wet and cold months throughout the year 2017. In our research, the highest incidence was in November (22.46% DD, 14.37% DI). It could be because of higher humidity (94.33% on average, which was the highest in the year 2017) and lower temperature (5.88°C on average). There was not found many studies about dermatitis interdigitalis, which cause more problems than dermatitis digitalis, so it is essential to learn more about this disease.

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ASSOCIATION OF GENES CXCR1 AND CD4 WITH WITH SOMATIC CELL SCORES AND MILK PRODUCTION TRAITS

Zdeněk Havlíček, Monika Klimešová, Lucie Langová, Ivana Novotná, Lucie Kratochvílová
Department of Animal Morphology, Physiology and Genetics, Mendel University,
Czech Republic

ABSTRACT

In the presented study the bovine CXCR1 and CD14 genes were considered a candidate gene of anti-mastitis defence in Holstein cow. Polymorphism of bovine CXCR1 and CD14 was investigated and its associations with Somatic Cell Scores (SCS) and milk production traits (milk yield, milk fat and milk protein content) analysed. Genes CXCR1 and CD14 resulted in the mutation of amino acid, but it showed no significant association with the SCS, milk yield, milk fat and milk protein percentage.

INTRODUCTION

Mastitis, an inflammation of the mammary gland, is a major source of economic loss on dairy farms. Moreover, mastitis affects milk quality directly in the technical characteristics and the hygienic quality of the milk, and indirectly through the intrinsic milk quality. Gram-negative (GN) bacterial infection is the main cause of bovine mastitis. The cluster of differentiation (CD) 14 gene serves an essential role in GN bacterium-induced innate immune response. CD14 works as bacterial lipopolysaccharide (LPS) receptor, combines with LPS-liposaccharide binding protein complex and causes cellular activation [4]. Of the sixteen polymorphisms in seven immune genes genotyped, just CXCR1-777 tended to associate with SCS, albeit only in the on-farm study [1]. The CXCR1-777 (G/C) single nucleotide polymorphism (SNP) results in glutamine to histidine substitution at amino acid position 245 located within the third intracellular loop of CXCR1 [6]. When CXCR1 is stimulated by IL8, this loop is implicated in G-protein binding and calcium signalling [2]. The CC genotype of CXCR1-777 associates with impaired neutrophil migration, impaired reactive oxygen species production in vitro and increased subclinical mastitis in vivo [5, 6]. Polymorphisms in the immune genes, CXCR1, CD14, SERPINA1, did associate with milk composition. Animals with the GCGGC SERPINA1 haplotype associated with superior genetic merit for milk protein yield and fat percentage [1].

MATERIAL AND METHODS

A total of 790 dairy cows (Holstein-Friesian) from a single experimental dairy farm were milked three times daily. Blood sampling (n=46) was taken from 46 dairy cow from the tail vein by caudal venipuncture and collected into tubes containing potassium ethylenediaminetetraacetic acid (EDTA K3E 15%, 0.12 ml). Blood samples were initially centrifuged at 2500 × g for 20 min at 4°C. Buffy layers containing white blood cells were collected and DNA extracted using the QIAGEN Flexigene DNA kit, according to manufacturer's instructions. DNA was quantified and quality assessed spectrophotometrically and by gel electrophoresis. Allele frequency for the polymorphisms CXCR1 and CD14 were determined by direct counting. Variance component analysis was based on the estimate of the polygenic effect, the effects of the putative QTL, and the effect of the residual environmental variance on SCS. Effects of year record, month record, year of calving, month of calving, order of lactation, phase of lactation, level of performance, level of fat percentage, level of kg of fat, level of protein percentage, level of kg protein, level of lactose, level of lactose, level of SB, mother, CD 14 gene, CXCR1 gene were included as fixed effects. The following linear mixed model was applied in the SAS model for estimation of variance components.

RESULTS AND DISCUSSION

This thesis was meant to evaluate allele and genotype frequencies of CXCR1 and CD14 genes in a dairy cow in the Czech Republic of Holstein breed (n = 46). Genotype frequencies (CD14) were CD = 0.260 DD = 0.740 and allele frequencies were C = 0.8695 D = 0.1305. Genotype frequencies (CXCR1) were CC = 0.065 GC = 0.695 GG = 0.240 and allele frequencies were C = 0.4130 G = 0.5870. The cluster of differentiation genes CD4 and CXCR1 are well known for its role in immunity, but its effects on production traits remain to be elucidated. The least-squares means and standard errors for the effects of the loci of the CXCR1 gene and CD4 gene on milk production traits and SCS of 648 Czech Holstein cows were tested. Our study observed no significant association with SCC for genes CXCR1 and CD4. Further studies analysing these and additional boCXCR1 SNPs have had conflicting results. While [3] study observed no significant association with SCC for the NS +735G>C SNP, another study found that SNP +735G>C tended to associate with SCC in a Holstein-Friesian dataset [1].

CONCLUSIONS

Genes CXCR1 and CD4 showed no significant association with the SCS, milk yield, milk fat and milk protein percentage.

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IMMUNE STATUS OF THE PIGLETS ORGANISM AND ITS CORRECTION BY THE LIPOSOMAL PREPARATION «VITARMIN» IN CONDITION OF STRESS

Nataliia Ohorodnyk, Volodymyr Snitynskyi, Bohdan Krektun

Lviv National Agrarian University, Ukraine

ABSTRACT

The weaning of piglets from sows evokes the stress which decreases nonspecific resistance and causes to immunodeficiency. It has been elucidated that vitamins, trace elements and amino acids reduce the negative influence of stress on the organism of animals. Nowadays, liposome preparations have been widely used, and comparatively with the conventional forms, are characterized by significantly higher efficiency.

The aim of the work was to find out the effects of vitamins A, D3, E, L-arginine, zinc, selenium, cobalt and magnesium in the form of liposomal preparation «Vitarmin» on the activity of cellular and humoral links of the specific immunity in the piglets organism. The investigation was conducted on the piglets, whom intramuscularly was injected these components in a dose of 0.1 ml/kg body weight before 2 days when the piglets were weaned from sows.

The obtained data are evidenced, that for the actions of such powerful stress impact, as weaning from sows resulted decrease in the quantity of total and theophylline-sensitive T- and B-lymphocytes and suppress functional activity of their regulatory populations in blood of piglets, that testifying a disbalance of immune system function. However, the obtained changes in the functional state of the receptor apparatus of T- and B-lymphocytes in the blood of piglets of the experimental group indicated that in the complex application, all components of the preparation «Vitarmin» are an effective means for preventing immunodeficiencies because activate the cellular and humoral mechanisms of the immune response in their organism after weaning from sows.

Key words: immunodeficiencies, T- and B-lymphocytes, stress, weaning, piglets, liposomal preparation

INTRODUCTION

Immune system is an important homeostatic system that affects the adaptive ability of the organism. The interruption of specific and nonspecific protective mechanisms interaction results to immunodeficiency [2]. It is known that stresses caused immune deficiencies, decrease of immune reactivity and involved in pathogenesis of a number of diseases [4]. Weaning of piglets from sows is the powerful and multiple stress factors affecting of the piglets organism in the early postnatal period of development [7]. Taking into consideration peculiarities of immunobiological reactivity of the piglets organism in the period after weaning, the effective correction of immunity are crucially relevant.

The development of complex remedy of chemical or biological nature, consisting with vitamins, trace elements and essential amino acid is an important pharmacological method that prevents the negative effects of stress on the organism of animals and signs of immunodeficiency [5]. Nowadays, development of new complex preparation in the form of liposomal emulsions is the most promising way to improve effectiveness of medications. Preparations in these forms are more bioavailable, non toxic and safe for animals [1]. Taking into consideration the relevance of such studies, the main purpose of our investigation was ascertainment the effect of developed by us complex liposomal preparation «Vitarmin» on processes formation of the immune response of the piglets organism in the period of weaning from sows.

MATERIAL AND METHODS

Experiments were performed on the two groups of piglets of 33-day age. The piglets were weaned from sows at 35-day age. Two days prior to the weaning, the animals of the control group received isotonic sodium chloride solution while the piglets of the experimental group received the Vitarmin in a dose of 0.1 ml per kg body weight once [6]. The lymphocytes isolated from blood, which were collected at 2 days before and at 1, 5 and 10 days after weaning of piglets, were the material for the experiment. Determination of the number of T-lymphocytes was carried out in the reaction of spontaneous rosette formation with ram erythrocytes according to the method by M. Jondal.

RESULTS AND DISCUSSION

The results of our investigation evidence, that weaning of piglets from sows at 35-day age affects the number of T-lymphocytes and their regulatory populations in blood (Fig. 1). In all periods after weaning, the piglets of the control group were characterized by reduction in the relative number of common T-lymphocytes in the blood. On the 1st day after weaning, the quantity of low-differentiated ($P < 0.01$) and highly-differentiated ($P < 0.05$) forms T-lymphocytes, as well as on the 5th day cells with medium density of receptors ($P < 0.05$) was decreased. Injections to the piglets of the Vitarmin resulted to increase ($P < 0.05$) the number in the blood of total T-lymphocytes with low density of receptors on 1st day, and the number of their forms with average receptors density ($P < 0.05$) at the 5 day after weaning. The application of the studied liposomal preparation allowed to reduce the negative effect of stress and accordingly contributed to the increase of the number of active T-lymphocytes and their subpopulations in the blood of piglets after the weaning.

Weaning piglets from sows caused changes in the content of theophylline-resistant (TFR) and theophylline-sensitive (TFS) lymphocytes in the blood. Significant increase ($P < 0.05$) of the amount of TFR-lymphocytes and their forms with average density of the receptors in the blood of piglets of the control group on the 10th day after the weaning have been noticed. These changes coincide with decrease ($P < 0.05$) of the number of undifferentiated cells. In the blood of piglets of this group during all periods of investigation the quantity of TFS-lymphocytes has been decreasing ($P < 0.05-0.001$).

The decrease in the number of TFR-lymphocytes types with low density of receptors in the blood of piglets in the experimental group on the 1 day ($P < 0.01$) and TFS-lymphocytes on the 10th day ($P < 0.05$) after the weaning was defined. It should be noted that comparatively with the period before weaning the immunoregulatory index (IRI) which is an indicator of the ratio between TFR- and TFS-lymphocytes, was significantly increased in the blood of animal of the control group on the 1 and 10 days after weaning (Fig. 2). On the 5th day ($P < 0.05$) as well as on the 10th day after the weaning, the values of IRI in the blood of piglets of the experimental group were greater than of control.

The obtained results also indicate that the weaning of piglets from sows reduces the ability of lymphocytes to transformation into blasts. By means of the reaction of blast transformation lymphocytes (RBTL), it was found that this reduction was reliable in animals of the control group on the 1st day after weaning ($P < 0.05$). Injection of Vitarmin to the piglets activated mytogen-induced ability of T-lymphocytes to transform into blasts, which is evidenced by the significant differences in the RBTL in animals of the experimental group for the 10th day after weaning. The obtained data indicate that the Vitarmin affects the T-cell link of immunity of the piglets organism and effectively increases its functional activity while the weaning from sows take place.

In comparison with the control, on the 10th day after weaning in the blood of the piglets of experimental group were detected ($P < 0.05$) more quantity of B-lymphocytes with low density receptors and at the 5th day after weaning ($P < 0.001$) the quantity of cells with average density of receptors.

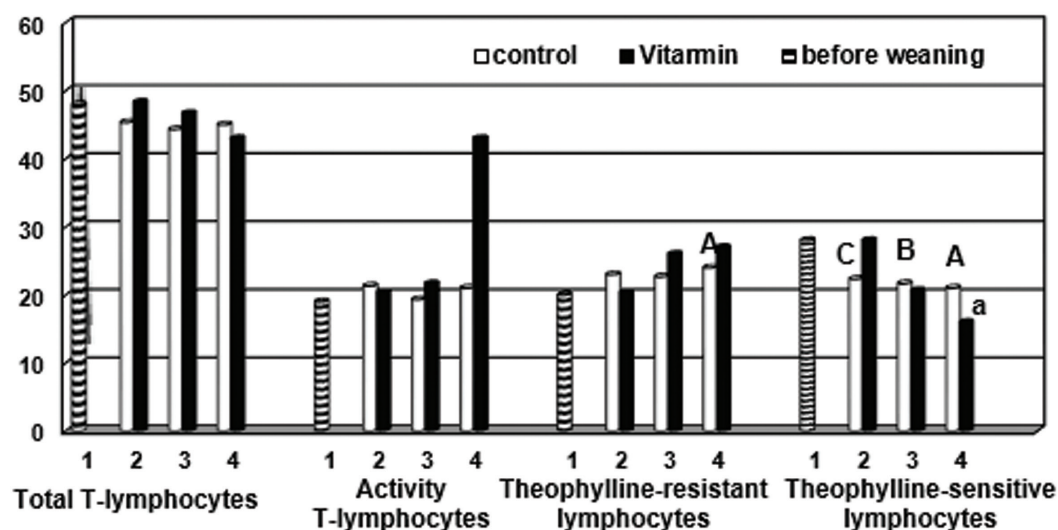
The increase of a number of T- and B-lymphocytes in the piglets of the experimental group after weaning is probably due to the effect of vitamins A, D₃, and E in composition of Vitarmin. A wide range of effects on the processes of regulation of lymphocytes demonstrate zincum and selenium [5]. L-arginine enhances the formation of interleukin-2, activates mitogenesis, proliferation and differentiation of T- and B-lymphocytes, increases their activity [3].

CONCLUSIONS

Introduction of the liposomal preparation «Vitarmin» to piglets before weaning from the sows contributed to increase immunoregulatory index and relative number of T- and B-lymphocytes, stimulates their functional activity in the blood in a period after weaning.

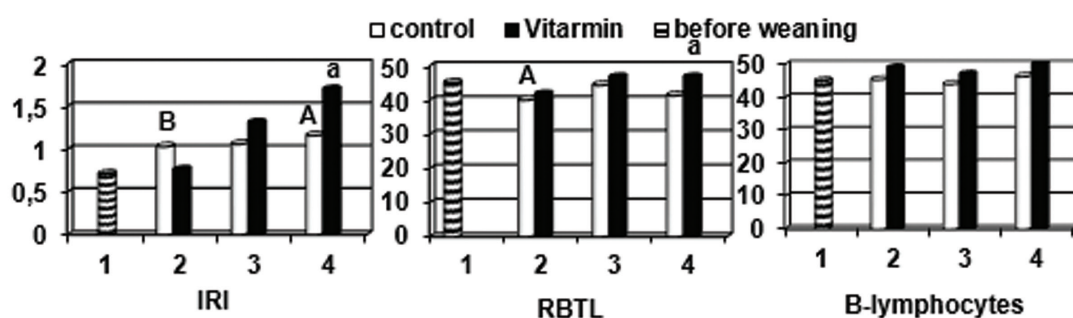
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a – denote significant differences in comparison with the control group: a – $P < 0.05$; A, B, C – denote significant differences in comparison with the period before weaning: A – $P < 0.05$; B – $P < 0.01$; C – $P < 0.001$; 1 – 2 days before weaning; after weaning, days: 2 – 1; 3 – 5; 4 – 10

Fig. 1. Quantity of T-lymphocytes and their functional activity in the blood of piglets, %



a – denote significant differences in comparison with the control group: a – $P < 0.05$; A, B – denote significant differences in comparison with the period before weaning: A – $P < 0.05$; B – $P < 0.01$; 1 – 2 days before weaning; after weaning, days: 2 – 1; 3 – 5; 4 – 10

Fig. 2. Immunoregulatory index, reaction of blast transformation T-lymphocytes and the number of B-lymphocytes in the blood of piglets, %

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EFFECTS OF LEAD ON THE LEVEL OF HEAT SHOCK PROTEINS EXPRESSION IN THE BLOOD CELLS AND VARIOUS ORGANS OF SCALY CARP

Martha Onyskovets, Volodymyr Snitynskyi, Bohdan Krektun

Lviv National Agrarian University, Ukraine

ABSTRACT

Heat Shock Proteins (HSP) belong to the natural biomarkers, which are important indicators for animal diseases diagnostics and / or instrument of analyzing the effects on organism of the habitat deteriorating factors. The contamination of water by heavy metals has adverse effect on fish organism. Even in a small quantities, such heavy metal as lead is very dangerous. The analysis of toxic effects of the lead ions on the level of expression of such heat shock proteins as HSP60, HSP70 and HSC70 family in leukocytes, liver, brain and gills of the scaly carp was the main goal of our investigation.

Necessary levels of heavy metals concentrations in all series of experiment were simulated by adding in the water environment of the pool with the fish of lead (in the form of $Pb(CH_3COO)_2 \cdot 3H_2O$) to reach concentrations in 0,2; 0,5 and 5 mg/dm³. Those concentrations correspond to the 2nd, 5th and 50th-fold indices of the Threshold Limit Value (TLV) of lead in water environment. Concentration of HSP60, HSP70 was determined by the dot-blot-analysis due to application of monoclonal antibodies against heat shock proteins SAB4501464 (Sigma, USA), [5A5] (ab2787) (Abcam, USA) and [1B5] (ab19136) (Abcam, USA) and polyclonal goat antimice antibodies, conjugated with alkaline phosphatase ("Tropix", USA).

The significant dose-dependent increase ($p < 0,001$) in all experimental groups of HSP60 and HSP70 concentrations in leukocytes, liver, gill and brain has been detected, applying dot-blot analysis. At the same time, significant changes in expression of HSC70 protein have not established. It is the evidence that stress-proteins are the sensitive markers of toxic effects of excessive concentration of lead.

INTRODUCTION

Development of modern methods of aquatic biological resources quality estimation contributes to sorting out the problems of conservation and restoration of industrial fish populations in the natural environment. The relevance of such studies is largely determined by the increase of anthropogenic impact on natural reservoirs, where the fish, as a final link of the trophic chain, is exposed to significant toxicological threats [7, 9].

The contamination of reservoirs by such heavy metal as lead, which, even in a small quantities, provokes stress and morphofunctional changes in the organism of fish is most dangerous [2, 5].

Heat shock protein is a family of highly-conserved proteins that are required by the cell in all its processes of life, including adaptation to a huge number of cytotoxic factors, both xenobiotic as well as natural origin [3]. As molecular chaperones, they provide folding / refolding of cell proteins, preventing the aggregation of denatured proteins. These substances are responsible for assembling oligomeric complexes, transporting proteins through the membranes of intracellular compartments etc. The expression of heat shock proteins has been described in a variety of cell lines, tissues and organs of a wide variety of organisms [4-6, 8].

The obtained data evidences a significant role of these proteins in cell responses to the stress factors and infectious pathogens, abiotic stressors, high temperature and cold shock, such environmental pollutants as heavy metals [2]. The impact of lead on concentration of HSP in fish tissues has not been studied enough. Such studies are extremely relevant and necessary for assessing the health status of fish during monitoring of aquatic biocenoses [1]. The analysis of toxic effects of lead on the level of expression of heat shock proteins with molecular weight 60 and 70 kDa was the main goal of our investigation. The last group of proteins includes HSP70, induced by stress factors, as well as HSC70, constitutively expressed by cells.

MATERIAL AND METHODS

During 96 hours the fish were kept in the aqueous environment of a tank which additionally was supplemented with $Pb(CH_3COO)_2$. The control group of fish was maintained for the similar period of time under the same conditions, without lead acetate supplementation. The tanks with oxygenated, running water were maintained at temperature of 18- 20°C .

The blood was sampled by Pasteur pipette from the heart of fish.

The tissues of liver, brain and gills were removed from the fish and washed by physiological saline solution. The samples were frozen in liquid nitrogen and stored until to the laboratory treatment.

According to the experimental procedure, samples of the tissues were defrostrated and used in mix with physiological solution while preparing of homogenates has taken place. Simultaneously the protein concentrations were measured. Namely, after defrosting, the tissue was lysed in the ten- fold volume of the lysis buffer, pH 7.4 (10% N-laurylsarkosine, 10 μ M phenylmethylsulfonyl fluoride, 10 μ M N-ethylmaleimide in 0.01 M N-phosphate buffer, 0.001% proteinase

inhibitor cocktail - Sigma , Germany).

Lysates were put on nitrocellulose membrane (Millipore) in a volume of 3 µl with concentration of total protein approximately 1-5 µg. To detect background indices, the lysis and delution buffers were applied on the membrane. The membrane was blocked for 1 hour by 5% solution of casein.

After application of control and experimental samples, the membrane was incubated with antibodies against heat shock proteins SAB4501464 (Sigma, USA), [5A5] (ab2787) (Abcam, USA), and [1B5] (ab19136) (Abcam, USA) at PBS 90 min., as well as with polyclonal goat anti-mouse antibodies conjugated with alkaline phosphatase (Tropix, USA) - 1: 5000 in PBS for 30 min.

Detection of immune complexes was performed by using of commercial substrate solution for alkaline phosphatase - CDP-Star (Tropix, USA). Visualization was done by using X-ray film ECL HyperFilm (Amersham, USA) and a kit for films developing (Kodak). Images were processed using the software package GelPro (Version 3.1, USA).

RESULTS AND DISCUSSION

The concentration-dependent growth ($P < 0.001$) of HSP60 and HSP70 in all experimental groups with applicable lead concentrations was detected applying dot-blot analysis. Comparing with the control group, the concentration of HSP60 and HSP70 in the white blood cells increased as much as 15 and 98 times, respectively. The highest level of the proteins expression (185.2 ± 12.39 U.S. for HSP60 and 252.3 ± 18.64 U.sup.v. for HSP70) was recorded in the liver of fish (Tabl.).

Table

The effects of the lead on concentration of heat shock proteins in blood leucocytes and tissues of Scaly carps ($M \pm m$; $n=3$), c.units

Tissues	Blank group	Concentration of lead (Pb^{2+})		
		0,2 mg/l (2 TLV)	0,5 mg/l (5 TLV)	5 mg/l (50 TLV)
HSP60				
Leucocytes	8,25±0,95	34,2±3,58*	74,2±11,21*	121,58±23,69*
Liver	2,58±0,21	25,9±0,95*	95,8±2,99*	185,25±12,39*
Gill	6,18±0,36	12,2±1,58*	28,4±3,87*	88,74±9,98*
Brain	2,31±0,14	6,52±0,58*	18,2±2,78*	74,46±18,84*
HSP70				
Leucocytes	1,22±0,12	8,15±1,02*	40,8±3,58*	120,3±10,87*
Liver	2,56±0,32	19,2±2,12*	65,3±8,35*	252,3±18,64*
Gill	0,95±0,09	9,27±1,22*	102,3±2,95*	135,5±9,74*
Brain	0,62±0,03	5,49±0,48*	12,3±1,85*	19,3±3,05*
HSC70				
Leucocytes	84,8±5,37	76,3±4,85	69,3±6,97	73,7±5,41
Liver	385,2±29,87	348,2±30,21	321,1±22,58	345,9±24,79
Gill	120,3±14,31	112,4±18,05	139,6±15,75	126,0±10,48
Brain	186,5±19,52	160,0±21,22	195,3±25,36	170,2±14,97

Appendix:

- 1) Differences are significant in comparison to Blank group: * – $p < 0,001$;
- 2) 1 conditional unit = 1 pixel per square. inch

Trace amounts of HSP70 were detected in the gills of the fish of the control group. The fish exposed to the lead effects in concentration of 0.2 mg / l was characterized by no significant changes in the content of the investigated proteins, while concentration of lead in 0.5 mg / l and 5 mg / L in water resulted in increase of the studied parameters to almost 5 and 15 times for HSP60 and 107 and 144 times for HSP70 (Tabl.).

It was established that in comparison with the control group, none of the applied concentrations of lead brought on significant changes in the expression of HSC70 protein in the investigated organs of *Cyprinus carpio* L.

It could be explained by the fact that HSP60 and HSP70 belong to the group of stress-proteins affected by wide range of stressors, in particular, the heavy metals. Moreover, HSC70 is involved in more specific mechanisms of response on the deterministic stress-induced factors [2].

Thus, the obtained data indicates that stress-proteins are possibly applicable as the sensitive markers of toxic effects of the Lead.

CONCLUSIONS

The significant dose-dependent increase ($P < 0.001$) in all experimental groups of HSP60 and HSP70 concentrations in leukocytes, liver, gills and brain has been detected, applying dot-blot analysis. At the same time, significant changes in expression of HSC70 protein have not been established. It is the evidence that stress-proteins are the sensitive markers of toxic effects of excessive concentration of lead.

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ANALYSIS OF THE INFLUENCE OF EGG INCUBATION TEMPERATURE ON LEOPARDS GECKO BEHAVIOR (EUBLEPHARIS MACULARIUS)

Jakub Pacoń

Wrocław University of Environmental and Life Sciences

ABSTRACT

Leopard gecko, is one of the most popular lizards kept and reproduced in homes. Due to the fact that eublefar leopard was one of the first species of lizards reared on a large scale, their genetics and physiology were relatively well known (it is known, inter alia, that the incubation temperature of eggs affects the sex of offspring). However, relatively little attention is paid to the behavior of the leopard gecko. For this reason, a few years ago the phenomenon aroused the case of the so-called "Hot females" (the name was given by the terrarists). The method of obtaining the so-called "Hot females" means incubating eggs in such a way that 100% of females are incubated (incubation for the first two weeks at 26-27 degrees Celsius), and then for the last two weeks, changing the incubation temperature above 32 degrees Celsius. The individuals hatched as a result of such manipulations have phenotypic features of females, their color is much more intense, but there are also drastic changes in behavior; these individuals are extremely aggressive (also in relation to humans), they are not suitable for a herding lifestyle. There is a supposition that this is caused by changes in the synthesis of testosterone. Until now, no information has been found to confirm or contradict this assumption, nor has the difference in testosterone levels been found in "Hot females" and males and females from "classical incubation".

DEFINING FISH LEARNING ABILITY BASED ON INSTRUMENTAL CONDITIONING

Paweł Podobiński

Wrocław University of Environmental Life and Sciences

ABSTRACT

Based on instrumental conditioning, it is possible to teach the animal an active and conscious response to a specific stimulus in order to obtain a reward or avoid punishment. Complex methods of shaping specific reactions are usually applied to higher vertebrates (mainly birds and mammals) due to their significant cognitive abilities. In spite of this, world literature more and more often is rising issues of intelligence both fish and invertebrates. Giant gourami *Osphronemus goramy* specimen has been selected as a subject to the training. This species shows considerable interest in human contact and, as a freshwater fish from Labyrinthine suborder, has well-developed eyesight and hearing. The training consists in indicating by fish the boards with a specific color, in response to the trainer's gestures. Along with the acquisition of skills to combine gesture-color information, more and more complex task variants are envisaged. Positive reinforcement is achieved by means of an appetitive stimulus in the form of food in granules. According to the law of effect, the reaction rate of the fish will affect the size of the reward, in order to strengthen the cause and effect relationship. Negative reinforcement through aversive stimulus will be to drive the fish to the angle of the tank. The role of discriminatory (differentiating) stimulus is played by gradually introduced symbols or sounds, depending on the demonstrated cognitive abilities of the fish. They are designed to diversify the learning process, which in its assumption should significantly improve its effectiveness. The aim of the experiment is to determine the ability to learn reactions to the presented stimuli, pay attention to the aspect of a particular stimulus, as well as to demonstrate the functioning of working memory in the giant gourami.

THE WELFARE OF FERRETS (MUSTELA PUTORIUS FURO): HOUSEKEEPING VARIANTS

Dominika Grabolus, Patrycja Waclawik

Wrocław University of Environmental and Life Sciences

ABSTRACT

The ferret, also known as the domestic ferret, European ferret or the farm polecat is small carnivorous mammal, classified as European polecat subspecies (*Mustela putorius*). The ferret has been domesticated for thousands of years. Ferrets have been used for hunting and fur production, as pets and as models in biomedical research. Apart from fur farming, the popularity of a ferret also as a domestic animal has been increasing since the 1980's. Ferrets are now becoming more and more popular pet animals next to dogs and cats. They are kept both in external aviaries and in houses in many European countries as well as around the world. At home, these animals are kept in cages as well as free-range. In the case of the farm polecat, there are set standards for the maintenance conditions and welfare. As far as home conditions are concerned, no standards have been set regarding the minimum size of the

cage, surface layout and surrounding equipment. On the zoological market there are not many toys and elements that would enrich the environment for ferrets. They are extremely curious animals and very playful. Toys that relate to the hunting and eating behaviours are appropriate as are new objects to explore. The research focused on housekeeping methods, which included both ferret cages and the equipment. In addition to the size of the cage, the orientation of space (vertical or horizontal) was an important aspect. Number of levels, if any were present and the material from which the cage was made were also investigated. Types of beds in the cage and beyond, as well as the type and manner of attachment of bowls and drinkers. In the surveys carried out among owners and breeders, presence of toys and additional objects with which ferrets interacted were included.

ROSEMARY REDUCES HEAT STRESS BY INDUCING CRYAB AND HSP70 EXPRESSION IN BROILER CHICKENS

Shu Tang

Nanjing Agricultural University

ABSTRACT

Heat stress negatively affects poultry production and animal health. In response, animals invoke a heat stress response by inducing heat shock proteins (HSPs). Scientists are actively seeking natural products that can enhance the heat shock response. The present study aimed to assess the effects of a Rosemary extract comprising antioxidant compounds on the heat shock response and HSP expression profile in broiler chickens. The response of broilers to HS in the presence of Rosemary extract was assessed using an in vivo myocardial cell model establishment. The results showed that lactate dehydrogenase (LDH), creatine kinase (CK), myocardial CK (CKMB) levels were reduced by the Rosemary extract before and during heat stress. Heat stress alone increased CK and CKMB levels. The levels of oxidative damage-associated enzymes were compared between the Rosemary+Heat stress and heat stress alone groups. The results indicated that in terms of these enzymes, the Rosemary extract induced a more anti-oxidative state. Pathological examinations should that heat stress caused myocardial fiber fracture, karyopyknosis and degeneration. The addition of Rosemary extract ameliorated these lesions to some degree, preserving more of the basic structure. Heat stress decreased the cellular levels of Crystallin Alpha B (CRYAB) and HSP70. The addition of the Rosemary significantly increased the levels of CRYAB and HSP70 during heat stress ($p < 0.0001$). Immunohistochemistry showed that after Rosemary treatment, CRYAB and HSP70 showed more intense staining compared with the no heat stress control group. In the Rosemary+Heat group, after 10 hours of heat stress, the staining intensity of these two proteins remained higher than in the heat stress group. Thus, Rosemary extract could induce high levels of HSP70 and CRYAB in chicken heart before and during heat stress. Thus Rosemary extract could be used to alleviate heat stress in broiler chickens.

THE EFFECT OF HOUSING SYSTEM ON BEHAVIOUR OF DAIRY CALVES

Gabriela Mala, Pavel Novak, Pavlina Jiroutova, Josef Knizek, David Prochazka, Martina Slavikova

Institute of Animal Science, Czech Republic

ABSTRACT

The aim of this study was to evaluate the effect of housing system on dairy calf behaviour, their performance and health on the basis of long-term monitoring over one year period. Calf-bulls were housed in two different housing systems (individually and in groups) on one farm during the milk nutrition period. We analysed the 24-hour cycles of the basic behavioural activities of 40 calves (lying and resting, standing, feeding, drinking, body and surface sucking and licking etc.). The observed qualitative parameters (behaviour) were evaluated by nonparametric tests, quantitative parameters (live weight, average daily gain) using ANOVA for repeated measurements in the Statistica 7 software package. Based on the results of selected signs of behaviour, it stands to reason that calf-bulls in the outdoor group hutches were more active by 6.4% compared to the calf-bulls housed in the outdoor individual hutches, who spent more time lying down (by 4.0%). The calf-bulls housed individually spent longer time on feeding and drinking. Regarding to the occurrence of negative signs of behaviour, had the group housed calf-bulls higher sucking rates of other individuals in the group (by 0.3% of daily time), whereas in the individually housed calf-bulls was higher frequency of surfaces licking of hutches, runs and buckets (by 0.7% daily time). Calf-bulls reared from the 28th day of age in the group hutches achieved a higher ($P=0.051$) average daily weight gain during the whole rearing time by +0.083 kg compared to bulls reared in the individual hutches.

INTRODUCTION

Intensive breeding systems affect animal welfare because they significantly reduce their physical activity "manifestations of natural behaviour" such as: limiting of a space for resting, feeding and water drinking, as well as being protected from adverse climatic conditions and diseases [1]. Dairy calves are raised under a wide variety of housing systems. In Europe, around 60% of dairy calves are reared individually during their first eight weeks of life, while others may be housed in pairs or small groups [2]. In the Czech Republic, the most calves during the milk period are housed in outdoor individual hutches, that is more than three quarters of all born calves. Only a small proportion of calves are reared either in a calf house, in individual hutches under a shelter or in group hutches or pens [3].

Environmental conditions influence key factors during early life of calf, including the development of personality, abnormal behaviour, stress response, susceptibility to infection [4]. Housing and care of a farm animal should be directed towards respecting the needs, both physiological and behavioural [5]. We must know, understand, follow and accept these demands. Management and other environmental factors such as diseases, individual variation, seasonal and diurnal variation affect changes in a duration or frequency of normal behaviours, the development of abnormal behaviour and physiological indicators of welfare [6].

The aim of this study was to evaluate the effect of the housing system on dairy calf behaviour, their performance and health based on a long-term monitoring over one year period.

MATERIAL AND METHODS

Calf-bulls were housed in two different housing systems (individually and in groups) on one farm during the milk nutrition period (from birth to 60 days). All calves after their births (40 calves) were housed in plastic individual hutches (IH). The control group of 20 calf-bulls was reared in plastic individual hutches during the milk nutrition period. In contrast, the experimental group of 20 calf-bulls was moved to plastic group hutches (GH) at the age of about 28 days where they were housed in fours (animals) until weaning. Both IH and GH were made of HDPE polyethylene with a smooth surface. Both groups had the same exposure to the cardinal points. We analysed the 24-hour cycles of the basic behavioural activities of 40 calves (lying, resting, standing and feeding, drinking and body parts and surface sucking and licking, etc.) every week. There was monitored daily live average gain of weight on 40 Holstein calf-bulls every week for a period of one year.

The observed qualitative parameters (behaviour) were evaluated by nonparametric tests, quantitative parameters (live weight, average daily gain) using ANOVA for repeated measurements in the Statistica 7 software package. The Scheffe test was used to compare averages between the test groups.

RESULTS AND DISCUSSION

The behaviour of calves can often vary quite significantly depending on the level of the breeding environment, housing system, management and health status.

Table 1: Behaviour of calves depending on housing system

Behaviour	Group housing		Individual housing	
	Median [hours a day]	Range of variation [hours a day]	Median [hours a day]	Range of variation [hours a day]
Laying and resting	16.70	16.26-17.15	17.69	16.67-18.17
Standing	5.53	4.90-6.07	4.27	2.67-5.67
Starter intake	0.58	0.38-0.78	0.68	0.17-1.33
Drinking (milk, water)	0.50	0.49-0.51	0.59	0.50-0.67
Hutch surfaces licking	0.58	0.28-0.88	0.77	0.17-1.83
Sucking of body parts	0.08	0.05-0.17	0.00	0.00-0.11
Jump on other calves	0.03	0.00-0.05	0.00	0.00

Calves housed in GH and IH spent most of the daily time by lying and resting (Table 1). Some authors [7,8] found out that the calves spend lying down about 17-19 hours per day; it is about 70-80% of the day. The total lying time of calves depends not only on the depth of bedding but also on its moisture [8]. The possibility of rest and sleep is essential indicator of welfare.

It is evident from the results of the observation of selected behavioural elements that calf-bulls reared in the GH were more active by 6.4% compared to individually housed calf-bulls which spent more time lying (4.0%). Jensen et al. [9] also found out that the calves housed individually are less active than the calves in group.

In comparison with the individually housed calf-bulls that spent longer time on feeding and drinking of water. Regarding the negative manifestation behaviour, calf-bulls housed in GH sucked some body parts of other calves in a group by 0.3% more time a day. Again, there is a difference in the individually housed calf-bulls which spent by 0.7% more time licking of hutch surfaces, paddocks, buckets compared to the group-housed calf-bulls.

Table 2: The average daily gain of calves depending on housing system

Housing system	N	Birth weight [kg]	Live weight at weaning [kg]	Average daily gain [kg]
		Mean ± S.D.	Mean ± S.D.	Mean ± S.D.
IH/GH	20	42.4 ± 6.5	88.0 ± 9.5	0.811 ± 0.097
IH	20	45.6 ± 3.2	86.6 ± 7.5	0.728 ± 0.112
p		0.169	0.697	0.051

The birth weight of calf-bulls varied from 31.0 to 56.5 kg. Calf-bulls, destined for breeding in the group, had a non-significantly lower birth weight by -3.2 kg compared to bulls housed from birth to weaning in IH (Table 2). The weaning weight of calf-bulls ranged from 74.5 to 109.5 kg. Calf-bulls reared in group hutches had a non-significantly higher live weight by +1.4 kg in consequence higher intake of starter (1.2 kg versus 0.9 kg) than individually housed calf-bulls during the milk nutrition period (Table 2).

The average daily gain of weight on the calf-bulls varied from 0.593 kg to 1.018 kg during milk nutrition period. The calf-bulls reared from 28 days of age in group had higher (P=0.051) average daily gain of weight for the entire rearing

period by +0.083 kg than the calf-bulls housed only individually. These results are consistent with the studies of Bernal-Rigoli et al. [10] and Tapki [11] who noticed that the calves reared in the group had significantly higher daily weight gain due to a higher feed intake. De Paula Vieira et al. [12] recorded significantly higher feed intake of group housed calves, but did not show any statistically significant increase in average daily gain. In contrast, Maatje et al. [13] reported reduced feed intake and lower average daily increment in group housed calves due to competition for feed, respectively access to feed.

Occurrence of diarrhoea and respiratory diseases was only observed in 23% bulls in IH, i.e. up to 28 days of age. There was no evidence of diarrhoea or respiratory disease at older bulls in both types of housing. The study of Maatje et al. [13] described a higher incidence of diarrhoea and respiratory disease in group-housed calves compared to pair-housed calves. Hänninen et al. [14] found a higher occurrence of disease in group housed calves compared to individual housed calves. In contrast, Chua et al. [7] showed no significant differences in disease incidence between various calf housings.

CONCLUSIONS

The behaviour of calves is very important indicator of welfare and health. The behaviour of calves exhibits different variations not only depending on the age and level of the breeding environment, but also, of course, on the housing system, rearing management and health status. A suitable calf housing system is one that creates the prerequisites for allowing natural behaviours, sufficient time to rest and feed that will provide the basis for maintaining an adequate level of welfare. It is as important prerequisite for achieving optimum production indicators and health during next rearing and breeding as well as in adulthood.

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FOOT-PAD DERMATITIS: POTENTIAL PARAMETER FOR POULTRY WELFARE

Omar Bennoune, Fehat Nouicer, Khawla Ben alia
University of Batna 1, Algeria

ABSTRACT

Special attention to animal welfare has been paid to the protection of animals during these last decades with drastic regulations especially in European. Poultry production is one of the most intensive system of animal production where the poultry houses are crowded and the animals are confined to reduced small areas. Poultry houses crowdedness leads to fast litter deterioration as well as high emission of ammoniac and rise of humidity. Foot-pad lesions may range from simple redness and breast feathers detachment to ulcerative and complicated breast blisters. Many poultry houses, in Batna region, were periodically visited. Temperature, humidity and litter quality were recorded as well as the broilers weight. Foot-pads were carefully observed and observed lesions were classified according to our new scoring scale. This later ranged from normal and simple skin discoloration to severe ulceration of more than 50% of the foot-pads and complicated breast burns. Histological sections were done on foot-pads to confirm the macroscopic observed lesions and to reveal the underlying process. Foot-pad dermatitis prevail on breast lesions

in our poultry farms with six scores (from 0 to 5), the foot-pad recorded lesions were as follows: score 0:16%, score 1: 8%, score 2: 29%, score 3: 12%, score 4: 25%, score 5:10%. In one poultry farm and due to extended rearing period, a dramatic situation was observed and 100% of broilers have ulcerative foot-pad dermatitis with score 5 and complicated with hock burns. Foot-pad dermatitis and their percentage look like that observed in some European countries. Foot-pad dermatitis represents a potential parameter and may be used as a good indicator for assessment of poultry welfare. Therefore, drastic measures must be taken to minimize these lesions through shortage of the rearing period, looking for fast growing poultry strains and application of good farming and welfare practices.

ANIMAL, HOUSING AND NUTRITION AS PREREQUISITE FOR HEALTH, REPRODUCTION AND PRODUCTION IN DAIRY CATTLE

Pavel Novak¹, Gabriela Mala¹, Alzbeta Jarolimkova²

¹Institute of Animal Science Prague, Czech Republic;

²MSD Animal Health, Czech Republic

ABSTRACT

Adequate level of rearing environment is the presumption of achievement of the production and reproduction potential of the farm animals and the profitability of the farm. The aim of this study was to focus on simple screening assessment of the animals, housing environment and nutrition with emphasis on ensuring the possibility of implementing the behavioural manifestations of dairy cows from the point of feeding with proper food and water, lying, resting and rumination next social interactions, movement, microclimate including ventilation, further lighting and finally milking. All these factors are prerequisite for maintenance the adequate level of health, reproduction and production parameters of dairy cattle herds. The obtained data were statistically analysed by Statistica software (non-parametric tests).

A comprehensive analysis of all monitored parameters will provide objective information about the health of herd and management of the whole herd including the critical control points needing an attention from the point of health, welfare and biosecurity.

INTRODUCTION

Housing environment must create such conditions allowing the natural behaviour of the animals, sufficient feeding and resting time, as basis for maintaining an adequate level of welfare of dairy cows as an important prerequisite for achieving optimal production and reproduction performance.

The correlation between the air quality, the health of animals and the level of production indicators is very complicated, especially when studying the effect of gradually changing macroclimatic conditions throughout the year.

The level of animal health protection depends on the concentration of the dairy herd, on the epizootological situation in the region and on the level of animal immunity. Ensuring adequate hygiene standards in livestock is a prerequisite for achieving of high level of production and reproduction parameters and economic profitability for breeders. Infectious pressure on farms can cause health problems in cattle. The importance of prevention and sanitation increases with the size of the herd [8].

MATERIAL AND METHODS

The monitoring of dairy cows during lactation was carried out on 45 dairy farms with different herd sizes (11 small farms up to 100 heads, 19 medium farms from 101 to 500 heads and 15 large farms over 500 heads) at different period of the year (freezing and mild winter - transitional - mild and hot summer).

The analysis is based on the zootechnical and veterinary records of farms (production, reproduction and health indicators); and subjective assessment of the selected indicators of breeding environment (stable environment, lying boxes, feeding, water supplying, corridors, lighting, milking, welfare, health and biosecurity).

Individual indicators were evaluated by simple 3-point scale (1 - optimal, 2 - acceptable, 3 - unacceptable). The result for each evaluated indicator is given by the sum of points for each evaluated character. The values were statistically evaluated by a non-parametric test (Kruskal-Wallis ANOVA) in the Statistica 7.0 program package (StatSoft).

RESULTS AND DISCUSSION

Comprehensive evaluations of selected group of indicators in relation to ideal and unacceptable conditions are presented in table 1 and total evaluation of the level of welfare, health a biosecurity in table 2.

Table 1: Evaluation of selected groups of indicators in dairy cows

Monitored indicators	Herd size				
	Ideal breeding condition	Small < 100 head	Medium 101-500 head	Large > 500 head	Inadequate breeding condition
Number of herds		11	19	15	
Production, reproduction	14	29	26	33	42
Environment	7	14	12	14	21
Lying stalls/resting area	5	7	9	10	15
Feeding	7	15	13	12	21
Watering	5	11	9	10	15
Corridors	3	5	6	7	9
Lighting	2	6	4	4	6
Milking	6	12	11	14	18
Overall assessment	49	99	94	104	147

Table 2: Evaluation of welfare, health and biosecurity in dairy farms

Evaluation criteria	Herd size				
	Ideal breeding condition	Small < 100 head	Medium 101-500 head	Large > 500 head	Inadequate breeding condition
Number of herds		11	19	15	
Welfare	85	171	164	172	255
Health	80	164	156	164	239
Biosecurity	85	178	168	175	260
Overall assessment	250	512	487	511	754

The biggest problems in achieving of the expected indicators of production and reproduction were found to be a significant disproportion between animals in the first lactation and the third and other lactations, as well as problems with early detection of heat and optimal time of insemination. Unsatisfactory fertility is up to 60% due to deficiencies in management and 40% nutrition and feeding of dairy cows. The most common health problems that affect milk production and reduce the profitability of farming include mastitis, hoof disease, reproductive and metabolic problems [1].

Properly functioning ventilation system must provide adequate levels of air exchange in cattle barns throughout all macroclimatic periods of the year. Increased condensation of water on the inner surface of the roof lining has been proved in the cold season of the year due to air exchange restrictions; then in the hot summer where is much higher level of thermal stress. Insufficient air exchange during hot summer macroclimatic period increased the air temperature in the stable; in the freezing winter, condensation of water on the internal barn structures occurred.

In large farms, pens overcrowding and uneven barns ventilation leads to the cow's accumulation in the middle of the stables. On the other hand, good ventilation of the front of resting boxes in the hot summer period encouraged animal lying and cooling fans over the feeding corridor reduced the heat stress levels and stimulated the cows to feed themselves.

When the animals are during frozen climatic period protected from high humidity and draught, the lower critical temperature limit is reduced and the negative effect of cold stress is minimized [2].

In the long term, adequate light intensity has a positive impact on reproduction, immunity, feed intake and cow behaviour [3,7]. The level of natural and artificial lighting was the worst at the small herds due to very dirty windows and anti-draft networks. At the artificial lighting due to contamination of lamp covers.

The basic prerequisites for maintaining the welfare and adequate cleanliness of the body surface include a sufficient amount of clean bedding in lying boxes and regular removal of faeces from handling and feeding corridors. The hard floor in the cubicles or the low bedding layer causes hair loss, lesions, swelling and abrasion due to poor design, construction or installation of lying boxes, improperly installed or damaged neck, breast, side and feeding barriers.

The lack of space at the feeding and water through, as well as a low number of cubicles in pens, unsuitable or wet litter in the lying boxes can cause decrease of the resting time of cows.

In all farms, there were deficiencies in regular cleaning of water trough from feed residues and biofilm layers on their inner surface.

Unsuitable condition of rearing environment and technological systems in the barns can cause physiological stress response in animals that affect their health. It also increases a sensitivity of the organism to pathogens.

The highest levels of lying boxes were in small herds and the worst in large herds. The biggest problem is ensuring a sufficient quantity of good quality litter and pens overcrowding. In overcrowded pens reduces the lying (resting) time in cubicles, increases the incidence of submissive animals being pushed away from the feeding and drinking by dominant individuals [4], frequency of lame animals, but also significantly negatively affects milking [5].

We proved that the high level of hygiene during milking process, which is a prerequisite for maintaining a good dairy cow health, at the same time reducing the risk of microbial contamination of milk, was the highest on medium-sized farms.

Maintaining the good dairy cow health is a major problem in large farms than on small and medium-sized farms [6]. We have found out that the implementation of the biosecurity principles including the preventive measures is easier in the large farms compared with the smaller farms.

CONCLUSION

All technological systems, components and equipment should be in accordance with the welfare requirements in terms of ecology, ethology and breeding ethics. For all animals including dairy cows, there has to be created a breeding system that manages the cow's health. It allows a normal behaviour of the body's acclimation abilities and yet provides a high level of breeding and nursing care.

However, it is also necessary to keep in mind the farmers economic profitability.

ACKNOWLEDGEMENT

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DETERMINATION OF BODY WIDTH IN CONVENTIONAL LAYER HYBRIDS AND DUAL-PURPOSE HENS

Mona Franziska Giersberg^{1,2}, Birgit Spindler¹, Nicole Kemper¹

¹University of Veterinary Medicine Hannover, Foundation, Germany;

²Wageningen University & Research, the Netherlands

ABSTRACT

Keeping dual-purpose breeds is one alternative to the killing of male day-old chickens. However, little is known about the body size and shape, and thus the basic spatial requirements of these birds. In the present study, the body widths of adult dual-purpose hens (Lohmann Dual, LD) and conventional layers (Lohmann Brown plus, LB+) were determined based on the measurement of distances in digital images. The LD hens showed about 7% larger body widths, although they weighted 5% less compared to the LB+ hens. It is therefore important to consider the specific morphology of the hybrid line housed to ensure the provision of sufficient horizontal space, particularly perch and linear feeder space.

INTRODUCTION

Dual-purpose breeds represent an alternative to the killing of male day-old chickens, and seem to have beneficial effects on further challenges in laying hen husbandry, such as the occurrence of feather pecking and cannibalism [1, 2]. To date, dual-purpose hens are usually housed in systems developed for high yielding layer strains, though there is evidence that their behavioural needs may differ [3]. It was also shown that layer strains differ in their body size and shape [4, 5], however, little is known about these parameters regarding dual-purpose hens.

Biometric data provide basic knowledge on the body dimensions of animals, and are a useful basis for defining and discussing minimum space allocations in livestock housing [5]. In previous studies, body widths measurements of laying hens served as suitable indicators for determining animal-based linear space requirements, which are particularly relevant for offering sufficient perch or linear feeder space in laying hen housing systems [4, 6].

The aim of the present study was to assess and compare the body widths of conventional layer hybrids (Lohmann Brown plus, LB+) and dual-purpose hens (Lohmann Dual, LD) by digital image analyses.

ANIMALS, MATERIAL AND METHODS

All hens were kept under the same standard management conditions in an aviary system (Natura Nova 270, Big Dutchman, Vechta, Germany) with two compartments per genetic strain (about 925 hens per compartment).

At 34 weeks of age, a sample of at least 50 hens per compartment was caught and weighted individually. Subsequently,

the horizontal space occupied by the hens (=body width) was measured using a method described by Giersberg et al. [6, modified]. Therefore, each hen was placed on a round metal perch (3.5 cm diameter) in a test cage. Both the perching hen and a reference standard (10 cm length) were photographed from a front view using a digital camera (Olympus E-410, 17.5–45 mm lens, 10.0 megapixels, Olympus Optical Co GmbH, Hamburg, Germany) which was attached to a tripod in 160 cm distance to the test cage. The images were stored in a personal computer and analysed with the software program ImageJ (version 1.52a). Based on the known width of the reference standard and its pixel count, and the pixel count of a manually set connecting line between the outer contours of the hen's wing at the level of the carpal joints on each digital image, the program calculated the body width of the hen (in cm) automatically. Statistical analyses were performed using the software SPSS Statistics (version 25, IBM, Armonk; NY, USA). Besides calculating descriptive statistics, data were assessed visually for normal distribution by creating histograms including the Gaussian distribution curve. One-way analyses of variance were performed to tests hybrid effects on the hens' body widths and body weights. In addition, regression models were calculated separately for LB+ and LD hens to detect possible relations between animal body width and body weight. P-values <0.05 were interpreted to be significant. Data is presented as mean \pm standard error of the mean (SEM).

RESULTS AND DISCUSSION

On average, the LB+ and LD hens weighted 1875.4 \pm 9.62 g, and 1786.47 \pm 16.31 g, respectively. With 15.95 \pm 0.08 cm, the LD hens showed larger body widths than the LB+ hens (14.77 \pm 0.08 cm). Hybrid effects were found for body weight ($F_{1,212} = 22.64$, $P < 0.05$) and body width ($F_{1,212} = 103.26$, $P < 0.05$). This is in line with results obtained by Giersberg et al. [6] and Briese & Spindler [4] who found significant effects of hybrid line on the body widths of pullets and adult hens from high yielding layer strains. In the present study, the LD hens occupied about 7% more horizontal space, although they weighted 5% less compared to the LB+ hens. Similarly, Briese & Spindler [4] observed that adult Lohmann Brown (LB) hens required more linear space compared to Lohmann Selected Leghorn hens at any stage of production, whereas the average body weights of the two hybrid lines did not differ at the end of the laying period. Within hybrid, the relationship of body weight and body width was non-linear for the LB+ ($R^2 = 0.004$) and the LD hens ($R^2 = 0.108$; Fig. 1). Thus, in contrast to measurements of the two-dimensional floor space occupied by layer pullets [7], the hens' horizontal body widths did not increase linearly with increasing body weights. However, the distance measured between the carpal joints (= body width) refer to a skeletal feature of the bird, i.e. its frame size, which is not necessarily dependent on its body weight [6].

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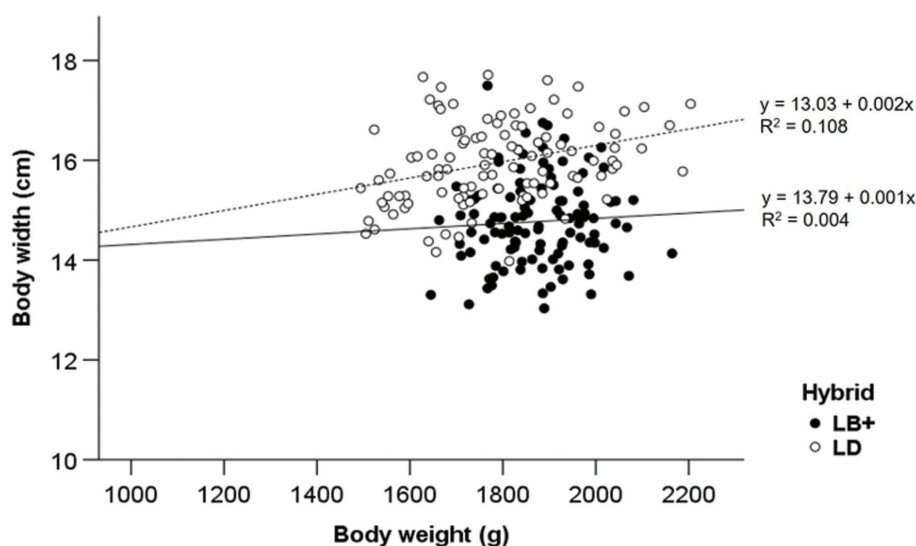


Fig. 1. Body widths (cm) of conventional layer hybrids (LB+) and dual-purpose hens (LD) in relation to their body weights (g).

CONCLUSIONS

The results indicate that dual-purpose hens (Lohmann Dual) show a larger frame size compared to conventional layer hybrids (Lohmann Brown plus), and thus occupy a larger amount of linear space. This should be taken into account when keeping alternative hybrids in conventional housing systems, particularly with regard to perch and linear feeder space allocation.

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HEALTH STATUS OF POLISH RED DEER IN KARKONOSZE NATIONAL PARK – FINAL REPORT

Przemysław Cwynar¹, Roman Rapala², Robert Kupczyński¹, Anna Burek¹, Krystyna Pogoda-Sewerniak¹, Klaudia Wlazlak¹

¹Wroclaw University of Environmental and Life Sciences

²Karkonosze National Park

ABSTRACT

Red deer (*Cervus elaphus*) is one of the most popular wild living animals in Central Europe. In Poland its population counts approximately 190,000 individuals living mostly in forest complexes. The analysis of the health status of this species are not under the constant control of the veterinary institutions, therefore the experimental design was carried out to determine the deer's health parameters in the natural conditions of these animals in Karkonosze National Park (Lower Silesia, Poland) what may be also helpful to improve the management of this species in the area. Totally, seventeen red deer were caught and released during the two years study. Every animal was pharmacologically immobilize to enable short time of animal handling in their natural environment when all of the samples were taken. The haematological and biochemical analysis was determined with the use of ABC Vet (Horiba ABX) and Pentra - 400 (HORIBA ABX, Canada). What is more, the heavy metals in pelage profile were also examined with the use of SpectrAA 220 FS (Varian Company). Red deer study proved that the population living in Karkonosze National Park is general good condition. Nevertheless, morphological analyses of blood (especially within WBC and RBC) showed significant deviations from the accepted reference ranges for ruminants, hence it seems reasonable to continue monitoring the health status of this population and verify the possibility of reducing the health status of other individuals. Detected skin parasites were limited to three species what is typical for the red deer biology and ecology.

GREY WOLF POPULATION TRENDS IN POLAND

Klaudia Wlazlak, Przemysław Cwynar, Katarzyna Krok, Anna Mucha

Wroclaw University of Environmental and Life Sciences

ABSTRACT

The wolf (*Canis lupus*) belongs to native carnivores (Carnivora) and represents the family of canines (Canidae), which is distinguished by 36 species with the wolf being the largest representative. Globally, there are estimated to be more than 160,000 wolves. The Polish population has more than 2,000 wolves. These data are known based on monitoring and collected inventory data of wild animals. The first aim of this study was to estimate the grey wolf population in Poland in the period 1980 – 2015, with use of data collected within the hunting districts by the Polish Hunting Association (PHA), Research Station of PHA and the Central Statistical Office of Poland (CSOP), using a statistical model of Holt's simulation. The second aim was to interpose these estimates to predict future trends in the Polish grey wolf population for the next 15 years. Grey wolf has been protected in Poland since 1998. In addition to monitoring of the current status of this species there is a need to determine the long term outlook of this species as this information is important when making policy decisions regarding wildlife conservation and the legal status of these animals. The range of occurrence of the grey wolf includes all the larger forest complexes of Eastern Poland, the entire Carpathian Mountains and most of the forests of Western Poland. Its role as a predator helps in maintaining ecological balance in forested areas. Controlling the abundance of this species contributes to its better protection and also allows to determine the prediction of the population trend in the future.

ANALYSIS OF EURASIAN LYNX QUANTITY IN POLAND

Klaudia Wlazlak, Przemysław Cwynar

Wroclaw University of Environmental and Life Sciences

ABSTRACT

Eurasian lynx (*Lynx lynx*) belongs to the Felidae family and is the biggest representative of it in Poland. Eurasian lynx is an endangered species since 1995 and is classified as near threatened by the International Union for Conservation of Nature and is also covered by the European Union Special Area of Conservation. Eurasian lynx is a measure of the biodiversity of forest ecosystems, hence its number requires monitoring. Data of quantity population of lynx was analyzed based on collected informations from the Central Statistical Office of Poland, Environmental Protection theme area (separately for voivodeships and national parks) and also from the Research Station of the Polish Hunting Association in Czemiń. The work presents the relationship between the quantity of the Eurasian lynx and changes that have taken place in Poland since 2004 to 2016. The changes assessed in this document includes the economic development, changes of forest structure and also the living conditions for lynx and the conservation programs, in which these animals have been included, in Poland. Monitoring and inventory of endangered species allow their better protection, understanding their biology and ecology and enable controlled development.

EFFECT OF SHADE ON BODY SURFACE TEMPERATURE OF PELIBUEY LAMBS UNDER HEAT-STRESS

José Antonio Aguilar Quiñonez¹, Leonel Avendaño Reyes², Miguel Angel Gastélum Delgado¹, Juan Eulogio Guerra Liera¹, Arnulfo Vicente Perez¹, Ulises Macias Cruz²

¹Universidad Autónoma de Sinaloa

²Universidad Autónoma de Baja California

ABSTRACT

The purpose of this study was to determine the effects of providing shade on temperature of different body surface areas of Pelibuey male lambs under hot and humid conditions (climate: BS1(h¹)) of northwestern México (geographical location: 24° 48' N, 107° 23' W). Twenty pure Pelibuey lambs (4 months' age) were divided in two groups of 10 lambs each, and a one of two treatments was randomly assigned to each group: 1) lambs individually caged in a pen with permanent shade (SH), and 2) lambs individually caged in a pen without shade (NSH). The study lasted 20 days in summer (June 6th – June 26th) and the material of the shade was galvanized steel sheet installed at 5 m height. The body surface temperatures (BST) were recorded at 06:00, 12:00 and 18:00 hours every 3 days. Data was analyzed with a completely randomized design with repeated measurements. The maximum and average temperature-humidity index (THI) of NSH and SH treatments were 98.8 and 89.6, and 84.7 and 81.5 units, respectively. The BST of head, neck, back, rump, shoulder blade, belly, forehead, eye, and testicles were higher (P<0.05) in NSH than SH lambs during the three measured times. The highest BST (P<0.05) were detected at 12:00 h in back (50.05 vs 36.34°C), forehead (44.64 vs 36.31°C), and head (44.28 vs 36.54°C) for NSH and SH treatments, respectively. On the other hand, the lowest TBS (P<0.05) were detected at 06:00 h in back (32.04 vs 36.85°C), testicles (32.34 vs 33.32°C), and forehead (32.43 vs 35.1°C) for the treatments SH and NSH, respectively. Non-shaded lambs showed more physiological signs of heat stress through the day, especially at midday, which suggests that shade improved the thermoregulatory capacity of Pelibuey lambs in this warm zone.

EFFECT OF ANAPLASMOSIS ON OPEN DAYS IN COWS

Alejandro Cordova

Universidad Autonoma Metropolitana

ABSTRACT

The objective of this work was to evaluate the effect of *Anaplasma marginale* on open days in dairy cows. 15 cows, Holstein breed, were used to determine the presence of the disease, to which 2 diagnostic tests, blood smear and hematocrit were performed. By reviewing records, cows declared on open days were evaluated. A blood sample was taken per animal, by puncture of the coccygeal vein; collected in tube with EDTA anticoagulant, the smears were stained with Giemsa and observed under a microscope. For the hematocrit, three quarters of a 75 x 1.5 mm capillary tube were filled and centrifuged at (3000 rpm / 5min). For the identification of the hemoparasite, from a total of 15 cows analyzed by the blood smear stained with Giemsa, it was found that 9 were positive and 6 negative; 60 and 40%, respectively. For the hematocrit, of a total of 15 cows analyzed by the microhematocrit technique, it was found that 6 were positive and 9 were negative; corresponding to 40 and 60%, respectively. In the cows selected container to review the records, an average of 141 open days of the total was found. Based on the results obtained, it is concluded that the presence of Anaplasmosis is the cause of the increase in the days open in the animals studied, since 100% of the cows that were used for the work, 60% were positive and 40% negative.

NUTRITIONAL CAUSES THAT MAY CAUSE INFERTILITY IN COWS

Alejandro Cordova

Universidad Autonoma Metropolitana

ABSTRACT

Despite the advances that exist today on feasible technologies applied in breeding and animal production, few farmers or ranchers have shown concern for improving the general environmental conditions of their Units of Animal Production, without taking into account that these conditions are largely responsible for animal health, welfare altering them and impacting significantly in the presence of problems of reproductive and productive nature, significantly increasing production costs in the dairy industry. In this work Some nutritional causes that can cause reproductive disorders in cows are described.

FEED THAT IS POLLUTED BY ZEARALENONE AND OTHER MYCOTOXINS IMPACT QUALITY ON MILK

Rimvydas Falkauskas, Bronius Bakutis, Violeta Baliukoniene, Jurgita Jovaisiene, Gintarė Kasperavičiūtė, Gediminas Gerulis, Indrė Falkauskienė

Lithuanian University of Health Sciences Veterinary Academy

ABSTRACT

Feeding production animals feed that is polluted by little quantities of mycotoxin concentrations is researched only a little. Even less researched is body's response when cows are fed feed that has low level of mycotoxins. What kind of parts the body accumulates in itself. Negative impact of mycotoxins to animals health is not definitely clear and what part of mycotoxins metabolite has passed barriers falls into production. Feed for analysis were taken from the dairy cows that comes from Lithuanian farms where was noticed non-specific origins SCC (somatic cells count) increase in milk. Composition of mycotoxins has been identified in feed (aflatoxin, B1, Zearalenone, deoxynivalenol) and in samples of milk we were identifying ZEA and qualitative indicators (fat, proteins, urea, lactose content, PH, SCC,TBC) In the samples of feed composition of mycotoxins has been established TLS (Romer Labs methods).

ELISA Test Ridascreen® Zearalenone (R-Biopharm AG) has been used to identify ZEA in milk. Qualitative indicators of milk were analysed VI „Pieno tyrimai” (Lithuania) The average AFL B1 composition that was analysed in cows feed - $2,67 \pm 0,5 \mu\text{g}/\text{kg}$, ZEA - $496,25 \pm 35,12 \mu\text{g}/\text{kg}$, DON - $65,31 \pm 7,21 \mu\text{g}/\text{kg}$. We have established that increasing composition of ZEA in TMR cows feed has influenced growth of SCC and TBC in milk. It was established that 16.7 % of milk samples has contained ZEA mycotoxins. The amount of ZEA composition in milk samples was 0.01% up to 0.31% compared to the amount of mycotoxins that got into the cows organism with TMR.

ENRICHMENT OF THE BREEDING ENVIRONMENT AS A FACTOR CONDITIONING THE IMPROVEMENT OF WELFARE OF LAYING HENS MAINTAINED IN A CAGE SYSTEM

Damian Konkol, Mariusz Korczyński

Wroclaw University of Environmental and Life Sciences

ABSTRACT

Animal welfare is a factor conditioning their health, productivity and, consequently, production economics. The level of welfare can be measured using physiological, behavioural, health, zootechnical and economic criteria. A good indicator of animal welfare is their behaviour, because in the case of its reduction they show a number of abnormal behaviours. In the case of laying hens, normal patterns of behaviour include burial, pecking, sand baths, spreading, fluttering and feather ruffling. Hens kept in cages often have no opportunity for behavioural expression which results in numerous anomalies. These anomalies include, for example, pterophagia, pseudo-nesting, cannibalism, stereotypical walking through the cage, substitute movements such as head shaking or moving the tail feathers, as well as idle movements to imitate the sand bath. It should be noted that these disorders are more common in cage system. The experiment was to check whether enrichment of the breeding environment of laying hens maintained in a cage system would improve their welfare. It lasted five weeks. It used 72 laying hens of the Lohmann Brown line. The hens were divided into four experimental groups due to additional feeders placed in cages. There were six replications (cages) for each group, while each replication consisted of three birds. No additional feeders were placed in the cages of the hens from the control group (K). In the cages of the hens from the first group there is one additional feeder, the second - two, and the third - three. Throughout the experiment the behaviour of the birds was observed and their production parameters such as the number of eggs laid, their weight and feed intake were monitored. In addition, the quality parameters of eggs, such as strength and shell thickness, were also evaluated.

EVALUATION OF WELFARE OF THERAPY DOGS WORKING IN ANIMAL-ASSISTED THERAPY - PRACTICAL EXAMPLES

Anna Budny-Walczak, Robert Kupczyński, Dominika Macalik

Wroclaw University of Environmental and Life Sciences

ABSTRACT

Animal-assisted therapy with dogs in the form of interventions (AAI), educational (AAE) and activity (AAA) is becoming more popular not only among people with disabilities or seniors, but also youngest children in nursery. Assessment of dog welfare during classes can be found on the basis of “calming signals” (CS). CS are behaviors that dogs are showing in stressful situations and are aimed at preventing conflicts. CS can be compared to wolf “cut-off signals”, which are used to inhibit aggression in the recipient. The CS that are the most often noticed are: turning head, yawning, licking, drinking, no reaction to basic commands, “smile”. The aim of the study was to assess the welfare of therapy dogs based on behaviors shown during classes with children aged 2-5 years old. Border collie females (n = 3), aged 5 years (BC1) and 2 years (BC2, BC3), actively participated classes in 5 nursery schools. During the courses, females were observed in terms of demonstrated CS. In a large group of children focused and calm, bitches willingly participated in all types of activities. Another situation was observed with children making noise. With direct contact in such a group CS was clear to notice. During 30 min. classes BC1 yawned 4 times. BC2 giving her paw to some children, turned her head (2 times). In a larger group of noisy children, BC3 was looking for closer contact with the guardian, showing uncertainty and fear. Calming signals should be also a signal of reduced welfare. There are some tips to increasing dog’s welfare: classes should be limited to a few hours a week, meeting place should be prepared (ventilated, devoid of food and toys), class group shouldn’t be too large (about 10-12), the dog-human contact that can cause discomfort/pain should be avoided (strong grip on the paw, patting).

EXAMINATION OF THE OCCURRENCE OF ENDOPARASITES IN MOUFLONS (OVIS MUSIMON) IN THE KSIĄŻAŃSKI LANDSCAPE PARK (WAŁBRZYCH, POLAND)

Paulina Cholewińska, Anna Wyrostek, Katarzyna Czyż, Damian Konkol, Piotr Nowakowski

Wroclaw University of Environmental and Life Sciences

ABSTRACT

In 1902, mouflons were brought to the area of the Sudetenland, and for 100 years they occur in the Książański Landscape Park near Wałbrzych. The size of the herd normalized in the 80s of the twentieth century and from then on it ranges between 100 and 120 individuals. The herd in 2017 consisted of 120 pieces. In order to determine the quantitative and qualitative composition of the parasites in the herd, 20 faecal samples were collected in the field from female similar size and only one young. The samples were taken in May within 5 days. The tests were prepared in terms of the flotation method. The samples were ground, then floated for about 10 min (+/- 1 min), where the mass of samples for analysis was 2g (+/- 0.05). Qualitative analysis was based on the results obtained by taking pictures with a digital camera connected to the microscope. Quantitative analysis, on the other hand, was made using the McMaster method.

MAJOR RISK FACTORS FOR ENVIRONMENTAL AND FARMING TECHNOLOGY INVOLVED IN THE SPREAD OF PARATUBERCULOSIS IN HUNGARIAN DAIRY HERDS

Barbara Bogнар, Viktor Jurkovich

Department of Animal Hygiene, Herd Health and Mobile Clinic, University of Veterinary Medicine, Budapest, Hungary

ABSTRACT

Paratuberculosis (PTBC) has a worldwide distribution [2]. Properly used diagnostic tests and accurately implemented control programs help preventing the transmission of the disease among and within herds [1]. With a pre-assembled question line, we asked twentyfive dairy herds about the environmental conditions and farming technology in the calving pens and during the calf rearing. The preliminary results of our research showed the major risk factors of PTBC in Hungarian dairy herds. Poor hygiene, the absence of calving protocols and improper colostrum management have an association with higher ELISA positivity in the herd. Our results support the theory that the management steps and protocols taken to reduce the prevalence of PTBC help to reduce the occurrence of other infectious calf diseases.

INTRODUCTION

Paratuberculosis (Johne's disease) is a widely occurring disease [2] caused by *Mycobacterium avium* subsp. paratuberculosis (MAP) manifesting in slowly progressing waisting, severe diarrhoea [11], edema due to hypoproteinemia caused by protein-losing enteropathy [2, 12]. Cattle and sheep are primarily affected but MAP was also found in another mammal species [2]. Nowadays PTBC is one of the biggest economic damaging disease among the dairy industry [6]. An association between Crohn's disease in humans and MAP has been described, although causality remains to be proven [11]. Neonates and juvenile ruminants are the most susceptible [14], usually infected via fecal-oral route. MAP can be ingested through colostrum [10] and intrauterine infections may occur [13] as well. The infected animals shed the bacterium in faeces, colostrum and milk [7]. The incubation period of the disease is rather long, the clinical signs usually appear around 2-7 years of age [12]. The animals can shed MAP in the subclinical phase of the disease, the "silent" carriers are important sources of transmission [12]. Early diagnosis is hard due to the long course of the disease and the intermittent shedding thus prevention and adequate management practices seem to be the most important keys to control the disease [8].

MATERIAL AND METHODS

Twentyfive dairy herds have been visited between September 2017 and April 2019. The average number of lactating cows was 661 ± 32 animals on the farms, the apparent prevalence of paratuberculosis infection detected by ELISA method was $5.1 \pm 1.7\%$ (min 2.3, max. 9.5%). Production and animal health data were collected using the computerized herd-management system, several details about the animal keeping technology, with special regard to calf housing and calving place were also recorded during the farm visit. We put questions about the herd ELISA status (MAP, BVDV, etc.) based on the last herd blood testing, the location of the calf's place, the measure of the calf IgG. At the calving area we checked the calving management, protocols, the colostrum management, the dam – calf relationship after birth, the hygiene of a calving area. The data were recorded in a Microsoft Excel datasheet.

RESULTS AND DISCUSSION

This paper discusses three main topics of the questionnaire: (1) the location of the calf; (2) the calf and colostrum management; and (3) the calf health situation (the main problems and the mortality rate until the 90 day of life).

In the herds where calf were not well separated from adult cattle (e.g. near the walking alley where the cows go to the milking parlour or near the cows within the calving area), ELISA MAP positivity was in average 6%. In contrast to this, the farms where the calves were well separated the average ELISA MAP positivity was 3,2%.

The farms used different colostrum management protocols (pooled or own dam's or only from MAP free animals) and there were differences in the general hygiene of the maternity pens. The farms differed regarding the management of calving meaning that the calving cows are separated in some farms or the cows are grouped together during calving. On the farms where there was no proper colostrum management, the calving happened among other cows in the maternity pen and the pen hygiene was poor the ELISA MAP positivity was 7,2%. It was found that diverse problems happen together on these farms. Contrary to this, on well managed farms, where the above mentioned problems were not detectable, the ELISA positivity was only 2.3%.

Diarrhoea was the main health issue in calves until 90 days of age. There was a lower mortality rate (2% vs 2.3%) and lower occurrence of calf diarrhea (8% vs 17%) on farms where there were protocols against PTBC, respectively. Providing infection-free calving management (which means controlled colostrum intake, proper hygiene of the calving area and separation of the calf immediately from the infected cattle during the parturition) are the most important in the disease prevention [3] since the contact of calves with adult cow faeces is one of the most important risk factors in MAP transmission [4]. Our result, in agreement with others [3, 9], shows that the general hygiene plays a major role in controlling the disease. If the farmers pay more attention to the conditions of calving and to calf rearing the occurrence of other bacterial calf diseases can decrease. In conclusion, PTBC control is beyond the control of the spread of the disease. It has been suggested by simulation models that improving calf management was more efficient to decrease MAP prevalence in a herd than a test and cull strategy [5].

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EFFECT OF STRUCTURED ALKALINE WATER IN MINK WELLNESS AND FUR QUALITY

Gediminas Gerulis, Bronius Bakutis, Andrius Vasiliauskas, Violeta Baliukoniene, Jurgita Jovaisiene, Rimvydas, Gintarė Kasperavičiūtė

Lithuanian University of Health Sciences Veterinary Academy

ABSTRACT

After the structuring, this alkaline water is absorbed more quickly by the body and helps to restore the balance of alkalis and acids in the body, which can be balanced by feeding the mink with commercial feed. For this reason, it chooses to monitor the effects that this water makes on mink, by observing weight variability, quality of the fur, and wellness. Urine tests and biochemical blood tests were performed to assess wellness. In the study, 25 animals were divided into three groups, the control group (n = 7) , the second group (14 days alkaline water) (n = 8) and the third group (60 days alkaline water) (n = 10). After the study, it was found that the mink weight of 14 days fed by alkaline water was increased by an average of 5.1% for the control group of animals. The statistically significant difference in the quality of the fur was not determined for both criteria, but the quality of the fur skinned with structured-alkaline water was 14 days, according to the classes defined for potassium quality, was 100% more versatile than the class A and B quality, while the control group was 71.42% and 60 days group - 50%. The results of the urine tests showed that, in the second group, the urine biochemical parameters did not exceed the norm, urine pH was at the limit of the norm and no crystals were detected, while in the third group animals 50% having urinary crystals and also 30% who had a urine pH higher than normal. As well as assessing the results of a blood biochemical study, the second group of indicators is closer to the norm than the control group, while the third group observes the increase of these indicators.

EFFECT OF WATER DELIVERY METHOD ON GROWTH AND FEED INTAKE OF DAIRY CALVES

Jan Broucek¹, Michal Uhrincat¹, Peter Kisac¹, Antont Hanus¹, Miloslav Soch², Lubos Zabransky²

¹National Agricultural and Food Centre, RIAP Nitra, Slovakia;

²South Bohemia University, Ceske Budejovice, Czech Republic.

ABSTRACT

Sixty Holstein calves were reared in individual hutches from the second day of life to weaning at the age of 8 weeks. Calves received colostrum and mothers milk ad libitum 3 times a day from a bucket with nipple from the second to fourth day. From the fifth day they received 6 kg of milk replacer per day divided into 2 portions in 12 h intervals. From the second day until weaning the calves were offered concentrate mixture and alfalfa hay ad libitum. All calves were divided according to the method of water delivery into 3 groups - nipple sucking from bucket (N), drinking from bucket (B), and without delivery water (WW). The methods for the evaluation of health, diarrhea, and respiratory condition were used. No significant difference was found among groups in the average daily gains. The N group of calves drank more water to weaning than the B group (69.39 kg vs 50.72 kg), and group N had the highest intake of starter mixture (N 14.43 kg, B 11.30 kg, WW 13.31 kg). The highest alfalfa hay consumption during the milk-drinking period was found in group WW (N 21.34 kg, B 22.26 kg, WW 23.59 kg).

INTRODUCTION

Water is essential in many biochemical processes in the organism, for oxidation body tissues, and feed digestion. Many environmental factors affect water consumption (water quality, drinker design, dry matter intake, weather conditions, and housing) [4, 5]. Water restriction could intensify the effect of heat stress related to nutrient digestibility or blood parameters and decreased performance of animals [14, 9].

According to the EU Council Directive [2], calves over 2 weeks of age have to be allowed ad libitum access to water. Prior to this age they must supply their daily need for fluid through the intake of milk or milk replacer. Decreased water intake could have long-term negative effects on both growth and welfare of dairy calves. Therefore, any limited water supply would inevitably disrupt the productive process in dairy calves. In addition, water restriction for any

reason can act as a stressor and intensify the severity of stress and during heat stress suppress immune system function of animals [9].

However, little information is available on how much water calves fed milk or milk replacer consume during the milk-feeding period. Calves provided ad libitum milk diets may in fact not consume substantial amounts of water. In a study by Kertz et al. [6], calves were offered ad libitum water or no water for 4 weeks. Calves not fed supplemental water gained less body weight and consumed less concentrate as compared with calves with ad libitum access to water. According to Hepola et al. [5], no differences in water intake between the 2 water sources (open bucket and nipple) were noted.

Traditionally, water intake is directly related to feed intake, so the more feed the calf consumes, the more water it will consume. Feeding free-choice water increases starter intake and weight gain. Calves fed water free-choice also had a lower incidence of scours [1]. Manthey et al. [8] compared the impact of free-choice versus restricted water intake on calves. However, restricting water intake in the first 42 d did not affect calf performance. The amount of liquid in milk replacer fed also affects the amount of water consumed. It is very possible that this relationship is due to the fact that increased water in milk replacer will reduce the need for additional water to be fed as liquid or free water [11].

The aim of this study was to evaluate effects of delivery method on the growth, feed intake and health condition of calves kept in individual hutches in southern Slovakia.

MATERIAL AND METHODS

Sixty Holstein calves (30 females and 30 males) were reared in individual hutches from the second day after birth to weaning at the age of 8 weeks. The same conditions of nutrition were ensured. Calves received colostrum and mothers milk ad libitum three times a day from a bucket with nipple from the second to fourth day. From the fifth day they received 6 kg of milk replacer per day divided into 2 portions in 12 h intervals. From the second day until weaning the calves were offered concentrate mixture and alfalfa hay ad libitum. Feed and water refusals were removed and weighed each morning prior to feeding. The experiment lasted from April to November. All calves were divided at birth according to the water delivery into 3 groups. Beginning the 5th day, in addition to the water present in the milk replacer, water was provided in a nipple bucket (N), provided for drinking from an open bucket (B), or not provided (WW).

The meteorological data were recorded continuously by electronic probes, which were positioned at animal height and connected to a data logger. Air temperatures and relative humidity readings were taken for each hour of the day. The temperature-humidity index (THI) was calculated [10]. Blood samples for analysis of white and red blood compounds were taken every second week. The classical methods for the health condition evaluation was used [7]. The data were analyzed using a General Linear Model ANOVA by the statistical package STATISTICS, Version 10.0. Values are expressed as means \pm standard error of the mean.

RESULTS AND DISCUSSION

From April to November we recorded 60 summer days and 15 tropical days. Sixty-six days with the value of the THI above 72.0, which is already a stressor, were found during the period. For the whole experimental period, 26 days had THI values higher than 78.0, which was a substantial stress.

N group of calves drank more water through weaning than B group (69.39 \pm 66.91 kg vs. 50.72 \pm 51.95 kg, $P=0.05$), and group N had the highest intake of starter mixture (N 14.43 \pm 8.82 kg, B 11.30 \pm 5.45 kg, WW 13.31 \pm 6.86 kg, $P=0.05$). Significant differences were found between groups WW and N in the first and the fourth weeks of life (WW 0.16 \pm 0.16 kg vs. N 0.05 \pm 0.09 kg; $P<0.01$, WW 2.18 \pm 1.05 kg vs. N 1.32 \pm 0.76 kg; $P<0.01$). The highest alfalfa hay consumption during the milk drinking period was found in group WW (N 21.34 \pm 6.91 kg, B 22.26 \pm 7.52 kg, WW 23.59 \pm 8.76 kg, $P=0.05$).

We did not find significant differences among groups in the average daily gains. Daily gains were the highest in group N (N 0.46 \pm 0.13 kg, B 0.43 \pm 0.12 kg, WW 0.44 \pm 0.10 kg, $P=0.05$).

Studies of more authors [3, 13, 6, 1] have investigated the effect of water restriction on calves. According to them, calves receiving water ad libitum eat more concentrates than calves not receiving water. It was determined a higher ratio of water intake to total DMI with approximately 2 L of water consumed per kg of total DMI before weaning [12]. Water source (nipple or bucket) did not affect water, concentrate or alfalfa hay intake. Also, water restriction did not result in any obvious effect on feed intake. This is confirmed by the results of the investigation of health status and blood indicators. When calves were fed supplemental water in addition to that provided in milk replacer, they consumed more calf starter or grower and gained more body weight as compared with calves not given supplemental water [6]. Calves given water gained 2.63 kg more from 4 to 40 days of age than calves not receiving water in addition to milk replacer [3]. Our results are difficult to justify. It was probably enough for trial calves to get the water in a 6 kg milk replacer daily. It is also possible that the lack of water affects body growth after weaning.

No calf died or was culled for bad health. There were no water delivery effects for blood measurements of red blood cells. We did not find any significant differences among observed factors in the number of leukocytes or percentage of basophiles, monocytes, and neutrophils. The faces of calves in all groups had liquid consistency during the first weeks, then normal firm. Color of feces showed a steadily trend from yellow to green and consistency changed smoothly from liquid to normal.

CONCLUSIONS

Water restriction did not result in any significant effect on growth and health condition in experimental calves. Water restriction did not affect feed intake.

However, we cannot recommend that water be delivered just as part of the milk replacer on the basis of this experiment alone.

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EFFECT OF SHADE ON PHYSIOLOGICAL AND PRODUCTIVE VARIABLES IN PELIBUEY LAMBS UNDER HEAT-STRESS

Miguel Angel Gastélum Delgado¹, Juan Eulogio Guerra Liera¹, José Antonio Aguilar Quiñonez¹, Leonel Avendaño Reyes², Ulises Macías Cruz², Samuel J. Castro Camacho¹, Miguel Antonio Cardenas Contreras¹, Jose Manuel Hernández³

¹Universidad Autónoma de Sinaloa

²Universidad Autónoma de Baja California

³Finca el cielo

ABSTRACT

The objective of the work was to determine the effect of the use of shade in the pen on the productive behavior and physiological variables in Pelibuey lambs under hot and humid conditions (climate: BS1(h')) of northwestern México (geographical location: 24° 48' N, 107° 23' W). Twenty pure Pelibuey lambs (4 months' age) were used, that were divided into two groups of 10 and randomly assigned 2 treatments (n=10): T1 lambs in individual pens with permanent shade (CS); and T2 lambs in individual pens without access to shade (SS). The study lasted 20d (June 6-26); roof of galvanized sheet with height of 5m. The lambs were weighed on days 1, 10 and 20 of the test. Respiratory frequency (FR) and rectal temperature (TR) were measured at 06:00, 12:00 and 18:00 h each 3d. As well as total weight gain (GPT), daily weight gain (GDP), food consumption (CAL), feed conversion (CA) and food efficiency (EA). The data were analyzed with a randomized complete block design using the GLM procedure of the SAS (2004). The maximum and average temperature and humidity (ITH) indices were 98.8 and 89.6, as well as 84.7 and 81.5 units for the SS and CS groups, respectively. The RF was higher (P <0.05) in SS sheep than in CS at 06: 00h, 12:00 and 18:00h. The TR was greater (P <0.05) in SS than in CS at 06:00 h, 12:00 and 18:00 h. The CS group had higher (P<0.05) GPT, GDP, CA and EA than the SS group. However, CAL was similar (P> 0.05) between treatments. The use of shade improved the index of physiological variables and productive performance of corral lambs under conditions of heat stress.

EFFECT OF SEASON ON STRESS PHYSIOLOGY PARAMETERS OF HOLSTEIN HEIFERS IN A DESERT CLIMATE

Arnulfo Vicente-Pérez¹, Leonel Avendaño-Reyes², Ulises Macías-Cruz², Abelardo Correa-Calderón², Jose Antonio Aguilar-Quíñones¹, Emiliano Corrales-Navarro³, Juan Eulogio Guerra-Liera³

¹ Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Sinaloa, México;

² Instituto de Ciencias Agrícolas, Universidad Autónoma de Baja California, México;

³ Facultad de Agronomía, Universidad Autónoma de Sinaloa, México;

ABSTRACT

The aim of this study was to determine the effect of season (summer vs winter) on respiration frequency (RF), hematological components, blood metabolites and electrolytes under desert and arid conditions. Sixty heifers were

used, 30 in winter and 30 in summer, with average age and weight of 13 months and 378 ± 10 kg, respectively. The RF was measured at 07:00 and 16:00 h every 3 d, and blood samples were collected by puncturing the coccygeal vein during the morning (6:00 h) three times during the study. Hematological parameters were determined in fresh blood samples, while metabolites and electrolytes were determined in serum samples. Data was subjected to an analysis of variance under a completely randomized design. Summer season (August) presented minimum and maximum temperatures and ITH of 21.8 and 43.8°C, and 64.8 and 96 units, while winter season (February) had 0.15 and 29 °C, and 52.3 and 62.9 units, respectively. During summer, RF and concentration of granulocytes were higher ($P < 0.05$) than winter; however, lymphocytes, hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin and erythrocyte distribution width, cholesterol, triglycerides, glucose and urea were lower ($P < 0.05$) during summer. Heifers during summer showed signs of heat stress because of the elevated RF compared to winter season, but thermoregulatory mechanisms aided to maintain normal levels of hematological and biochemical blood concentrations within the reference range, which indicates a certain level of adaptation of Holstein heifers to the hot temperatures in this desert climate region of northwestern México.

INTRODUCTION

Heat stress-related decline in productivity is maybe the most economically negative factor fronting global animal production systems [1]. In arid regions, environmental temperatures in winter, despite they are low, are appropriate for an adequate development of Holstein heifers; however, these conditions during summer are so hot that may compromise heifer growth [2]. Lack of replacement heifers is one of the factors that most influence the development of dairy farms, since efficient breeding replacement can ensure future milk production and proper herd growth [3]. Under warm conditions, animals respond with a variety of physiological, behavioral, biochemical and hematological mechanisms as measures for protection and reduction the accumulated heat load [1, 2]. The first symptom is a decrease in dry matter intake, and then other signs are increase in respiration rate and water consumption as key thermoregulation mechanisms [4]. As heat stress (HS) increases, the physiological and behavior changes may result in an imbalance of several blood constituents, compromising the health status and welfare of cattle [4, 5]. In turn, blood components may reveal the impact of HS and the physiological state of Holstein heifers. For instance, glucose and cholesterol are related to energy metabolism, while urea and total protein epitomize with protein metabolism [5]. Dehydration is present under severe HS conditions, which is associated to an increase in pack cell volume and hemoglobin concentrations [6]. Therefore, the aim of this study was to determine the effect of season (summer vs winter) on respiration rate, hematological components, and blood metabolites and electrolytes in replacement Holstein heifers under arid environment.

MATERIAL AND METHODS

The study was conducted in a commercial dairy heifer ranch located at Km. 15 of the Mexicali-San Felipe federal highway, in the Mexicali valley, state of Baja California, northwestern México. This is an arid region with temperatures in summer that reach 50°C and during winter falls to -5°C [BW (h) hs (x')], and located at 32° 23' north latitude and 115° 20' west longitude [7]. Sixty heifers were used, thirty in winter and thirty in summer, with age and weight of 13 months and 378 ± 10 kg, respectively. The RF was measured at 07:00 and 16:00 h every 3 d, and blood samples were collected in the morning (06:00 h) three times during the study. The blood samples were collected in vacutainer tubes of 10 and 4 mL using the venipuncture technique of the coccygeal vein. For the analysis of hematological components, fresh blood samples were obtained in 4 mL tubes containing EDTA-K2 and were immediately transported to the laboratory for analysis using an Auto Hematology Analyzer (MINDRAY, BC-2800 Vet; Shenzhen, China). Other blood samples were collected in 10 mL tubes and centrifuged at 3500 rpm for 15 min at 10° C. The serum was separated and duplicated into 2 ml vials and stored at -20 ° C for further analysis of metabolites and electrolytes. The metabolites were analyzed with an auto-blood analyzer of liquid phase (EasyVet, KONTRoLab, Morelia, Mich., México), while electrolytes were determined in an electrolyte analyzer (LW E60A, LandWind, Shenzhen, China). The climatic variables were obtained from the climatic experimental station placed in the same heifer ranch. Data was subjected to an analysis of variance under a completely randomized. Statistical differences were declared at $P \leq 0.05$ and tendencies between $0.05 < P \leq 0.10$. All statistical analyses were performed using SAS software [8].

RESULTS AND DISCUSSION

Descriptive statistics for the climatic variables measured during the studied seasons are shown in Table 1, indicating that during winter heifers were in favorable conditions for their optimal growth, since THI values (58 units) were below 72, while in summer season the conditions are classified as severe heat stress, since they exceeded 72 units of THI (80 units). The threshold in which dairy heifers begin to suffer heat stress is 72 units. Dairy animals maintain a stable body temperature under 26°C of environmental temperature, and above that value, management practices like physical modifications should be applied to minimize the rise in body temperature [2, 9]. However, St-Pierre et al. [10] indicate that replacement Holstein heifers are much less influenced by heat stress than lactating cows, and their threshold may be between 72 and 77 units of THI. Figure 1 shows the interaction between season and time on RF, indicating that RF was higher ($P < 0.05$) during the evening compared to the morning in both seasons. According to Bahn et al. [11], dairy heifers having a RF between 20 and 60 bpm are considered inside the thermoneutral zone. From the above, the RF of the present study confirm that during the evening of the summer season heifers suffered heat stress since RF exceeded 80 bpm. Table 2 shows concentrations of hematological components, as well as metabolites and electrolytes by season. During summer, lymphocytes, hemoglobin, hematocrit, mean corpuscular volume and hemoglobin, erythrocyte and platelet distribution width, as well as metabolites decreased ($P < 0.05$) during summer season compared to winter. Hematology and biochemistry of blood are analyses that can provide valuable information regarding presence of diseases or metabolic disorders, and also to correctly formulate specific treatments to avoid health disorders in cattle [12]. However, these parameters may be modified by several factors such as breed, age, plane of nutrition, and management factors, among others [13]. Dairy cows expose to HS conditions showed significant alterations in red blood cells, hemoglobin and pack volume cells, as well as pH and CO₂ in blood [14]. Also, comparing winter and summer seasons in Holstein cows, an important reduction in hemoglobin, platelet count, mean corpuscular volume and count of red and white cells [15]. During summer season, CI showed a trend

($P = 0.07$) to increase while Na a trend ($P = 0.07$) to decrease. However, these changes were minimal to cause a significant effect on health. Even though seasonal differences were observed in hematological and biochemical profile of replacement Holstein heifers, all physiological parameters measured in blood are within the normal ranges for this type of cattle [13].

CONCLUSIONS

The respiratory frequency, hematological concentration, metabolites and blood electrolytes were affected in the heifers during the summer season, possibly as an effort to cope with the rise in environmental temperatures, and as part of their adaptation. Although differences in hematological concentrations were found, all values were within the reference range for Holstein heifers.

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Table 1. Average of climatic variables per season of the year during the study.

Season	Temperature (°C)			Relative Humidity (%)			THI		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Summer	21.4	43.8	33.3	16.5	54	34.4	64.8	96.0	79.8
Winter	0.15	29.08	14.03	11.26	45.5	36.3	52.3	62.9	57.6

Min=Minimum; Max=Maximum; THI=Temperature-humidity index

Table 2. Effect season on hematology, metabolites and electrolytes of Holstein heifers.

Parameter	Season of the year		S.E.	P-value
	Winter	Summer		
<i>Hematological</i>				
Leucocytes, X 10 ⁹ /L	10.9	10.4	0.96	0.680
Lymphocytes, X 10 ⁹ /L	5.42	4.54	0.22	<0.01
Granulocytes, X 10 ⁹ /L	3.74	4.53	0.24	<0.05
Hemoglobin, g/dL	11.9	10.1	0.27	<0.01
Hematocrit, %	34.2	29.9	0.83	<0.01
Mean corpuscular volume, Pg	41.6	38.8	0.36	<0.01
Mean corpuscular hemoglobin, g/dL	34.5	33.6	0.17	<0.01
Red cell distribution width, %	18.7	18.1	0.17	0.021
Platelet, X 10 ⁹ /L	386	333	32.4	0.251
Mean platelet volume, fL	5.02	5.08	0.04	0.312
Platelet distribution width, %	16.1	15.8	0.06	<0.01
<i>Metabolites</i>				
Cholesterol, mg/dL	108	95.5	1.78	<0.01
Triglycerides, mg/dL	36.1	23.8	0.88	<0.01
Glucose, mg/dL	100	86.9	1.01	<0.01
Total protein, mg/dL	7.22	7.09	0.07	0.15
Urea, mg/dL	25.2	23.3	0.50	<0.01
<i>Electrolytes</i>				
Chloride, mmol	104	105	0.20	0.07

Sodium, mmol	130	129	0.29	0.07
Potassium, mmol	4.52	4.62	0.06	0.30

S.E.= Standard error

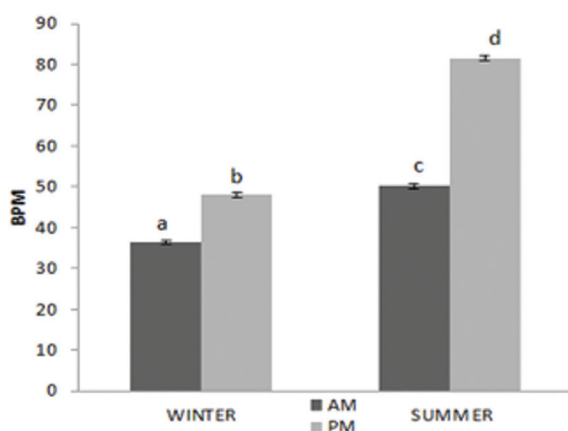


Figure 1. Interaction of season and time of the day on RF of Holstein heifers.

GAS ADMIXTURES CONCENTRATIONS IN DAIRY BARNs ESTIMATED BY FOURIER TRANSFORM INFRARED SPECTROSCOPY

Dorota Witkowska¹, Bartosz Chojnowski¹, Mariusz Korczyński², Janina Sowińska¹

¹University of Warmia and Mazury in Olsztyn

²Wrocław University of Environmental and Life Sciences

ABSTRACT

Gas emissions from livestock farming pose a widespread problem due to their harmful environmental impact and negative effect on living organisms. The dairy sector is considered to be an important source of greenhouse gases, including CO₂ and CH₄, which contribute to global warming. Some of inorganic (NH₃) and volatile organic compounds (VOCs) are classified as toxic or odorous. Direct and precise measuring of gas concentrations in dairy production process cause difficulties because of scarcity of simple instruments. The aim of the present study was to estimate gas concentrations in situ in different dairy buildings by Fourier Transform Infrared Spectroscopy (FTIR) method.

The experiment was carried out in autumn-winter season in four dairy buildings with different maintenance system (tie-, free-stall), herd size (60-90 head of cattle), floor (slotted, solid concrete, litter, rubber mats) and manure management (sub-floor storage, scraped). Gas concentrations were determined by FTIR method using a portable multi-component Gasmeter DX4030 analyzer for on-site measurements of chemical compounds at low concentrations in ambient air. Sample spectra were obtained 4 times at 5 locations inside each building and they were analyzed with the use of Calcmet Professional software with a library of reference spectra for 200 gases.

The prevalent gases were carbon dioxide (753-1588 ppm), methane (38-102 ppm) and ammonia (2-8 ppm). Their concentrations were the lowest (P<0.01) in loose housing system with slotted floor and sub-floor manure storage and rubber mats on stalls. Furthermore, 19 VOCs from hydrocarbons, monoterpenes, alcohols, ethers, aldehydes, ketones, amines and azines groups were identified. The concentrations of common saturated hydrocarbons and alcohols were ranged between 2-6 ppm. Other compounds did not exceed 3 ppm. All of VOCs, excluding isobutanol, in higher concentrations occurred in the deep litter system. Toxic admixtures of gas in each investigated building ranged within limits which are not harmful for livestock.

PREVENTION OF THE CATTLE BLINDNESS WITH THE RETRO BULBAR NOVOCAIN BLOCKADES IN VOLGOGRAD REGION

Igor Zhirkov

World Academy for Animal Husbandry

ABSTRACT

Background: Thelaziosis is infected a parasitic cattle disease with eye's pathologies, including keratitis and keratoconjunctivites. Animals develop turbidity of cornea and leucoma. The disease progresses up to a total blindness, in some cases, with "effluence" of one or both eyes. Our goal was to develop the treatment of mass leucoma in field conditions, using retro bulbar Novocain blockade. Technique: Adult animals are fixed upright, or under the general anesthesia, calves are in lying down position. The lower eyelid is carefully wiped by 5% spirit tincture of iodine. A prick point is skin of a lower eyelid, directly in the middle of an eye. The needle is entered on border of ventral edge of an eye-socket and soft tissues of an eye, conducted to an opposite corner of a mandible behind an eye against the stop in a bone tissue of an eye-socket. Thus, the end of a needle has to be in retro bulbar area. Depth is for calf of 5-7 cm, for cows of 8-10 cm and for bulls of 10-12 cm. After finished a needle in the necessary location, it is necessary to

be convinced, the eye white is not touched. For this raise an upper eyelid and watch the movement of an eye. After that attach the syringe to a needle and enter into retro bulbar area 0.5% solution of Novocain in the following doses to calves 6-12 ml, cows 20 ml and bulls 40 ml. Results: The medical effect consists in a leucoma disappearance, scarring of a cornea ulcer and removing of inflammatory process. As a rule disease symptoms disappear in 2-3 days after conducting manipulations. In some cases to repeat the procedure through 3-4 days is recommended. Conclusion: The present treatment was tested on 380 animals, and we observed the full recovery on 377 heads.

EFFECT OF DIET SUPPLEMENTATION WITH β -HYDROXY- β -METHYLBUTYRATE (HMB) ON STRESS RESPONSE IN SLAUGHTER KIDS

Janina Sowińska, Stanisław Milewski, Zenon Tański, Anna Wójcik, Dorota Witkowska, Katarzyna Ząbek, Tomasz Mituniewicz

University of Warmia and Mazury in Olsztyn

ABSTRACT

The study was performed on 26 Alpine kids divided into two equal groups: I - control and II - experimental group whose diet was supplemented with β -hydroxy- β -methylbutyrate (50 mg/kg BW). At the age of 60 days, 15 kids from each group were weaned from mothers for 15-h pre-slaughter fasting, and transported to a slaughter house on the next morning. Kids were weighed and subjected to blood sampling before transport and after transport. Blood samples were assayed for N:L ratio, cortisol and glucose levels. In the both groups of animals significant increase ($P < 0.01$) of cortisol concentration, N:L ratio and glucose level was found after transport. These results indicate that transport caused stress in both groups of kids. Significant interaction ($P < 0.01$) showed the dependence of the magnitude of the stress response on the group of kids. It was found that the kids administered HMB had a significantly lower cortisol concentration compared to the control group (2.38 $\mu\text{g/dl}$ and 3.55 $\mu\text{g/dl}$, respectively). After transport 3-fold increase of N:L ratio in the control group and only 2.1-fold in the experimental group was found. Simultaneously, after transport in the control group a larger increase was observed in the N:L ratio (2.1 and 1.4-fold, respectively) and glucose levels (2 i 1.6-fold, respectively) compared to the experimental group. The obtained results suggest that diet supplementation with HMB could alleviate stress response in kids during pre-slaughter transport.

THE EFFECT OF EIMERIA SPP. INFECTION ON THE RESULTS OF REPRODUCTIVE PERFORMANCE OF SOWS

Anna Bartosik, Damian Knecht, Anna Jankowska-Mąkosza

Wroclaw University of Environmental and Life Sciences

ABSTRACT

The aim of the study was to determine the effect of Eimeria spp. infection on selected results of reproductive performance of sows. The study involved 70 hybrid sows, from which faecal samples were collected on the 10th day of lactation. The biological material was analyzed in terms of prevalence and average oocyst content per gram of stool. This analysis was carried out using the McMaster method (Gundlach, Sadzikowski, 2004). In addition, in the litters of all sows in the experiment, the number of piglets born alive and stillborn (pcs), morality (%), number of weaned piglets (pcs), birth and weaning piglets weight (kg) and daily weight gains were monitored. Statistical analysis of the results was made using a one-way analysis of variance. The analysis showed prevalence of sows infection at the level of 19% ($n = 13$), and the average oocyst content per gram of feces in infected pigs was 1464 OPG. In the case of the average number of piglets born alive parameter, healthy sows gave 0.21 piglets more compared to infected sows of Eimeria spp. ($p \leq 0.05$). The number of piglets stillborn was 0.24 higher in infected sows than health one. There were no statistically significant differences between the average number of weaned piglets (about 12.30), morality (about 3%) and the average body weight of the piglets born (about 1.2 kg). There were statistically significant differences ($p \leq 0.05$) in the daily weight gain parameters of piglets (healthy 255g, infected 241 g) and in weaning piglets (healthy 7.67 kg, infected with 7.31 kg).

TYPE OF BEDDING MATERIAL AND SOMATIC CELL COUNT IN BOVINE MILK

Anna Zielak-Steciwko, Małgorzata Roszak, Marzena Kęsek,

Edyta Wojtas, Andrzej Zachwieja

Wroclaw University of Environmental and Life Sciences

ABSTRACT

Due to the fact that, in most farms, dairy cows are maintained indoors throughout the year, more and more attention is paid to improve environment in which animals are kept. Particular attention is paid to the lying area to provide cows with the highest level of comfort, which is crucial for the length of lying down time. This, in turn, translates into improved digestion (longer chewing period), better blood flow through the udder, and thus favors processes related to milk secretion. Shortening the lying time causes stress among animals. Cow's comfort is an important determinant of a modern approach on dairy production. Any omission of this aspect may increase the frequency of diseases or mechanical injuries, and may results in lower production levels, despite the high genetic potential in the herd. The aim of this study was to determine the impact of type of bedding material used in lying area on the level of somatic cell count (SCC) in milk. The analysis was carried out on the basis of reports from milk performance assessment from farms with different bedding material in lying area. In the first farm, straw bedding was used, in the second sand and in the third a solid liquid manure separation. All farms kept Polish Holstein-Friesian cows in a free-stall housing system. A relation was observed between the type of bedding material and SCC in milk. The lowest SCC was found in milk from cows kept on ere characterized by milk samples of cows, which were kept on solid liquid manure separation ($x = 136\ 000$ cells/ml). It can be concluded that cattle solid liquid manure separation, compared to straw and sand, has a positive effect on udder health. The use of a cattle manure separation by breeders may contribute to the quality of the product.

WELFARE AND DISEASE PREVENTION IN ORGANIC POULTRY

Maria Kucheruk, Roman Dymko

National University of Life and Environmental Sciences of Ukraine

ABSTRACT

Antibiotics in feeding birds are dangerous due to the penetration of their residues into food, and multiple drug resistance of microorganisms also occurs. Postbiotics may be an alternative to antibiotics for use in organic poultry farming to prevent bacterial diseases. The composition of the postbiotic includes natural components of microbiological synthesis identical to the metabolites of the symbiotic intestinal microflora. To study changes in the total number of saprophytic microorganisms in the air of poultry houses: 1) after aerosol treatment of the house, with the postbiotic "Bacteriosan", 2) in the control group - probiotic drugs were not used. The study was conducted on chickens at a certified organic poultry farm in the Zhytomyr region, Ukraine. Groups of experimental chickens were formed by 50 chickens in each group, which were kept under a free ranging. Chickens ate organic food. It was investigated the effect of postbiotic "Bacteriosan". Aerosol treatment was performed in the concentration 5 ml/m³ once in 3 days. Air samples were taken by sedimentation method with different exposure. Laboratory studies were carried out according to standard microbiological methods. Probiotic reduced total number of microorganisms in the air of experimental group. At the exposition of 2 min - by 35.56% there was less amount of saprophytic microflora in the air of the poultry house, at the exposition of 3 minutes - by 63.55%, compared to the control group. It is established that the investigated postbiotic in a certain dose has bactericidal properties against a wide range of microorganisms. It can be recommended for use in growing organic poultry for effect on reducing the total number of microorganisms in the air of poultry premises.

EGB 761 IMPROVED ANTI-HEAT-STRESS RESPONSES IN CHICKENS IN VIVO VIA REGULATION OF HSPS EXPRESSION AND DISTRIBUTION

Xiaohui Zhang, Endong Bao

Nanjing Agricultural University, Nanjing, China

ABSTRACT

This study was designed to investigate the protective effects of the Ginkgo Biloba extract, EGB 761, against heat-stress injury in chicken in vivo. Total 200 one-day-old hens were divided randomly into five groups: control (Con), heat-stress (HS), administration of 0.1%EGB and heat-stress (0.1%EGB+HS), administration of 0.3% EGB and heat-stress (0.3%EGB+HS) and administration of 0.6% EGB and heat-stress (0.6%EGB+HS). After administration of EGB 761 for 45 d, ten chickens in each group were exposed to heat-stress at 38±1°C for 3 h. The results showed that EGB 761 improved the production performance and physiological condition of chickens characterized by reduced feeding mortality compared to that in the Con group. EGB 761 attenuated the injury and lowered the histological scores of heart, liver, and duodenum in heat-stressed chickens. EGB 761 significantly reduced the transcription and translation levels of Hsp27, Hsp70 and Hsp90 genes in these organs, but induced nuclear translocation of Hsp27 and Hsp90 in hepatocytes and attenuated the nuclear Hsp90 level in intestinal epithelial cells. Pre-administration of EGB 761 protected chickens from heat-stress-induced damage by regulating the physiological condition and promoting functional transformation of Hsp27, Hsp70 and Hsp90 in all the tested organs as well as nuclear translocation of Hsp27 and Hsp90 in liver, which threw a light on anti-antibiotic adversity with traditional Chinese medicine.

THE GROWTH AND DEVELOPMENT OF ANIMALS OF THE KAZAKH WHITE-HEADED BREED OF DIFFERENT GENOTYPES BY THE GENES OF THE SOMATOTROPIC CASCADE

Ainura Taipova¹, Indira Beishova², Kuantar Alikhanov¹, Elena Belaya³, V. Ulyanov²

¹Kazakh National Agrarian University, Almaty, Kazakhstan

²Kostanay State University named after A. Baitursynov, Kostanay, Kazakhstan

³ Animal State Scientific Institution, Institute of Genetics and Cytology of the National Academy of Sciences of Belarus, Minsk, Belarus

SUMMARY

This article shows the results of a study of the association of dynamics of live weight and growth intensity in cattle of Kazakh white-headed breed with polymorphisms of somatotropic cascade genes. The following genes were selected for cattle genotyping: pituitary growth factor-1 (bPit-1), growth hormone (bGH), growth hormone receptor (bGHR) and insulin-like growth factor-1 (bIGF-1).

INTRODUCTION

At present, in many countries, ensuring the needs of the population with beef remains an urgent task. It is known that the efficiency of beef production is determined by the genotype of animals and their breed characteristics. The possibility of an intensive increase in the number of beef cattle can be achieved by increasing beef production only with the rational use of the improving effect of the genotype and the conversion of available in-breed resources [1, 2]. The aim of the work was to analyze the growth and development of Kazakh white-headed cattle depending on different genotypes of polymorphic genes bPit-1, bGH, bGHR, bIGF-1 [3].

MATERIALS AND METHODS

The object of the study was a group of cattle of the Kazakh white-headed breed (n = 296). Biological material, as well as zootechnical registration data, were provided by Zhanabek LLP, Kostanay region. Pure Link Genomic DNA Kits reagent kit was used to isolate DNA from blood samples. Genotyping was carried out according to four HORSES polymorphisms; bPit-1-HinFI, bGH-AluI, bGHR-Sspl and bIGF-1-SnaBI by PCR-RFLP (table 1).

Table 1 - Characterization of allelic variants of polymorphic genes of the somatotropic cascade

Polymorphism	Primer Sequence	Primer annealing temperature, ° C	Amplification length	Link
<i>bPit-1-HinFI</i>	F: 5'-aaaccatcatctccccttctt-3', R: 5'-aatgtacaatgtcttctgag-3'	56	451	[1]
<i>bGH-AluI</i>	F: 5'-ccgtgtctatgagaagc-3', R: 5'-gttcttgagcagcgct-3'	64	208	[2]
<i>bGHR-SspI</i>	F: 5'- aatactgggctagcagtgacaatat-3', R: 5'- acgttcactgggtgatga -3'	60	182	[3]
<i>bIGF-1-SnaBI</i>	F: 5'-attcaaagctgcctgcccc-3', R: 5'-acacgtatgaaaggaact-3'	64	249	[4]

Amplification products were separated by electrophoresis in 2% agarose gel in 1x TBE buffer, stained with ethidium bromide and photographed in transmitted ultraviolet light. Electrophoresis results were visualized on a QUANTUM Model 1100 SUPER transilluminator.

RESULTS AND DISCUSSION

An analysis of the growth and development data of the Kazakh white-headed breed established intergroup differences in live weight, absolute, average daily growth and feed conversion (table 2).

Table 2 - Characteristics of the Kazakh white-headed breed with different genotypes of *bIGF-1-SnaBI* polymorphism in absolute, average daily growth and feed conversion

Genotype	n	Average live weight, kg	Absolute gain, kg	The average daily gain, g	Feed conversion, units
Live weight of 9-12 months					
<i>bIGF-1-SnaBI^{AA}</i>	13	306,3	55,3	614	6,6
<i>bIGF-1-SnaBI^{AB}</i>	61	319,3	56,3	625	6,4
<i>bIGF-1-SnaBI^{BB}</i>	84	325,0	57,7	641	6,3
General sample	158	316,8	56,4	627	6,4
Live weight of 12-18 months					
<i>bIGF-1-SnaBI^{AA}</i>	13	352	45,7	254	7,3
<i>bIGF-1-SnaBI^{AB}</i>	61	367	47,7	265	7,0
<i>bIGF-1-SnaBI^{BB}</i>	84	371,6	46,6	259	7,2
General sample	158	363,5	46,6	259,3	7,1
Live weight from 18-24 months					
<i>bIGF-1-SnaBI^{AA}</i>	13	395	43	239	8,7
<i>bIGF-1-SnaBI^{AB}</i>	61	412	45	250	8,4
<i>bIGF-1-SnaBI^{BB}</i>	84	415,6	44	244	8,6
General sample	158	407,5	44	244	8,5

The data in table 2 indicate that animals with the *bIGF-1-SnaBIAA* genotype were characterized by the lowest gain in live weight. So, they differed from their peers with the *bIGF-1-SnaBIAB* and *bIGF-1-SnaBIBB* genotypes and the total sample in the period of 9-12 months by 10.5 - 13.0 and 18.7 kg, 12-18 months - 11.5 - 15.0 and 19.6 kg, 18-24 months - 12.5 - 17.0 and 20.6 kg.

Table 3 - Paired combinations of genotypes associated with live weight at the ages of 9-24 months in the main sample of livestock of the Kazakh white-headed breed, in absolute terms, average daily gain and feed conversion.

Diplotype	n	Average live weight, kg	Absolute gain, kg	The average daily gain, g	Feed conversion, units
Live weight of 9-12 months					
<i>bGH-AluI^{LL}-bGHR-Sspi^F</i>	23	320,6	58,6	651	6,2
<i>bGH-AluI^{LL}-bIGF-1-SnaBI^{AB}</i>	44	310,6	48,6	540	7,5
<i>bGH-AluI^{LL}-bIGF-1-SnaBI^{BB}</i>	53	310,3	58,3	648	6,2
<i>bGH-AluI^{LV}-bIGF-1-SnaBI^{AB}</i>	15	339,0	61,4	682	5,9
<i>bGH-AluI^{LV}-bIGF-1-SnaBI^{BB}</i>	31	336,6	60,0	667	6,1
<i>bGHR-Sspi^{FY}-bIGF-1-SnaBI^{AB}</i>	9	364,0	73,0	811	5,0
<i>bGHR-Sspi^{FY}-bIGF-1-SnaBI^{BB}</i>	16	367,3	72,0	800	5,1
<i>bPit-1-HinFI^{AB}-bGH-AluI^{LV}</i>	45	311,3	49,3	548	7,4
General sample	297	332,4	60,1	668	6,2
Live weight of 12-18 months					
<i>bGH-AluI^{LL}-bGHR-Sspi^F</i>	23	366,3	45,7	254	7,3
<i>bGH-AluI^{LL}-bIGF-1-SnaBI^{BB}</i>	53	350,0	39,7	220	8,4
<i>bGH-AluI^{LV}-bIGF-1-SnaBI^{AB}</i>	15	387,0	48,0	267	6,3
<i>bGH-AluI^{LV}-bIGF-1-SnaBI^{BB}</i>	31	386,6	50,0	278	6,6
<i>bGHR-Sspi^{FY}-bIGF-1-SnaBI^{AB}</i>	9	422,3	58,3	324	5,2
<i>bGHR-Sspi^{FY}-bIGF-1-SnaBI^{BB}</i>	16	424,6	57,3	318	5,3
<i>bPit-1-HinFI^{AB}-bGH-AluI^{LV}</i>	45	352,3	41,0	227	8,1

General sample	297	384,2	48,5	269	6,7
Live weight from 18-24 months					
<i>bGH-AluI^{LL}-bIGF-1-SnaBI^{AA}</i>	9	374,0	25,7	143	16,0
<i>bGH-AluI^{LL}-bIGF-1-SnaBI^{BB}</i>	41	376,3	26,3	146	15,6
<i>bGH-AluI^{LV}-bIGF-1-SnaBI^{AB}</i>	13	457,3	70,3	391	5,8
<i>bGH-AluI^{LV}-bIGF-1-SnaBI^{BB}</i>	26	452,0	65,4	363	6,3
<i>bPit-1-HinFI^{AB}-bGH-AluI^{LV}</i>	43	389,6	37,3	207	11,0
General sample	257	409,8	45,0	250	10,9

Analysis of the data obtained in Table 3 showed that in terms of live weight, absolute, average daily gain and feed conversion, the advantage was on the side of animals with paired combinations of the *bGH-AluI^{LV}-bIGF-1-SnaBI^{AB}*, *bGH-AluI^{LV}-bIGF-1-SnaBI^{BB}*, *bGHR*- genotypes *SspIFY-bIGF-1-SnaBI^{AB}*, *bGHR-SspIFY-bIGF-1-SnaBI^{BB}*. So, the difference from the total sample of animals in all experimental groups increased with age and amounted to 6.6 in the period of 9-12 months; 4.2; 31.6 and 34.9 kg, in the period of 12-18 months - 2.8; 2.4; 38.1 and 40.4 kg.

CONCLUSION

Based on the data obtained, it can be concluded that the most undesirable genotype in terms of average daily and absolute increase, as well as feed conversion is the *bIGF-1-SnaBI^{AA}* genotype.

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EPIZOOTIC SITUATION IN THE EXPERIMENTAL FARM "ATAMEKEN" TASKALA DISTRICT OF THE WEST KAZAKHSTAN REGION

D. Smagulov¹, Bakhyt Barakhov², Yerkyebulan Alpysbay²

¹ West Kazakhstan Agrarian and Technical University named after Zhangir Khan, Uralsk, Kazakhstan

² Kazakh National Agrarian University, Almaty, Kazakhstan

SUMMARY

This article presents the results of a study of epizootic situations for infectious diseases of sheep in the northern part of the Western region of Kazakhstan. Based on the above statistics, it turned out that, in the context of radical changes in the modern management system, special attention should be paid to the prevention and control of infectious animal diseases. This year, about 17 outbreaks of especially dangerous infectious diseases of farm animals (1 for emphysematous carbuncle; 13 for rabies, 2 for pasteurellosis and 1 for bradzot) were registered in the Taskala region. Last year, 1 399 000 sheep (101%) were examined for brucellosis, and 0.08% of infection was detected, i.e. 1,128 goals. Of the contagious diseases of sheep, rabies and bradzot were recorded in 2018. Of all the registered foci, personal homesteads of the owners appeared, i.e. single foci. For other especially dangerous diseases, the epizootic state in the region is stable.

The main goal of the development of the livestock industry in Kazakhstan is both to fully meet the domestic needs of the market for agricultural products, and to realize the export potential. In this aspect, the leading role in solving the problem is played by the intensive development of sheep husbandry, which meets the needs of the country's population in specific types of raw materials and food products.

Today in Kazakhstan, 18 domestic sheep breeds are bred, bred by folk selection, as well as by breeders who are specialized in almost all areas of sheep breeding and are zoned in all the climatic zones of our country.

With government support for the sheep husbandry industry, the number of sheep throughout the country is dynamically

increasing, reaching 22,471.9 thousand heads in mid-2019. This is facilitated by the features of agricultural land in the country, where out of the total area (222.1 million ha) more than 84%, i.e. 187.2 million hectares of land are in the pasture fund. At the same time, almost 70% of the area is located on semi-desert and dry-steppe zones, where the origin, formation and development of modern domestic sheep farming took place.

The western region of Kazakhstan has great potential for both increasing the number of sheep and for increasing all types of products. The total land fund of the region is 15 134 000. ha, of which 13 907 300 is occupied by farmland. On its territory there are significant arrays of natural pastures with an area of over 10 million hectares, which can be rationally used when grazing sheep without significant material costs.

The number of sheep in the West Kazakhstan region is 1,390,615 heads, of which only 54.4% are concentrated in more organized subjects of various forms of ownership - 44,164 in agricultural holdings and 712,133 in peasant farms, and the rest are kept in private farmsteads with a population of 634,318 heads.

This fact confirms that the pedigree resources and sheep breeding opportunities currently available are not being fully utilized. In this regard, the rational use of the genetic potential of sheep breeds and the creation on this basis of promising populations with high productivity and consolidated heredity, combined with valuable biological properties, are a unique opportunity, which, of course, must be used to quickly increase the profitability of this industry.

Infectious diseases, possessing an extremely high contagiousness, tend to quickly and widely spread, seriously hinder the preservation and increase in the number of livestock, increase productivity and improve the quality of the products obtained, the introduction of modern methods of development of the industry.

Ensuring the safety of livestock food products directly depends on the veterinary and sanitary welfare of animals.

According to international requirements and standards, the veterinary system must ensure food safety along the entire chain of its life cycle: from reproduction, production, slaughter, processing, storage, transportation, including import / export and before use, on the principle of "from the farm to the table."

For this, it is necessary to use international experience, modern technology and methodology that will ensure epizootic well-being, veterinary-sanitary and food safety of the country.

Over the past ten years, the number of sheep in the world has decreased by 10-15%, while wool production has decreased to 40.7%, but mutton production has increased by 64.2%. If earlier from wool in the overall economic effect they received almost 90% of the profit, and from lamb only 10%, now the opposite trend is in effect.

Kazakhstan's accession to the WTO necessitates a reorientation of domestic sheep husbandry to the production of mutton, especially lamb, which is in high demand both in the domestic and foreign markets.

The economic importance of the sheep industry in the economy is due to its size. A sufficient number of sheep makes it possible to rationally use feed resources, apply optimal technological schemes for the production and marketing of marketable products, and reduce its cost. In this regard, during the restoration of sheep breeding, the main attention should be paid to the creation of sheep-breeding farms of sufficient numbers to ensure the production of marketable products and to carry out the necessary training for their implementation.

In connection with the formation of a multistructure economy, the creation of peasant, farm, and cooperative farms, and a reduction in the number of livestock, the requirements for sheep breeds are changing accordingly. In recent years, in connection with the transition to market relations in sheep breeding, significant changes have occurred. Difficulties with the sale of products, low purchase prices for it, as well as other objective and subjective factors led to a significant reduction in the number of livestock and a decrease in animal productivity. The experts see a way out of the situation in improving the industry's efficiency by restoring the social infrastructure of the village, increasing the material interest of workers, raising the level of breeding and breeding, timely conducting the necessary veterinary measures, introducing modern technologies and scientific achievements, manufacturing and procuring high-quality feed [1].

Despite the significant successes achieved in the fight against the most common and economically significant infectious diseases of sheep, including and with helminthiases, the latter still cause significant damage to the industry. These diseases in sheep farms of the West Kazakhstan region are widespread and represent an important economic and economic problem.

Regional studies of the course of the epizootic process for individual infectious diseases make it possible to study its features in a specific territory, in specific natural and economic conditions, followed by the development of preventive and anti-epizootic measures that take into account the epizootic features of natural focal and other epizootically dangerous diseases [2].

According to veterinary reporting and a study by employees of the Kazakh Scientific Research Veterinary Institute, over 60 infectious diseases are recorded, including 29 - diseases of cattle (cattle), 26 - sheep and goats, 13 - horses, 6 - camels, 20 - pigs and 10 - birds. Of these, 18 infectious diseases are zoonoses common to animals and humans. For sheep diseases, the largest number of diseased animals was found for necrobacillosis - 77 901, chlamydia - 48 248, infectious epididymitis - 47 216, smallpox - 43 748 and Aujeszky's disease - 28 488 goals.

One of the most important tasks at present is the development of measures aimed at restoring the number of sheep and obtaining high-quality sheep products. The fulfillment of this task is closely related to the improvement and prevention of sheep from infectious diseases, the fight against which remains relevant [3].

According to the Veterinary Administration in 2016, out of the 1,782,430 heads of small cattle examined, 3,090 heads of animals with brucellosis were detected, the infection rate was 0.2%, a 2-fold decrease, because in 2015, the infection was at the level of 0.4%.

In 2017, 5 foci of especially dangerous diseases of farm animals were recorded:

- 2 foci - pasteurellosis (2 heads of cattle);
- 2 foci - emkar (4 heads of cattle);
- 1 outbreak - bradzot (1 head of MPC). Also, brucellosis is diagnosed annually, for that year the infection rate was 0.17%. From patients with brucellosis 2 291 sheep;
- 1 997 heads were handed over to meat processing enterprises;
- 153 goals are being prepared for shipment to meat processing enterprises;

- 141 goals are other outputs (case, slaughter for your own needs).

In sheep, 4 dysfunctional foci for brucellosis were registered, of which 1 outbreak was healed.

Over the 9 months of this year, 17 outbreaks were recorded for especially dangerous infectious diseases of farm animals (1 for emphysema pulmonary carbuncle; 13 for rabies, 2 for pasteurellosis and 1 for bradzot). For this period of 2017, 7 outbreaks were recorded.

In 2018, 1 399 000 heads (101%) were examined for sheep brucellosis, 1,128 were detected, infection - 0.08% (2017 - 0.16%). Of the infectious diseases of sheep in 2018, rabies was recorded (v. Kosoba, Syrym district), as well as bradzot (v. Akpater, Kaztalovsky district). Of all the registered foci of infectious diseases of sheep in the WKO, personal farmsteads of the owners appeared, i.e. single foci. For other especially dangerous diseases, the epizootic state in the region is stable [4].

As the analysis of the literature showed, targeted studies to study the epizootic situation on the infectious pathologies of sheep on a regional scale were not fully conducted. There is no such information as a sanitary-hygienic assessment of the soil, feed, water and pastures of the region. There is also insufficient information on the breadth and dynamics of the spread of infectious diseases of sheep throughout the region and in particular in various climatic zones, which makes it difficult to organize and conduct veterinary and sanitary measures in modern economic conditions.

According to official statistics, about 70% of organs and carcasses affected by helminths are partially and completely rejected. In this regard, there is now an urgent need to identify new approaches to the control and prevention of infectious diseases of sheep, based on improving primarily the methods of veterinary and sanitary measures.

Scientific support for the development of sheep farming is impossible to imagine without the veterinary well-being of its industries. The creation of appropriate detention conditions that meet zoohygienic and veterinary-sanitary requirements is one of the main conditions for the prevention of animal diseases. Thus, increased production, improved sanitary quality, livestock production, and increased animal productivity will be the basis for ensuring the country's food security.

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ANIMAL HEALTH, WELFARE AND BEHAVIOUR EQUINE SESSION

KEYNOTE LECTURE

THE ROLE OF EQUINE WELFARE IN IMPROVING BIOSECURITY, THE ENVIRONMENT AND FOOD QUALITY

Roly Owers MRCVS

World Horse Welfare, Anne Colvin House, Snetterton, NR16 2LR UK

Equidae are possibly the most versatile animal in society, used for sport, leisure, companionship, transport, draught power, tourism and as a source of milk and meat – with their roles often changing throughout their lives. In part because of their close partnership with people globally, in cities, suburban and rural areas, equine health and welfare are inextricably linked to human health and welfare. Those who are involved with horses have a responsibility to ensure not only are their horses' needs met, but they are provided with positive experiences and have a life worth living as outlined by the five domains of animal welfare. Those who breed horses have a responsibility to consider the future of every foal they produce, ensuring they are fit for their intended purpose and as far as possible that they are given a good life. Horses have been bred for sport for hundreds if not thousands of years, but we should be mindful that breeding for traits such as lightness or speed can be at the expense of their long-term health. Unscrupulous or indiscriminate breeding of poorly conformed horses has created health and welfare problems in some countries, where certain types of horses have become of low financial value resulting in them being poorly cared for, exported under the radar without health certification or at an increased risk of contracting or spreading disease. Whether horses are bred for sport, leisure, work, food or milk, they can become vulnerable when they switch roles, e.g. retiring from a career in sport or becoming unwanted, resulting in them being sold, abandoned or sent for slaughter. The consumption of horse meat is a personal and cultural choice, but it is vital that the horse's welfare is protected up to and including the time of death. Our charity does not oppose the horse meat trade but has long campaigned for an end to the long-distance transport of horses for slaughter in Europe, working constructively with the European Commission, European Parliament and many other stakeholders to improve transport practices and shorten journey times. Evidence shows that horse health and welfare deteriorates on long journeys, and this can be exacerbated by poor fitness and conditions. Horses often arrive at rest stops stressed and exhausted, sometimes bruised and injured, which can result in poor quality meat. World Horse Welfare continues to work globally with horsemeat breeders, slaughterhouses and the veterinary community to improve the welfare of these horses and seek solutions that will both protect equine health and welfare and provide a quality product. If we all take responsibility for the health and welfare of horses – however they are used throughout their lives – this will strengthen human health and welfare. Vets, breeders and those who keep horses all have a part to play.

ORAL PRESENTATIONS

ISOLATION OF WEST NILE VIRUS SPECIFIC MONOCLONAL ANTIBODIES USING ANTIBODY PHAGE DISPLAY

Shahbaz Bashir¹, Marlies Reusen¹, Aline Visser², Annelies Bogaerts², Jan Paeshuyse¹

¹Laboratory of Host Pathogen Interaction in Livestock, Division of Animal and Human Health Engineering, Department of Biosystems, Faculty of Bioscience Engineering, Kasteelpark Arenberg 30, 3001 Leuven, KU Leuven University, Belgium

²Regenesys BVBA, Belgium

Correspondence: jan.paeshuyse@kuleuven.be

ABSTRACT

West Nile Virus (WNV), a Flavivirus belonging to family Flaviviridae, is a dangerous vector-borne virus capable of breaching the blood-brain barrier in horses and inflicting damaging impact on the brain and the spinal cord. WNV infected horses can develop encephalomyelitis with severe neurological and clinical manifestation in the form of ataxia, frequent twitching of muscles, hind quarter paralysis, recumbence and ultimately death. Passive immunization with antibodies emerges as a promising strategy in countering this disease in humans. However in horses, there is a lack of therapeutic and prophylactic antibodies. The purpose of this study was to construct an equine antibody library, from which monoclonal antibody against WNV precursor membrane (prM) protein could be isolated post vaccination. Following WNV vaccination in horses, blood was collected for isolation of peripheral blood mononuclear cells (PBMCs). Following RNA extraction from PBMCs, cDNA was synthesized through reverse transcription for the amplification of variable region of heavy (VH) and light (VL). After the synthesis of scFv through SOE-PCR, the fragment was cloned in the recombinant antibody expression vector pComb3xSS and packaged with helper phage VCS-M13. This antibody phage display library serve as potential source for yielding monoclonal antibody against prM protein of WNV.

INTRODUCTION

West Nile virus (WNV) is a mosquito-borne Flavivirus in the Flaviviridae family belonging to the Japanese encephalitis sero-complex group, which consists of a number of viruses responsible for causing encephalitis in animals and humans worldwide [1]. In horses, It causes a neurologic disease characterized by clinical signs ranging from incoordination to recumbence, depression, muscle twitch, ataxia, convulsions, head pressing and paralysis [5]. WNV is an enveloped icosahedral viral particle carrying a ~11Kb long positive sense, single stranded RNA. The genome of WNV comprises of a single open reading frame flanked by 5' and 3' non-coding regions (NCRs) and codes for a long polyprotein precursor, which is processed and cleaved into structural (C, prM and E) and non-structural (NS1, NS2A, NS2B, NS3, NS4A, NS4B and NS5) proteins by host and viral proteases. E, prM, NS1, NS3 and NS possess antigenic properties and emerges as a suitable drug target. Pre-M/membrane (prM) protein is hypothesized to protect immature virion and make a heterodimer with E protein, which is found embedded in the viral lipid bilayer [3], present itself an ideal drug target.

Antibody phage display technology has revolutionized the field of immunovirology with its application in viral disease diagnostics and antiviral therapy. This robust and versatile technology allows the expression of an antibody fused to a phage coat protein on the surface of a filamentous phage. The DNA coding for the antibody is packaged within the phage, linking the phenotype to genotype. This technology has the potential of generation high affinity monoclonal antibodies against wide variety of antigens [4]. The purpose of this study is to construct and explore the potential of antibody phage display in generating equine monoclonal antibodies against prM protein WNV.

MATERIAL AND METHODS

Experimental animals comprised of three horses, a gelding (18 years old), two mare (6 and 16 years old), was setup at TRANSfarm KU Leuven after receiving the permission of KU Leuven ethical committee for animal experiments KU Leuven (Project # P141/2017). All three horses were vaccinated against WNV with booster dose being administered 2 weeks following the first dose. Blood sampling was performed before and 2 weeks after the first vaccination dose and then again 2 weeks after booster dose.

Isolation of peripheral blood mononuclear cells (PBMCs) was performed through density gradient centrifugation by using SepMates (Stemcell, Vancouver, Canada) tubes alongside Histopaque-1077 (Sigma). After washing PBMCs with 2% heat-inactivated horse serum (his, Hyclone) and 1mM EDTA, centrifugation at 1000g for 5 minutes yielded PBMCs in the form of pellet. RNA was extracted from PBMCs by using commercial RNA isolation kit (Roche).

cDNA was synthesized from 1 µg RNA by using transcript first strand cDNA kit (Roche) alongside both oligo-(dt)18 and random hexamer primers in MyCycler (BioRad, Hercules, California). Antibody variable domain genes (VH, Vλ and Vκ) amplification was carried out with the primers (sequence upon request) targeting the conserved regions alongside Platinum Taq-polymerase high fidelity (Invitrogen) enzyme. The PCR reaction was conducted in the T3000 Biometra thermocycler (Biometra) under following conditions; 94 °C for 2 min, 30 cycles of 94 °C for 15s, 57 °C for 30s, 65 °C for 30s for VH, 68 °C for 45s for Vλ and Vκ and extension at 68 °C for 45s with final extension at 68 °C for 5 min. The amplified VH, Vλ and Vκ fragments were gel purified on 2% gel.

The primers (sequence upon request) used to amplify the variable domains of antibody heavy chain, and light chain (λ, κ) contained the overhangs or tailed ends to be used in the splicing by overlap extension PCR (SOE-PCR) for connecting the variable regions of heavy and light chain. The tail of the primers also contains the *Sfi*I restriction sites serving as a site for attachment of outer and inner primers in the SOE-PCR for the synthesis of scFv. In SOE-PCR, the first 10 cycles will be conducted without the inner and outer primers with the following reaction conditions: Initiation

at 94 °C followed by 10 cycles of 94 °C for 15s, 50 °C 30 s and 68 °C for 45s. After the addition of addition of primers, PCR reaction of 35 cycles was conducted at following conditions: 94 °C for 15s, 62 °C for 30s, 68 °C for 1.30 min and final extension at 68 °C for 5 min.

Pcomb3xss (addgene # 63890) and scFv (VH-V λ and VH-V κ) were digested by using *sfi*I enzyme (NEB #R0123S) according to the manufacturer's instructions. After the digestion, digested Pcomb3xss vector and scFv were gel purified for ligation. The ligation of was performed by using T4 DNA ligase (Promega) with overnight incubation at 16 °C overnight. Next Morning after the inactivation of the ligation reaction, the ligation mix was transformed into XL1-Blue bacteria via electroporation. After transformation, the transformed mix was incubated in a shaker at 210 rpm at 37 °C for an hour. After incubation, the mixture was plated onto the large square LB agar plates having ampicillin 100 μ g/ml and incubated overnight at 37 °C. Next morning, clear bacterial colonies could be seen onto the plate. Ligation was confirmed through colony PCR and sequencing. The LB agar plates containing lawn of colonies were scraped and store in 50%glycerol.

RESULTS AND DISCUSSION

The purpose of this study is to construct a platform, which could serve as source for isolation of monoclonal antibody against prM protein of WNV. The strategies to construct antibody libraries through specific primers already exists for mouse, rabbit, chicken, camels and shark, but there is a knowledge gap for generation of antibody libraries in the form of scFv for horses [2] . This study reports the construction of equine antibody library through specific through specially designed primers to amplify variable domain of heavy and light chains and linking them through a long linker to form single chain variable fragment. The advantage of constructing this immunized antibody library is isolate specific monoclonal antibody against prM of WNV. Following RNA extraction and cDNA synthesis, equine VH, V λ and V κ were amplified successfully through PCR. The amplified VH (400bp), V λ (739bp) and V κ (950bp) fragments were resolved on 2% gel (Fig. 1,2,3). After gel purification, scFv was synthesized by joining VH with V λ and VH with V κ through Splicing by overlap extension PCR (SOE-PCR) and resolved on 2 %gel (Fig. 4). Newly synthesized scFv and pComb3xss vector were subjected through restriction digestion through *sfi*I enzyme. Ligation and transformation yielded an antibody library of the size of 108. Generation of this size library in equines is comparable to the previously conducted studies in other species [6, 7, 8]. Further exploration of this antibody repertoire is necessary to isolate monoclonal antibody against prM protein of WNV.

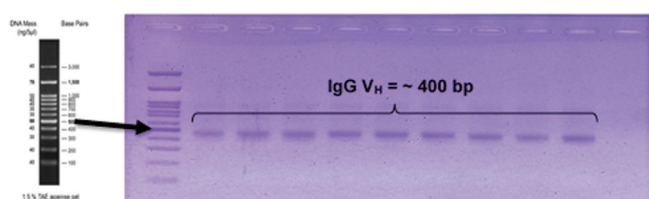


Fig.1. PCR amplification of variable domain of IgG heavy chain

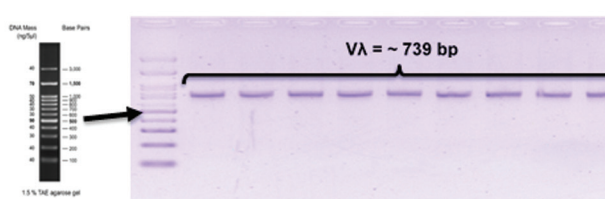


Fig.2. PCR amplification of variable domain of Lambda light chain

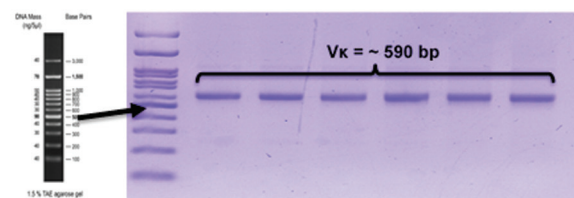


Fig.3. PCR amplification of variable domain of kappa light chain

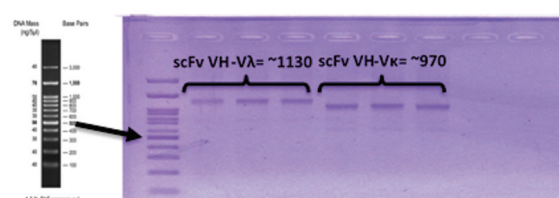


Fig.4. synthesis of scFv through SOE-PCR

CONCLUSION

we have successfully designed a series of primers to amplify the equine antibody repertoire and construct an antibody phage display library.

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CLINICAL ASPECT OF ENVIRONMENTAL CHALLENGE IN SEVERE EQUINE ASTHMA SYNDROME

Malwina Słowikowska, Natalia Siwińska, Agnieszka Żak, Artur Niedźwiedz Department of Internal Diseases with Clinic for Horses, Dogs and Cats, Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences, Wrocław, Poland

INTRODUCTION

Equine asthma syndrome is cost consuming equine respiratory tract disease. According to the patient history, clinical examination and laboratory tests there are two known forms of equine asthma: severe equine asthma and light/moderate equine asthma. The severe equine asthma, formerly called recurrent airway obstruction, is a non-infectious inflammatory disease of the lower airways in horses, affects equine adult patients over 15yo.

MATERIAL AND METHODS

The study was performed on 12 horses. The animals were divided into two groups: the control group and asthma patients. The horses were kept in a dusty environment for seven days and were then moved to an asthma-friendly environment for twenty-one days. During the environmental challenge, animals were kept mostly at the stable on the dusty straw bedding and fed crushed dusty oat and low quality dry dusty hay. During the asthma-friendly environment time horses were kept at the good quality pasture, with wood shavings and wet oat and good quality wet hay. Clinical examination was performed at baseline and on the 1st, 2nd, 3rd, 7th, 14th and 30th day.

RESULTS AND DISCUSSION

Regarding the respiratory rate at 6 of 7 time points, there was a significant difference between groups ($p > 0,05$). The higher values were observed in the asthma group. On the 7th day of the experiment, on the last day of the environmental challenge, there was no statistically significant difference between groups ($p < 0,05$). It was interesting that on the last day of environmental challenge there was no statistical difference regarding respiratory rate. The temperature at the time points did not show any statistically significant differences. This is consistent with the opinion of non-infectious asthma reasons. The heart rate analysis showed differences at T0 and T2 time point with higher numbers at the asthma group.

CONCLUSIONS

Due to some interesting tendencies regarding respiratory rate during an environmental challenge, this study probably needs to be conducted on a larger population.

The presence of podocin in urine in healthy horses and horses with kidney dysfunction – a preliminary study.

Natalia Siwinska¹, Agnieszka Zak¹, Malwina Slowikowska¹, Remigiusz Bachor², Zbigniew Szewczuk², Artur Niedzwiedz¹, Urszula Paslowska¹

¹Department of Internal Medicine and Clinic of Diseases of Horses, Dogs and Cats, Faculty of Veterinary Medicine, Wrocław University of Environmental and Life Sciences;

²Research Group of Chemistry and Stereochemistry of Peptides and Proteins

Background: Podocytes are highly specialized glomerular epithelial cells that are involved in selective filtration and the primary formation of urine. Podocin is excreted in the urine as a result of podocyte damage. This protein has been found in human patients with kidney injury. Currently, there is a lack of sensitive biomarkers of early kidney dysfunction in horses.

Objectives: The aim of this study was to assess the presence of podocin in urine sediments of healthy horses and horses with kidney dysfunction.

Methods: Six healthy horses and six horses with kidney dysfunction were included in the study based on: the history, the physical examination, a blood analysis, urinalysis and an ultrasound examination of the urinary tract. The obtained urine sediment was prepared in order to carry out further analyses aimed at detecting selected fragments of podocin peptides. The analysis of the urine samples was carried out with liquid chromatograph mass spectrometer Shimadzu LCMS-8050 using the ESI-LC-MRM method.

Results: In the tested urine sediment samples derived from horses with kidney dysfunction, peaks characterized by selected podocin fragmentation peptide ions were observed in the spectra. No signals were found in the case of urine from healthy horses.

Main Limitations: This test is a qualitative, non-quantitative study. Therefore, the correlation between the amount of podocin and the intensity of the disease process was not assessed.

Conclusions: The presence of selected synthesized peptides in equine urine samples, such as podocin, may be found in horses with kidney dysfunction. Lack of podocin in samples from healthy horses may indicate its absence in the physiological equine urine. The obtained results indicate that the detection of podocin in urine may be a good indicator of kidney dysfunction.

CORRELATION BETWEEN METAL SHOES AND HEEL CONTRACTION.

Magdalena Senderska-Płonowska², Adrianna Prochownik², Tadeusz Stefaniak¹

¹Wrocław University of Environmental and Life Sciences, Faculty of Veterinary Medicine, Department of Immunology, Pathophysiology and Veterinary Preventive Medicine, Wrocław, Poland

²Private Yard, Ashendon, UK

Objectives: Contracted heels are correlated with lameness (Turner, 2006) and changes towards navicular syndrome (Pool, 1989). Many veterinarians and farriers claim that shoeing leads to heel contraction (Ramey 2011, Cook, 2008, Teskey, 2005), however the statement is not fully accepted nor proven.

METHODS

Length and width of frogs were measured in 97 adult, warmblood horses.

47 horses have never been shod (group A) and 50 horses were being shod regularly for a minimum of 1 year, including 36 horses being shod on front feet only (group B) and 14 horses being shod on both front and hind feet (group C). Contracted heels were identified if length to width ratio was less than 0,67.

Results: Contracted heels were more noticeable in front hooves of group B (77,5% hooves were contracted) than of group A (47,8% hooves were contracted). The difference between groups was also found in hind hooves. Although the hind hooves were barefoot in both groups it still showed a remarkable contrast (57,5% vs 26%). The differences were statistically important ($p < 0.01$). Frog's length did not vary between groups. Several factors were considered into hoof contraction such as: age, breed, type of work and movement.

Conclusion: Despite the presence of significant differences between group A and B we cannot confirm the influence of metal shoes on heel contraction. It is highly presumable that another factors affect frog's width more than metal shoes. Some of these factors were seen more often in group B and C (performance horses, restricted movement) than in group A.

At the same time we cannot eliminate the biomechanics factor of front hoof affecting the rear hoof.

ACCELEROMETER-BASED LAMENESS DETECTION OF HORSES

Wanda Górnjak, Maria Soroko, Mariusz Korczyński

Wroclaw University of Environmental and Life Sciences

ABSTRACT

Lameness of horses is the most common reason for a veterinarian intervention and also the most expensive health problem in this field. Currently, most veterinarians rely on a subjective visual examination of a horse's gait to detect motion asymmetry. However, the subjective assessment of lameness has disadvantages in the form of limited perception of the human eye, the effect of bias and experience in assessing the movement of horses. With the development of technology, it is possible to analyse motion more closely together with the simultaneous recording of accompanying phenomena. The study included ten clinically healthy sports horses with no lameness detected by the empiric method. The gait was evaluated based on parameters such as acceleration of a hoof hitting against the pavement, step length, leg trajectory in three planes. The horses were led in the hand at walk and trot along a straight line until a sufficient number of steps was obtained. The data analysis revealed the irregularities of a gait of two horses which can be interpreted as a lameness. The obtained data were characterised by the chaotic nature of the acceleration peaks, the lack of symmetry and delay on the acceleration graphs of individual limbs. This lameness was not visible during the empirical examination of horses. Hence, the injury was not severe enough to manifest itself in the form of lameness under the test conditions. The result is the detection of the gait irregularities, which in time can escalate to lameness requiring extensive treatment, and in the case of sports horses exclusion from the races. The algorithm presented in this paper can be used for preventive tests and help to implement much cheaper treatment of the horse.

EVALUATION OF TEMPERATURE RELATED TO PRESSURE DISTRIBUTION IN SADDLES USING INFRARED THERMOGRAPHY (IRT)

Maria Soroko¹, Daniel Zaborski², Krzysztof Dudek³, Kelly Yarnell⁴, Wanda Górnjak⁵, Ricardo Vardasca⁶

1 Department of Horse Breeding and Equestrian Studies, Institute of Animal Breeding, Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland.

2 Department of Ruminants Science, West Pomeranian University of Technology, Szczecin, Poland.

3 Faculty of Mechanical Engineering, Wroclaw University of Technology, Wroclaw, Poland.

4 School of Animal, Rural and Environmental Sciences, Nottingham Trent University, Southwell, NG25 0QF Nottinghamshire, UK.

5 Department of Environmental Hygiene and Animal Welfare, Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland.

6 LABIOMEIP, INEGI-LAETA, Faculdade de Engenharia, Universidade do Porto, Porto, Portugal.

The impact of a load (rider and saddle mass) on saddle pressure distribution was evaluated using infrared thermography. Eighteen racehorses were ridden by four riders (1-4) in four different racing saddles. Thermographic images of the saddle panels were captured immediately after untacking the horse at each of the six thermographic examinations. On each image, six regions of interest (ROIs) were marked on the saddle panels. The mean temperature for each ROI was calculated. To evaluate the influence of load on saddle fit, 4 indicators were taken: ΔT_{max} (difference between the mean temperature of the warmest and coolest ROI); standard deviation of the mean temperature of the six ROIs; right/left; bridging/rocking and front/back panel pressure indicator. Incorrect saddle distribution was found in 25 measurements (23.1%) with ΔT_{max} greater than 2°C. The relationships between rider and saddle fit as well as saddle fit and horse were significant ($p < 0.001$). An average ΔT_{max} in rider 1 was significantly higher than in other riders ($p < 0.001$). The right/left panel pressure distribution differed significantly from the optimal value for riders 1 and 2; while the bridging/rocking panel pressure differed significantly from this value for riders 1, 3 and 4 ($p < 0.05$). Front saddle pressure distribution was most frequent in rider 1 (41.5%), whereas back saddle pressure in rider 3 (85.7%). The measurement of the mean temperature of saddle panels after training can be helpful in assessing the influence of a rider and saddle mass upon saddle fit. Temperature indicators during this study showed that riding skills may affect saddle fit.

POSTER PRESENTATIONS

EVALUATION OF FLUNIXIN MEGLUMINE EFFECT IN PAIN MANAGEMENT AFTER CASTRATION IN HORSES

Martyna Stakonaite¹, Zoja Mikniene¹, Zulkija Abilova²

¹Lithuanian University of Health Sciences (LSMU),

Faculty of Veterinary Medicine, Lithuania;

²Kostanay State University named after A. Baitursynov, Kazakhstan Republic;

ABSTRACT

The aim was to compare the effectiveness of a single pre- or postoperative Flunixin meglumine (FM) injection versus two injections preceding and the following orchiectomy in horses. 15 stallions presented for routine castration were divided into three groups. Group I received FM i.v. one hour prior to premedication. Group II was injected one hour after the operation. Group III received both doses. Their average behavior, facial expressions, blood cortisol levels were compared before, one hour, 6 hours after the operation and on the next morning. Pain scale showed that before the operation average scores varied insignificantly. The difference was observed on 6th hour after the operation as Group III had a lower score. Measurements of cortisol levels in blood serum showed on the first-hour Group I and III had lower levels (118.36 mmol/l and 116.48 mmol/l) than Group II – 159.69 mmol/l. On the 6th-hour cortisol levels of Group I increase significantly to 173.52 mmol/l and went decrease in Group II to 132.93 mmol/l. Even lower cortisol levels were evident in Group III (113.87 mmol/l). The next morning Groups I and II did not differ significantly from one another (144.4 mmol/l and 165.27 mmol/l), although Group III still had low levels of cortisol (109.07 mmol/l). FM injected twice (Group III) was effective during the whole first day of the postoperative period.

INTRODUCTION

Correct pain recognition and management is nowadays of growing importance in equine medicine. Currently there are many equine pain evaluation techniques. For objective judgement measurable parameters such as heart and respiratory rate, temperature and peristalsis as well as blood parameters are verified [3]. It is known that heavy pain results in elevation of the heart rhythm, serum cortisol and reduction in locomotion [5]. However these parameters are influenced by many factors other than pain, hence many of the pain assessment scales focus additionally on changes of facial expression, behaviour, stance or movement in evaluating various types of pain [3]. The horse as a prey animal is prone to hide signs of sickness. That is why indications of pain might be very subtle and hard to notice in medium grade pain, which is evaluated in assessing animals' wellbeing and effectiveness of analgesia after a surgical operation [2]. Therefore in this study pain evaluation included behaviour and facial expression as well as measuring blood serum cortisol levels after various types of Flunixin meglumine (FM) application. The aim of this study was to compare the effectiveness of a single pre- or postoperative Flunixin meglumine (FM) injection versus two injections preceding and following an orchiectomy in horses.

MATERIAL AND METHODS

Fifteen stallions' different breeds, coat colour and aged between 2 and 4 years presented to LSMU Large Animal Clinic for a routine castration were divided into three groups. Group I (n = 6) received a single perioperative injection of Flunixin meglumine (1.1 mg/kg i.v, Finadyne 5 %, Nyderland) one hour prior to premedication. Group II (n = 5) were injected of Flunixin meglumine (1.1 mg/kg i.v, Finadyne 5 %, Nyderland) one hour after they stood up after the operation. Group III (n = 4) received both doses. All medication were administered by veterinary assistant who was controlled pain and measured pain scale score. All the other procedures and medications, including surgery and anaesthesia were performed by the same surgeon team using equal anaesthesia protocol and castration technique. Horses underwent routine surgery castration with closed technique through a scrotal approach without primary closure of the wound in dorsal recumbency under general anaesthesia [6]. All castrated horses also received antibiotic treatment for free days starting at the morning before surgery (Pen-Strep, United Kingdom), 8 mg penicillin and 10 mg dihydrostreptomycin /kg i.m. every 24 hour.

The weight of each horse was estimated with a weight tape in order for the correct drug doses to be administered. The anaesthesia protocol was the same for all the patients: pre-medication with Xylazine hydrochloride (1.1 mg/kg i.v., Xyla 2 %, Estonia), induction with Diazepam (0.05 mg/kg i.v., Diazepam-ratiopharm, 10mg/2ml injection, Slovenia) and Ketamine (2.2 mg/kg, Ketamin 10%, Germany,) intravenously via a jugular catheter. After that horses were intubated, they were hoisted into a surgical table and immediately attached to a large animal circle system induced inhalation anaesthesia with Sevoflurane (Sevorane, United Kingdom). 10–15 min after surgery, which horses were moved to a recovery box; then, as soon as they were able to walk (20–60 minutes after anaesthesia), returned to their home box. Recovery from anaesthesia is the time that a horse need to stand up. No intraoperative complications were reported and all horses recovered from anaesthesia fully and uneventfully prior to the first data collection post-procedure. All surgeries/general anaesthesia were carried out between 9 and 11 am. Patients' average behaviour, facial expressions, blood cortisol levels were compared before, one hour, 6 hours after the operation and on the next morning (24 hours after first injection). Behavioural ques observed included activity, pose, head position, attention to the painful area, interaction with the observer, response to feed and pain related actions such as pawing. Every category received 0 – 4 points, depending on intensity of the behaviour [1, 2]. Facial expression was filmed and evaluated later in detail according to Glerup [2] and Dalla Costa et al. [1] developed equine facial pain scales. The presence of lowered ears, contraction of m.levator anguli oculi medialis, dilated nostrils, tension in facial muscles and altered shape of the muzzle were observed [2]. Every sign was given 0 – 2 points (0 – not present, 2 – obviously expressed) [1]. Behaviour and facial expression points ranged from 0 to 12 (0 - no pain, 12 – most obvious pain recorded). Blood cortisol was measured by automatic immunological analysis (AIA – 360, Japan) from blood collected into tubes with no anticoagulant. All statistical analyses were conducted using SPSS 19 (SPSS Inc., Chicago, USA). Differences were considered to be statistically significant if $P \leq 0.05$.

RESULTS AND DISCUSSION

Despite the severity of pain associated with routine castration in horses being contentious [1], the findings of previous studies [4] have demonstrated that this procedure is associated with some degree of pain.

The initial patient pain assessment before the operation showed similar results indicating none or low pain, variations most likely caused by stress in the new environment. Pain scale showed that before the operation average scores varied insignificantly (Group I – 2.6 points, Group II – 1.2 points, Group III – 1.3 points). The clear difference was observed on 6th hour after the operation as Group I had a score of 6.8 points and Group II – 5.4 points, although Group III had a clearly lower score of 2.8 points. This changes in composite pain scale showed similar by other authors [1]. Measurements of cortisol levels in blood serum showed no difference between the groups before the operation. Group I initially received a FM injection before the operation and showed low cortisol level right after (118.36 mmol/l), however 6 hours after the surgery this group had highest level of cortisol (173.52 mmol/l), compared to other groups, presumably due to lower Flunixin effectiveness 10 – 12 hours after application. Group II received a FM injection only right after the operation, therefore their serum cortisol level at the time was relatively high (159.69 mmol/l), but low 6 hours after FM application (132.93 mmol/l) compared to Group I. Group III received both FM injections – before the surgery and after. Therefore their serum cortisol level right after the surgery (116.48 mmol/l) did not differ significantly from Group I, which had the same treatment at that point. However 6 hours after the second injection cortisol level in Group III was obviously lower than any other group (113.87 mmol/l) and remained lowest until the next morning (109.07 mmol/l) compared to other two groups (144.4 mmol/l and 165.27 mmol/l), reason for that possibly being double dose of FM and prolonged effect of this medication. The same results but about pain scale showed Dalla Costa et al [1]. The two administration of 1.1 mg/kg of Flunixin pre and post operation may show greater and lower pain relief than a single preoperative administration.

CONCLUSION

A single FM injection before premedication (Group I) was effective only 1st hour after the operation. An injection after the operation (Group II) had still no effect on hour 1, but was already evident on hour 6. Consequently FM injected twice (Group III) was effective during the whole first day of postoperative period.

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LAMINITIS IN HORSES

Maja Rokita¹, Magdalena Szklarz^{1,2}, Maciej Janeczek¹

¹Wroclaw University of Environmental and Life Sciences, Faculty of Veterinary Medicine, Wroclaw, Poland

²Leczenie Koni EquiDOC

ABSTRACT

Laminitis (pododermatitis diffusa aseptica), although known and well recognized for years, remains one of the most frequent orthopedic conditions in horses. It's clinical relevance should not be underestimated, as regardless to the underlying reason the seriousness and the consequences of the disease depend on the quick and adequate treatment. The aim of the study was to present the symptoms, types, pathomechanism, diagnostics and therapeutic methods of laminitis in horses. Laminitis is usually manifested by acute or persistent lameness affecting forelimbs or both fore- and hindlimbs accompanied by exeeded pulsation and increased hoof temperature. Feed and water uptake can be reduced due to recumbent position of the patient. Laminitis is divided into several types: endotoxic, nutritional, metabolic, mechanical and iatrogenic. The diagnosis is made on the basis of clinical symptomatics and radiological findings. Treatment usually combine pharmacological therapy, local cooling in acute phase of laminitis and proper trimming or shoeing of the equine patient.

PLACENTITIS IN MARES

Magdalena Szklarz^{1,2}, Maja Rokita¹, Maciej Janeczek¹

¹Wroclaw University of Environmental and Life Sciences, Faculty of Veterinary Medicine, Wroclaw, Poland

²Leczenie Koni EquiDOC

ABSTRACT

Despite the ongoing development in the field of equine reproduction placentitis remains one of the most common causes of abortion or premature parturition in mares. Regardless to the underlying reason the consequences of the disease for mare and unborn foal depend on the quick and adequate treatment. The aim of the study was to present the symptoms, types, pathomechanism, diagnostics and therapeutic methods of placentitis in horses. Clinical symptoms of placentitis include premature mammary gland development sometimes accompanied by vulvar discharge. Placentitis is divided into several types: ascending, hematogenous, diffuse and multifocal. The diagnosis is enabled by ultrasonographic findings and measurements of CTUP (combined uterine and placental thickness) combined with culture if vaginal or vulvar discharge is present and serial hormonal blood evaluation. Treatment usually consists pharmacological therapy including antiphlogistic and antimicrobial therapy, exogenous progestagens and medication improving uterine perfusion aiming to stabilize the pregnancy and to deliver a live foal.

ANIMAL HYGIENE, DISEASE PREVENTION, BIOSECURITY AND ANTIBIOTICS RESISTANCE

KEYNOTE LECTURES

NUTRITIONAL STRATEGIES TO REDUCE ANTIMICROBIAL USE IN POST-WEANING PIGLETS

Marcin Forkajm

Lallemand Animal Nutrition

ABSTRACT

The aim of the lecture is to understand important rule of antibiotic reduction in swine. Lecture is focused on very important period of piglet life - weaning. In the past it was one of the most "Antibiotic usage" period in pig production. Nowadays it is possible to wean the piglets with less or no antibiotic or zinc oxide. To prevent using so much medicines, very important is to understand how stressful for animal this period is and how piglet body is reacting. It is possible to reach the goal by knowing and using specific raw materials, probiotics and nutrients levels, to prevent problems during and after weaning. Lallemand made a lot of trials according to this subject and it is possible to keep piglets in good shape and keep good feed intake after weaning by using specific yeasts for sows, piglets and fatteners - Levucell SB Titan.

SALMONELLOSIS: EPIZOOTIC SITUATION, AVAILABLE METHODS OF ERADICATION IN FACE OF PRESENT REGULATIONS AND CONSUMER EXPECTATIONS AS CHALLENGE FOR THE POULTRY INDUSTRY

Krzysztof Chudzik

Veterinary doctor

ABSTRACT

Due to the real threats associated with the increase the level of bacterial infections, but also due to intensive work on the development and implementation of safe and effective methods of breeding and breeding poultry without the participation of antibiotics, there is a real need to implement tools which might be helpful to reduce the risk of infection. Based on EC Directives, correlated with EFSA guidelines, the farm owners has main responsibility to implement biosecurity principles. In case of lack of incomplete sanitary regimes, the farm should consider the real risk of significant costs and losses in production.

The elimination of bacteria from the environment, even those posing a potential health risk for humans and animals (e.g. Salmonella spp.), has never been and will not be entirely possible within the whole environment. However, we can effectively control the risk of potential infections and losses associated. Routine and strict bio sanitary regimes, followed by the implementation of properly selected tools in managing all activities on the farm, initially might generate additional costs on the part of producers and processors. However within relatively short time allows to obtain the expected economic effects. Alternative methods of reducing infections, other than e.g. antibiotic therapy, will allow producers to continue safe and profitable production. In the light of the growing threats related to the growing resistance of bacteria, dangerous for people and animals, adaptation to EU Directives, we might say is absolutely "must have" for meat and egg producers meet to implement and follow same regulation but also in order to respect growing consumer "demands" and expectation to have more safe and meat and eggs. Understanding properly and deeply those changes (both: regulated by law and expected by consumers), it seems the only one way which allows polish producer to continue the production, and stay as effectively competitive within markets of EU countries.

PHYTOGENIC LIVER TONIC LIV.52® PROTEC - EFFICIENCY AS LIVER TONIC, ON PERFORMANCE, CARCASS YIELD AND ABDOMINAL FAT IN BROILERS

R.K. Rao

Vice-President Technical, The Himalaya Drug Company, Bengaluru, Karnataka, India

ABSTRACT

The present study was undertaken to evaluate the effect of a hepato specific phytogetic growth promoter (PGP), Liv.52® PROTEC powder, on performance, carcass yield and abdominal fat in broiler chickens. PGPs are used as feed additives to improve the feed quality, live weight gain, feed conversion ratio (FCR) and livability. A total of 320 one-day-old commercial broiler chicks were procured and randomly divided into 2 equal groups (n = 160, in each group) in 8 replicates having 20 birds each. The groups were designated as G0 or control group, in which the birds were given basal diet without any feed supplement, and G1 or treatment group, in which the birds were given basal diet + Liv.52® PROTEC powder at 500 g/tonne of feed. Performance parameters such as body weight, feed conversion ratio (FCR), corrected feed conversion ratio (CFCR), livability, European efficiency factor (EEF), and carcass yield were recorded for 42 days. The findings of the present trial revealed that the supplementation of Liv.52® PROTEC powder in broiler chicken diet improved body weight (1.78%), FCR (2.35%), CFCR (3.75%), livability (4.40%), EEF (9.60%), carcass yield (1.70%) and reduced abdominal fat (0.57%) by way of optimum feed utilization. No adverse effects were noticed throughout the study. The study results showed a marked improvement in productive performance with supplementation of Liv.52® PROTEC powder. Herbal ingredients with liver tonic property that stimulate the liver functions, support liver cell integrity, enhances the lipid metabolism and reduces its accumulation in the liver. Also, antioxidant, anabolic and hepatoprotective properties, present in Liv.52® PROTEC powder improves feed efficiency; helps maximize the carcass yield, reduce abdominal fat; and promote overall health of the birds. Liv.52® PROTEC powder is an excellent feed additive with liver tonic property, that stimulate the liver functions, support liver cell integrity, enhances the lipid metabolism and reduces its accumulation in the liver, that has potential value addition in improving the overall health of the birds.

ORAL PRESENTATIONS

SCREENING FOR BACTERIOPHAGES LYTIC TO BACTERIA CAUSING EXUDATIVE EPIDERMITIS IN PIGLETS

Julia Louisa Tetens¹, Sabrina Koberg², Georg-Friedrich Thimm¹, Charles Franz², Christina Hölzel¹

¹Institute of Animal Breeding and Husbandry, Department of Animal Health and Animal Hygiene, University of Kiel

²Department of Microbiology and Biotechnology, Max Rubner-Institute Kiel

ABSTRACT

Exudative epidermitis, commonly also known as greasy pig disease is one of the most frequent generalized or localized skin diseases affecting piglets. The primary cause of this disease are virulent strains of *Staphylococcus hyicus*. Generally, antibiotics are the method of treatment for exudative epidermitis with decreasing success due to the incremental development of multiple resistances of bacteria against antibiotics. Bacteria such as MRSA (methicillin resistant *Staphylococcus aureus*) and Enterobacteriaceae producing extended spectrum β -lactamases (ESBL) like *Escherichia coli* and *Klebsiella pneumoniae* are prominent examples of this precarious situation. This development is alarming not only from a veterinary but also from a One Health perspective and requires alternative strategies for therapy as well as prevention. Bacteriophages, defined as viruses that infect and kill bacteria, might offer an opportunity for both. Compared with antibiotics the risk to develop resistance is much lower as bacteriophages, following population dynamic laws, might actively overcome mutations in bacteria leading to resistance mechanisms. A further advantage of bacteriophages is their high specificity. Thus, bacteriophages only kill target bacterial species and do not destroy the host's commensal microbiota.

In reverse conclusion, this implies the need to extensively screen for an effective bacteriophage for every pathogen. Within this study, we isolated the pathogen *Staphylococcus hyicus* as well as phages that show lytic nature towards the pathogen on a piglet raising farm with exudative epidermitis as a stock problem. Further steps will be the characterisation of phages regarding their morphology, stability and bacteriolytic activity towards other pathogens with the objective to elucidate the potential of these phages as therapeutic alternatives to antibiotics.

BACTERIAL ADAPTATION TO SURFACTANT ANTIMICROBIALS

Olga Makarova¹, Philip Ferguson², Paul Johnston¹, James Mason², Jens Rolff¹, Uwe Roesler¹

¹Freie Universitaet Berlin

²King's College London

ABSTRACT

Background and objectives: Cationic surfactants are potent antimicrobials and include benzalkonium chloride (BAC), a common disinfectant, and pexiganan (PEX), a therapeutic antimicrobial peptide. Both BACs and PEX act on bacterial membranes. But do these similarities lead to the similarities in resistance mechanisms and cross-resistance, compromising their clinical use?

Materials and methods: Stable resistant mutants of *Staphylococcus aureus* were generated by passaging daily in increasing concentrations of BAC or PEX, and analysed by whole genome sequencing and metabolomics. Minimum inhibitory concentrations were determined for BAC, PEX and a panel of antibiotics. Fitness costs were assessed by growth curves.

RESULTS

Adaptation to PEX was fast and high-level (32-fold, five transfers) compared to BAC (4-fold, seven transfers). Mutations associated with phospholipid metabolism and efflux pump activity were found in PEX and BAC mutants, respectively. Metabolomics confirmed vastly different cellular responses. There were no changes in cross-resistance to BAC, PEX and antibiotics. PEX mutants had high fitness costs, while BAC mutants showed none.

Conclusion

We find no support that concurrent use of PEX and BAC results in mutual cross-resistance and resistance to antibiotics in *S. aureus* due to a shared mechanism of action. While low level of resistance evolution recommends BAC as an efficient biocide against *Staphylococci*, absence of fitness costs in resistant mutants is worrying.

BROILER HEALTH, EFFICIENCY AND ANTIMICROBIAL USAGE IN SHEDS AT DIFFERENT STOCKING DENSITIES

Guido Di Martino¹, Claudia Caucci¹, Alessandro Dalla Costa¹, Manuel Santagiuliana¹, Monica Lorenzetto¹, Katia Capello¹, Luigi Gavazzi², Lebara Bonfanti¹

¹IZSve, Italy

²AmadoriGroup, Italy

ABSTRACT

According to Council Directive 2007/43/EC, broiler farmers are allowed to increase stocking density from 33 to 39kg/m², provided that specific environmental requirements are met (e.g. level of ammonia and carbon dioxide, ranges for ambient temperature in summer and relative humidity in winter). Limited information is available on the effect of stocking density on broiler health/welfare and, consequently on the need for antimicrobial consumption. A previous study found broiler health being more influenced by the quality of the environment, rather than stocking density

(Dawinks et al., 2004). This study compared the annual data of broiler mortality, feed conversion and antimicrobial usage of 160 farms at 39 kg/m² vs. 72 farms at 33 kg/m². Both groups were set within the densely populated poultry area in North Italy and came from the same integrated poultry industry, characterized by common management, genetics, feeding and vaccination program. Antimicrobial usage (AMU) was collected in each farm per cycle and expressed as DDDit/Kg. DDDita was calculated per each substance as the maximum dose defined by the Italian drug label. For each cycle, total milligrams of active substances administrated was divided by the DDDita, obtaining the total n.DDDita administered and then divided by the total kilograms of live weight produced. The annual AMU value per farm was obtained as the median of AMU values calculated for each cycle. Results, stratified by gender, showed no significant effect of stocking density on broiler mortality, feed efficiency and drug usage. However, a higher variability of antimicrobial consumption in farms at 39 kg/m² compared to 33 kg/m² was found. These findings may indicate a minor role of stocking density on health and welfare of intensively reared poultry.

EFFECTS OF DIFFERENT FLOORING SYSTEMS ON ANIMAL HYGIENE AND ANIMAL WELFARE IN BROILER HUSBANDRY

Sophia Heitmann

University of Veterinary Medicine, Foundation; Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour, Hannover, Germany

ABSTRACT

Wet litter in poultry houses is an omnipresent problem in commercial husbandry. It encourages the growth of microorganisms, which has negative effects on bird health, welfare and performance. In the presented study, a slatted floor was implemented below the drinker and feed lines and the effects of this flooring system on both, litter quality and animal health were analysed.

The study was performed in two broiler stables (22.67 m² each). The control stable reflected conditions of commercial systems, consisting of concrete flooring with wood shavings used as litter material. For the second stable, slatted floor was installed below the drinker and feedlines (height: 18 cm). In total, it covered 50 % of the space. A littered area flanked the slatted floor right and left. Ramps allowed the birds to access the floor. In each stable, 500 broiler chickens (ROSS 308) were kept, with a stocking density of about 39 kg/ m². Air, litter and excreta samples were taken at the beginning and the end of the fattening period. The total bacteria count, coliforms, *Escherichia coli* and ESBL-producing bacteria were determined. Footpad dermatitis, hock burns, soiling of feathers and breast blisters were evaluated.

The total bacteria count in litter on day ten were 2.19 x 10¹⁰ cfu/g for the slatted floor and 2.29 x 10¹⁰ cfu/g in the conventional system. On day 32 a total bacteria count of 8.02 x 10⁹ cfu/g (slatted floor) and 1.25 x 10¹⁰ cfu/g (conventional) was found. A reduction of coliforms and *Escherichia coli* was detected on day 32 in the slatted floor system. Preliminary results showed improved of footpad health, too.

These preliminary results indicate a promising effect of the slatted floor; however, further replications (being in process) are needed to confirm these findings.

IMPACT OF MESOPHILIC ANAEROBIC DIGESTION ON CLOSTRIDIUM PERFRINGENS

Lorine DERONGS¹, Céline Druilhe¹, Laure Martini², Caroline LE MARECHAL², Martine Denis², Anne-Marie Pourcher¹

¹IRSTEA, France

²ANSES, France

ABSTRACT

Introduction

Mesophilic farm biogas plants produce digestate which is recycled as organic fertilizer. Among pathogens, *Clostridium perfringens*, which produces several toxins, deserves special attention due to its ability to multiply under mesophilic anaerobic conditions. The study aims to (i) enumerate *C. perfringens* and (ii) characterize the toxinotype and evaluate the antimicrobial resistance of strains of *C. perfringens* toxinotypes isolated from manure and raw digestate.

MATERIALS AND METHODS

A one-year study was conducted on manure and raw digestates from 3 biogas plants (BGP), BGP1 and BGP3 treated swine manure. BGP2 treated cattle manure (85% of the manure input) and poultry (15%). *C. perfringens* was enumerated by cultural method. A total of 170 presumptive strains were characterized by searching the most common major and minor toxin genes of *C. perfringens*. The antimicrobial susceptibility was determined on 18 antibiotics commonly used in livestock.

RESULTS

Average concentrations of *C. perfringens* in manure were 105 CFU / g. They were either slightly lower (BGP1, BGP2) or similar (BGP3) in digestate. 151 (89%) of the 170 *C. perfringens* strains harbored *cpa* gene. Toxinotype A was the most frequently found (145/151). It was sometimes associated with the minor toxins $\beta 2$ (53/145) or NetB (10/145), or both (13/145). No strains harbored the minor enterotoxin gene *cpe*, which is responsible for food poisoning. The resistance profiles of the strains did not differ according to their origin (manure vs digestate). However, strains originated from cattle and swine manure were more resistant to the 18 antibiotics than those isolated from the poultry manure.

Conclusion

Mesophilic anaerobic digestion did not impact *C. perfringens* concentration. Toxinotype A which is responsible for gas gangrene or intestinal disease in human and animal, is predominant in both manure and raw digestate. Moreover, multi-resistant *C. perfringens* are present in raw digestate.

PATHOGENICITY AND ANTIBIOTICS SENSITIVITY PROFILE OF AEROMONAS BESTIARUM USED IN EXPERIMENTAL INFECTION OF DIFFERENT DEVELOPMENTAL STAGES OF CLARIAS GARIEPINUS

Olakunle S. Tiamiyu¹, Gbolahanmi A. Oladosu², O.R. Anifowose³, O.L. Ajayi⁴

¹University of Ibadan, Nigeria;

²University of Ibadan, Nigeria;

³Animal Care Veterinary Diagnostic Laboratory, Nigeria;

⁴Federal University of Agriculture Abeokuta, Nigeria;

ABSTRACT

Motile *Aeromonas Septicaemia* (MAS) known to be the commonest bacterial infection of cultured fish is mostly ascribed to *Aeromonas hydrophila*. This study was therefore conducted to determine the pathogenicity of *Aeromonas bestiarum* in fry, juvenile and post-juvenile of *Clarias gariepinus*, and evaluate the antibiotic sensitivity profile of the organism for effective control.

Aeromonas bestiarum was isolated from dead fry in Ijebu Ode. The organism was characterized and used for this study. Two-hundred apparently healthy fry collected from a commercial hatchery were randomly divided into four experimental groups of 50 fry. Three groups were infected with 1×10^8 (cfu)/ml of *Aeromonas bestiarum* by immersion in 2L of water, while the fourth group were not infected. Fish in the infected and control groups were monitored daily for signs of infection and mortality. The cumulative mortality in fry, juvenile and post-juvenile were 85%, 82% and 50% respectively. Gross lesions observed in post-juvenile fish were bulgy eyes, swollen dorsal muscle caudal to the cranium, congested kidney and skin depigmentation. Histological lesions were equally recorded in the hepatic tissue, diffuse degeneration and necrosis of the tubular epithelium in the interstitium of kidney. It was re-isolated from infected fish in the different developmental stages, while the organism was observed to be sensitive to two antibiotics. Groups of survivors in the different stages were treated for five days. On the second day of treatment, there was 15%, 14% and 0% mortality in the treated fry, juveniles and post-juveniles respectively, while the mortality rate of untreated but infected group (control) were 40%, 42% and 42% for fry, juveniles and post-juveniles fish respectively.

This shows *Aeromonas bestiarum* causes high mortality in fry, juvenile and post-juvenile of *Clarias gariepinus*. It's however sensitive to Enrofloxacin and Gentamicin which can be used for treatment of infection by *Aeromonas bestiarum* for now

INTRODUCTION

African catfish also called African sharp tooth catfish, *Clarias gariepinus* (Burchell), is an economically important fish species in West African countries including Nigeria [11]. This dominance of African catfish production is related to their aquaculture attributes which include ability to withstand handling stress, disease resistance, fast growth rate, high fecundity and palatability [6]. Bacterial diseases in fish cause disease outbreaks that could lead to high economic losses. A few examples are Vibriosis, Pseudomonadiazis, Staphylococcosis, Streptococcosis, hemorrhagic septicaemia, and Columnaris disease, Mycobacteriosis, Yersiniosis (enteric red-mouth disease), Motile *Aeromonas*

Septicaemia and Edwardsiellosis [2]. Economic losses due to disease are likely to increase as aquaculture expands and intensifies [10].

This then shows why thorough investigation into the nature of these disease conditions is important, especially through experimental infections. Experimental infection of animals has been a very important tool in establishing aetiology of specific disease conditions and of studying their pathogenesis and pathophysiology.

MATERIALS AND METHOD

The *Aeromonas bestiarum* used for this study was isolated from the case of fingerlings mortalities that were presented for bacteria isolation, identification and Antibiotics sensitivity Test at Animal Care Veterinary Diagnostic Laboratory, Ogere, Ogun State, Nigeria. Two hundred pieces of 14 days old *Clarias gariepinus* fry, 100 pieces of 11 weeks old Juvenile and 100 pieces of 13 weeks old Post Juvenile African Catfish were collected and the fry were randomly divided into four groups each of 50 fish, while the Juvenile and post juvenile were divided into four groups of 15 fish each. Twelve Experimental tanks (Fig. 1) were used and properly labeled as Fry Control, Fry A, Fry B, Fry C, Juvenile Control, Juvenile A, Juvenile B, Juvenile C, and Post Juvenile Control, post Juvenile A, Post Juvenile B and Post Juvenile C. Each tank contained 4 liters of water. The microbial and aflatoxin analysis of the Artemia and Skretting fry and Juvenile wean diet (0.7mm and 1.8mm) fed to the fry Juvenile and Post Juvenile were carried out. The infection trial was carried out by immersion of fish in water containing 1.8×10^8 cfu/ml of the isolates of *Aeromonas bestiarum* at the rate of 5ml/L while the control group was not infected [9]. After 5 days post infection, half of water in each experimental tank was replaced 24 hours to ensure good water quality [13]. Samples of dead fry, Juvenile and post Juvenile were cultured for bacteria using standard methods and re-isolation of the bacteria isolates used for the experimental infection. The samples of dead Juvenile and post Juvenile under hygienic condition were transported to the pathology laboratory of Federal University of Agriculture Abeokuta for histopathology reports.

RESULTS AND DISCUSSION

The microbial analysis result of the feed sample was 0×10^5 cfu/g as shown in (Tab. 1) included total aerobic count, coliform count, fungal count and vibrio count while Total Aflatoxin test for Artemia was 36ppb and Fish feed was 34ppb respectively. The 2 results above indicated there was no feed contamination during this study. There was high total aerobic counts in all the infected tanks (448 ± 206 cfu/ml) (Tab. 2) compared to control tanks (120 ± 56 cfu/ml) within 21 days meanwhile there was low dissolved oxygen in all the infected tanks (4.5 ± 0.75 ppm) (Tab. 3) compared to control tanks (6.4 ± 0.48 ppm). There was high percentage mortality in all the infected tanks, fry 85%, Juvenile 82% and Post Juvenile 50% (Tab. 4) compared to control tanks, fry 10%, Juvenile 6.7% and Post Juvenile 6.7% within 21 days. The Histopathological lesions caused by the infection of *Aeromonas bestiarum* at cellular levels were obvious in the liver and the kidney. In the liver, there was loss of cohesion in the hepatic tissue, as well as the presence of emboli in hepatic blood vessels (Fig. 4), diffuse degeneration and necrosis of the tubular epithelium with odema fluid in the interstitium of kidney (Fig 5).

The infected and re-isolated bacteria *Aeromonas bestiarum* was only sensitive to Enrofloxacin and Gentamicin (Fig. 6). It was intermediate to Furaltadone, Streptomycin and resistant to Colistin, Penicillin-Streptomycin and Oxytetracycline.

The treated Fry, Juvenile and Post Juvenile with Enrofloxacin 20% at 10mg/kg body weight reduced the mortality rate to 15%, 14% and 0% respectively while the mortality rate of untreated Fry, Juvenile and Post Juvenile was 40%, 42% and 42% respectively 5 days post treatment. *Aeromonas bestiarum* [1] was previously known as *Aeromonas hydrophila* genomospecies 2 hence the reason why not so much has been said of *Aeromonas bestiarum* in Tropical Africa. It is however a growing problem in Poland [7]. Other *Aeromonas* species such as *Aeromonas hydrophila*, *Aeromonas salmonicidae*, *Aeromonas caviae* have all been reported in Nigeria. The most important fish pathogen was *Aeromonas hydrophila* [4] and highest prevalence is in polluted waters [5]. The mortality rates of 85% and 82% Tab. 4 were observed in Fry and Juvenile fish tanks, infected with *Aeromonas bestiarum*, respectively in this study. This result is similar to the report of Madubuike et al. [5] who observed cumulative mortality rate of (30 – 90%) in catfish infected with *Aeromonas hydrophila* at the rate of 1×10^8 cf.u/ml of the pond water. The variation in the pattern and mortality rates may be related to the species of fish, strain of *Aeromonas* species, experimental conditions, dose of the infective pathogen given, route of administration of the pathogen and duration of the experiment [9]. The high mortality observed in 14 days post infection with *Aeromonas bestiarum* in this study might have resulted from the alteration of homeostasis of the fry due to necrosis of the skin and fins (Fig. 3) that are likely to affect the osmoregulatory and respiratory function of the fish. In this study, some fish showed marked hemorrhages on the base of the fins and vent (Fig. 2). These were the findings of Laith AR and Najiah [8] who reported similar findings in *Clarias gariepinus*. At 4 days post infection with *Aeromonas bestiarum*, hyperemic spots was observed on the base and tip of the skin which is also similar to what Madubuike et al, [9] observed in fingerlings that were infected with *Aeromonas hydrophila*. Camus et al, [3] also reported exophthalmia, pale gills and stomach filled with cloudy fluid similar findings were observed in this study.. Laith and Najiah [8] discovered degenerative changes in the glomerular epithelium of the kidney of diseases of catfish infected with *Aeromonas hydrophila* which was similar to the report of histopathology in this study (Fig. 4, 5). Laith and Najiah [8] reported that the *Aeromonas hydrophila* strain was resistant to Ampicillin and Colistin Sulphate. In this study, resistance of *Aeromonas bestiarum* to some antibiotics were also observed but it is only sensitive to Enrofloxacin and Gentamycin Fig. 6. Kozińska [7] reported that *Aeromonas hydrophila* and *A. sobria* were both sensitive to Enrofloxacin which is also similar to observation of this study. Enrofloxacin was therefore, the antibiotics that could be used for the treatment of *Aeromonas bestiarum* infection in catfish by bath at 10mg/kg body weight [12].

CONCLUSION

Aeromonas bestiarum causes high mortality in fry, Juvenile and Post Juvenile of African Cat fish. The organism is however sensitive to Enrofloxacin and Gentamicin during treatment.

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EFFECT OF NEWCASTLE DISEASE VIRUS (KUDU-113 STRAIN) INFECTION ON CALCIUM METABOLISM IN RESPONSE TO ENDOCRINOLOGICAL CHANGES IN COMMERCIAL LAYERS

Adekunle LA², Idris SY¹, Enam SJ¹, Jubril, JA², Adamu S¹, Esievo KAN¹

¹ Department of Veterinary Pathology, Ahamadu Bello University, Zaria, Nigeria

² Department of Veterinary Pathology, University of Ibadan, Ibadan, Nigeria

ABSTRACT

The effect of experimental ND Virus (Kudu 113 strain) infection on some aspects relating to endocrinology of calcium metabolism, which affect egg shell quality and production was studied. Twenty 22-week-old ISA brown layers vaccinated against ND were allocated to infected and uninfected groups of 10 chickens each. The chickens in the infected group were inoculated intranasally with 0.1 ml of NDV (Kudu 113 strain). Blood samples were collected for whole blood and serum on day 2 (pi), every other day for the first week and then weekly for 5 weeks and analysed for Haematology and serum chemistry accordingly. Clinical signs of ND were first observed in the infected chickens from day 3 pi, these were anorexia, ruffled feathers, greenish diarrhoea, misshapen, small-sized and white-shelled eggs. The abnormalities in egg shell were observed in the infected chickens in the 2nd and 3rd week pi, which subsequently normalized. The mean packed cell volume (PCV) in the infected chickens on day 6 pi was significantly lower ($P < 0.05$) than that of the uninfected. There was a significant difference in plasma calcium levels between both groups. There were significant decreases in the concentrations of calcium and phosphorus from onset to day 18 and then an increase in phosphorus on day 25. Plasma oestrogen activity showed a significant increase from onset to day 18 and then decreased on day 25 pi. The activity of parathormone also increased progressively until day 32 pi. From this study, ND induced decline in plasma calcium and phosphorus levels which triggered increase in oestrogen and parathormone activity with consequent rise in plasma calcium and phosphorus levels.

INFLUENCE OF THE BIOGAS-PROCESS ON MYCOBACTERIUM AVIUM SSP. AVIUM

Thorben Schilling, Rashmi Aiyar, Ludwig E. Hoelzle

University of Hohenheim

ABSTRACT

Manure as well as other input materials for biogas-plants can contain several pathogenic organisms that are associated with human and animal diseases. Some of these organisms can be inactivated during the biogas-process. However, for some organisms with higher tenacity there is no or only little data available referring to their survival abilities in biogas plants. One example are Mycobacteria. The aim of our study was to obtain data about the tenacity of mycobacteria under different conditions within the biogas process as well as data on the thermal pre-treatment such as pasteurization of substrates containing Mycobacteria. Substrate inoculated with *Mycobacterium avium* ssp. *avium* (MAA) was introduced in 100 ml glass syringes. Those were incubated at different temperatures for different times. Samples were decontaminated after treatment and inoculated on selective media. For thermal treatment, bacterial suspensions were heated to different temperatures for one hour and plated on selective agar plates after treatment to obtain data on the thermal stability during pre-treatment. For identification of suspicious colonies both ZN staining and PCR were used.

Our results indicate that the inactivation of MAA is not possible under mesophilic conditions at common retention times. We found that under thermophilic conditions a retention time of 24 h is not sufficient to inactivate MAA. In

addition, the thermal pre-treatment studies showed that 70 °C for one hour was not sufficient to inactivate MAA. In conclusion, usual temperature and retention time set-ups of the biogas fermentation process seem to be critical for the pathogen inactivation since our results indicate that neither the thermophilic treatment between 50°C and 55°C for 24 hours nor a thermal pre-treatment at 70 °C for one hour is adequate for disinfection. Therefore, we recommend the combination of both treatments and a longer retention time in the fermenter, respectively.

THE UTERINE MICROBIOME AND RESISTOME OF DAIRY COWS

Hanna Kronfeld^{1,2}, Christina Hölzel¹, Nicole Kemper²

¹University of Kiel

²University of Veterinary Medicine Hannover

ABSTRACT

The microbiome is defined as the total of microorganisms (including their variety of features) in a distinct habitat. Disorders of the microbiome can lead to various diseases. In case of the uterine microbiome this can result in fertility disorders.

The uterus of animals was thought to be sterile for a long time. Therefore, the research about the microbiome is still at an early stage. Only culture-independent, molecular biological methods enabled a closer examination of the bacterial composition, since the majority of bacteria are not culturable.

Our study aims to gain new insights in the bacteriological composition of the uterus of dairy cows. In addition, we will test the resistance to antibiotics. For this purpose, individual clinical and gynecological examinations of the cows are performed and uterine swab samples from the surface of the endometrium are taken from the uterus of each cow. A single cow is sampled several times to assess the stability of the microbiome composition. In addition the bacterial profile is compared between heifers and cows, healthy and clinically diseased animals and between different points in time (postpartum, in heat). For the differentiation of the bacteria cultural-biochemical and molecular-biological methods are used. Thereafter, a sensitivity test of the isolated bacteria is performed on order to determine the minimum inhibitory concentration of antibiotics. Status quo and first results will be presented.

EFFECTS OF LOW-FREQUENCY ELECTROMAGNETIC FIELDS ON WATER MICROORGANISMS AND BIOFILM FORMATION IN WATERLINES USED IN POULTRY PRODUCTION

Rafael Hernan Mateus Vargas¹, Nicole Kemper¹, Nina Volkmann¹, Manfred Kietzmann²,

Jessica Meissner², Jochen Schulz¹

¹Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour, University of Veterinary Medicine Hannover, Foundation, Germany

²Department of Pharmacology, Toxicology and Pharmacy, University of Veterinary Medicine Hannover, Foundation, Germany

ABSTRACT

Conventional disinfection of waterlines is based on the use of chemical compounds, which may have limited effectivity against biofilm development and could be hazardous for the environment. Use of low-frequency electromagnetic fields (LF-EMF) to treat water has been reported as an alternative to conventional disinfection methods of water pipe lines. Therefore the objective of this study was to evaluate the effect of the application of LF-EMF on the microbiological properties of water at 20-meter long models of waterlines (circulating and non-circulating) conventionally used in poultry holdings. Treated waterlines were equipped with commercial devices producing pulsed electromagnetic signals of low-frequency (350 to 10,000 Hz). Treated and non-treated lines were monitored during 28 days through plate counts of water and biofilm samples as well as fluorescence microscopic examination of coupons of polyvinyl chloride. LF-EMF treatment resulted especially in changes of the bacterial counts of biofilms in the first two thirds of the experiment period when compared to non-treated controls. Due to high standard deviations between trials, the notated differences were mainly not statistically significant. Furthermore, despite the observation of some tendencies, biofilm coverage did not differ significantly between treated and control lines, as determined by fluorescence microscopy. Although the presented data indicates that LF-EMF treatment may influence culturability of water microorganisms, no inhibitory effects on bacterial biofilm formation were confirmed over 28 days of experiment.

NEW TECHNOLOGY TO CONTROL SALMONELLA IN FEED

Simon Carlton

Technical Director EMEA Anitox

ABSTRACT

Feed and feed ingredients are considered fomites for the transmission of microbial pathogens to animals. It has been known for many years that molds/mycotoxins are present in feed and are economically important to the producer. Bacteria such as Salmonella, E. coli and Clostridia can also be present in feed and are not only economically important to the producer but are important in terms of food safety. The recent isolation of viruses such as PEDV and ASF from feed has induced many producers to implement stricter biosecurity programs with regards to feed microbial quality. Various intervention strategies have been employed including removal of high-risk ingredients from the diet, heat treatment and chemical preservatives. Exclusion of high-risk ingredients was a common strategy for reducing risk in feed back in the early 1990's. However, as technology to detect microorganisms improved, it was observed that virtually no ingredient is devoid of risk. Heat treatment, such as pelleting and extrusion have been utilized to reduce Salmonella levels in feed. The efficiency of heat treatment in reducing bacteria in feed is dependent on many

factors, including temperature, time, humidity and others. The emergence of thermotolerant strains of Salmonella and Clostridia have led to producers to invest in more intensive heat treatment processes while sacrificing nutritional quality. Chemical preservatives, such as organic acids and formaldehyde, are another intervention strategy reduce microorganisms in feed. Organic acids, such as formic acid can reduce the level of non-spore forming bacteria in feed by 50 - 90% at usage rates of 5 to 10 kg/ton. Organic acids are bacteriostatic to Clostridial spores at the 10-20 kg/ton usage rate but are not sporicidal. Differences in the susceptibility of strains of Salmonella to organic acids has been reported and long-term usage can result in acid-tolerant strains. Formaldehyde has been used for many years to control microorganism in feed. Its recent ban for use in animal feed within Europe has made producer search for alternative technology. A novel aldehyde based product has been tested in university and commercial trials for bactericidal, basterostatic and residual activity.

This presentation aims to examine alternatives to formaldehyde use in feed including Heat Treatment, Organic Acids and a new Feed Sanitizing product.

SALMONELLA OCCURRENCE IN ROOMS OF A FATTENING PIG BARN TREATED WITH COLD FOGGED PERACETIC ACID

Jochen Schulz¹, Marius Fillmer¹, Istvan Szabo², Nicole Kemper¹

¹Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour, University of Veterinary Medicine Hannover, Foundation, Germany

²German Federal Institute for Risk Assessment (BfR), NRL for the Analysis and Testing of Zoonoses (Salmonella), Berlin, Germany

ABSTRACT

The impact of periodically cold fogged peracetic acid on the occurrence of Salmonella was investigated in a commercial fattening pig barn during four fattening periods. Results of environmental samples (boot swabs and dust) and serological findings were compared between treated and untreated rooms. Rooms were sampled four to seven times (weekly or fortnightly) per fattening period. Fifty-six environmental samplings were carried out in four treated rooms and in four untreated rooms. Each sampled room was occupied with 144 fattening pigs. The seroprevalences of 30 animals from treated and 30 animals from untreated rooms were tested at the beginning and at day 92 of the fattening period. Salmonella were detected 26 times in samples from treated rooms and 10 times in samples from untreated rooms. The serovar Salmonella Typhimurium was detected in nearly all positive samples. In two cases the serovar Salmonella subspecies I was identified. The association between the treatment status and Salmonella findings was significant (Fisher's exact test, $p = 0.0022$). However, the seroprevalences showed no significant differences between pigs from treated and from untreated rooms. Possible causes of the unexpected more frequently detection of Salmonella in treated rooms will be discussed.

RESISTANCE INDUCTION TO ROUNDUP, A COMMON HERBICIDE, IN ENTEROBACTERIACEAE IN VITRO

Judith Pöppe, Katrin Bote, Uwe Roesler, Olga Makarova

Freie Universitaet Berlin, Institute for Animal Hygiene and Environmental Health

ABSTRACT

Glyphosate is the most widely used herbicide in the world, and its formulation Roundup LB plus (RU) is the most common glyphosate-containing herbicide in Germany. Antimicrobial effects of glyphosate have recently been recognised. The objective of this study was to investigate the ability of RU to induce resistance in Enterobacteriaceae of animal origin as well as cross-resistance to antibiotics and fitness costs in the resulting resistant mutants.

Ten isolates each of Escherichia coli and Salmonella enterica serovars from pigs and cattle were passaged daily at increasing concentrations of RU. Whole genome sequencing has been performed for the stable resistant isolates and respective ancestors. Fitness costs were assessed by growth curves and cross-resistance to antibiotics determined by Vitek.

The overall dynamics of adaptation to RU was slow and relatively low-level, with early extinctions in E. coli. One E. coli and four Salmonella isolates showed a 2-4-fold increase in minimum inhibitory concentration (MIC) to RU. Mutations associated with glyphosate resistance were not found in E. coli but in all Salmonella isolates. There were no changes in fitness costs or antibiotic resistance profiles.

Salmonella are more likely to develop resistance to RU compared to E. coli. Resistant mutants show no fitness costs. RU resistance does not occur easily and is relatively low-level. It is therefore possible that RU use may result in preferential selection of pathogenic RU-tolerant Salmonella bacteria that can persist in the environment.

MINIMUM INHIBITORY CONCENTRATIONS FOR GLYPHOSATE AND A GLYPHOSATE-CONTAINING FORMULATION IN LIVESTOCK-ASSOCIATED ENTEROBACTERIACEAE

Katrin Bote, Judith Pöppe, Olga Makarova, Roswitha Merle, Uwe Roesler

Freie Universitaet Berlin, Institute for Animal Hygiene and Environmental Health

ABSTRACT

Glyphosate is the most popular herbicide in the world. The target structure of glyphosate, the enolpyruvylshikimate-3-phosphate synthase (EPSPS), is also present in bacteria. Concerns have been raised about the potential effects of glyphosate residues in animal feed on bacteria in livestock. Here, we investigated the current levels of sensitivity to glyphosate (as an active ingredient and as a part of the formulation Roundup LB plus) in diverse isolates of Escherichia coli and Salmonella enterica.

We determined minimum inhibitory concentrations (MIC) of glyphosate and Roundup LB plus in Müller-Hinton I medium using a broth microdilution method for 225 Salmonella spp. and 238 E. coli isolates. Statistical modelling

was used to determine the effects of the different periods of isolation, host species, serovars, pathogenicity and ESBL-status of isolates on susceptibility to glyphosate/RU.

The distribution of MIC values for *Salmonella* spp. was 10-80 mg/ml for glyphosate and 20-80 mg/ml for RU. For *E. coli*, the distribution of MIC values was 5-10 mg/ml for glyphosate and 20-40 mg/ml for formulation. Among the isolates with a MIC higher than the 95%-percentile, the pathogenic *E. coli* were the dominant subgroup, in *Salmonella* spp. no population over the 95%-percentile was identified. Antibiotic resistance profile did not have a large effect on glyphosate sensitivity in *E. coli*, whereas host animal species and periods of isolation had small but statistically significant effects on glyphosate MICs in both species.

These results demonstrate that although *Salmonella* spp are more resistant to glyphosate than *E. coli*, the MIC distribution within the species is small, suggesting the absence of a highly resistant subpopulation in farm animal-associated Enterobacteriaceae.

INACTIVATION OF ESBL/AMPC-PRODUCING ESCHERICHIA COLI IN CHICKEN MANURE DURING AERATION AND ANAEROBIC DIGESTION

Corinna Thomas, Christine Idler, Christian Ammon, Christiane Herrmann, Thomas Amon

Leibniz Institute for Agricultural Engineering and Bioeconomy e.V. (ATB)

ABSTRACT

The high prevalence of extended-spectrum- β -lactamase (ESBL)-producing *Escherichia* (*E.*) *coli* in European broiler farms leads to the possible dissemination of antibiotic-resistant strains into the environment when using contaminated feces as organic fertilizer. The aim of the present study was to determine the effects of aerobic and anaerobic mesophilic treatments on the survival of two artificially added ESBL/AmpC-producing *E. coli* strains during lab-scale aeration and anaerobic digestion of chicken manure.

Two-liter-reactors were filled with chicken manure and either water for the aeration trials or digestate for the anaerobic digestion to get initial dry matter contents below 5 %. All reactors were then spiked with either an ESBL-producing or an AmpC-producing *E. coli* strain, both isolated from chicken feces. The reactors were then incubated aerobically or anaerobically at 37 °C and 42 °C, and the number of *E. coli* was determined over a period of 35 days. In addition, all samples were analyzed for total ammoniacal nitrogen, volatile fatty acids (VFA) and pH.

Starting with initial levels of 107 colony forming units (cfu) per milliliter, both *E. coli* strains were below the detection limit (< 100 cfu/ml) after 35 days for both treatments and temperatures. At 37 °C, *E. coli* reduction was faster during aeration than during anaerobic digestion, while at 42 °C, there was no significant difference between treatments. Both 37 and 42 °C led to similar reduction kinetics during aeration while the 5 °C-difference led to a significantly faster reduction during anaerobic digestion. During aeration, the pH was significantly lower and the concentrations of VFA higher than during anaerobic digestion.

Aeration and anaerobic digestion of chicken manure are suitable treatments to reduce antibiotic-resistant *E. coli* in chicken manure. The results may help define time-temperature guidelines for biogas plants and aeration may be a potential solution for wastewater treatment.

IDENTIFYING A LINK BETWEEN ESBL-PRODUCING ENTEROBACTERIA IN DAIRY CALVES AND FARM MANAGEMENT

Jil Waade¹, Fanny Ebert¹, Uwe Seibt¹, Evelin Ullrich², Alexander Starke¹, Walther Honscha¹, Uwe Truyen¹, Stephanie Speck¹

¹Universität Leipzig, Institute of Animal Hygiene and Veterinary Public Health

²Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie

ABSTRACT

Raised awareness towards antimicrobial resistance and its spread among humans and animals alike, has led to an ever growing interest in identifying its origins. Food-animals are considered a reservoir for Extended-spectrum β -Lactamase (ESBL)-producing enterobacteria (e.g. *E. coli*, *Klebsiella* spp., *Enterobacter* spp.). This study aims to determine the prevalence of ESBL-producing enterobacteria in young dairy calves and draw possible links to housing conditions and management factors.

Ten dairy farms in Saxony volunteered to participate and were visited twice in an interval of approximately 6 months. During these visits a comprehensive analysis of the farm, its management and the herd health status was carried out. On each farm faecal samples of 10 randomly selected calves (aged 0 to 14 days) were collected. Bacteria were grown and enumerated on Brilliance™ ESBL agar. Morphologically different colonies were isolated and bacterial species differentiated biochemically and by MALDI TOF. Furthermore, ESBL-production was phenotypically confirmed using the commercially available Micronaut-S- β -Lactamase test.

Every faecal sample contained ESBL-producing organisms in a median concentration of $2,11 \times 10^8$ colony-forming units (cfu)/g ($\pm 4.81 \times 10^8$). The majority of bacteria were *E. coli* (n=67; 89.3%). *Enterobacter cloacae* (n=5; 6.7%), *Klebsiella pneumoniae* (n=2; 2.7%), and *Morganella morganii* (n=1; 1.3%) were found additionally. Of all samples investigated three revealed more than one ESBL-producing species.

Our study revealed a 100%-prevalence of ESBL-producing enterobacteria in calves on all farms investigated, making it difficult to draw a link to farm management. Beta-lactams are the most frequently used antimicrobials at the participating farms, and this potentially contributes to the maintenance and spread of ESBL.

The project (nr. 2517-0859) was funded by the Saxon State Office for Environment, Agriculture and Geology.

HYGIENE IN FREE FARROWING PENS FOR SOWS: ANALYSES WITH SPECIAL EMPHASIS ON AIR HYGIENE

Eyke Lühken, Jochen Schulz, Nicole Kemper

University of Veterinary Medicine Hannover, Foundation, Germany

ABSTRACT

For porcine health, the hygienic status, characterized by different parameters, of the husbandry system is crucial. Parameters such as noxious gases or microbial load can vary within and between batches and regular monitoring offers useful information. As alternative farrowing systems gain importance, the aim of this study was to compare hygienic parameters, with the main emphasis on air quality in pens without any fixation of the sow during lactation (single loose housing pens and a group-housing system for six lactating sow with a conventional farrowing crate system). The samplings were carried out over an entire year in eight repetitions (batches). No significant differences in microbiological air quality between the analyzed housing systems for sows were found.

INTRODUCTION

Due to animal welfare concerns and growing public interest, the restriction of sows in farrowing crates (FC) has become a central topic in the debate on animal husbandry in many countries as FC were found to exert a deleterious effect on both the behavior and physiology of these animals [1]. Loose-housed farrowing systems (LH) were consequently developed, providing a healthier alternative to traditional FC. They offer increased freedom of movement and improved opportunities for social contact and nest-building behavior, which result in lower stress levels [1]. However, hygiene management is critical for maintaining the animals' health and for preventing infections, with cleanliness of the animals' environment and good air quality being important determinants of welfare [2]. Air quality can be assessed based on the following parameters: concentrations of carbon dioxide, ammonia, endotoxins, dust, total airborne bacteria (TAB), and fungi (i.e., molds and yeasts). The first four listed parameters were the focus of a recently published study [3]. The represented study focuses on the latter parameters (i.e., TAB, molds, and yeasts). Additionally, this study evaluates the concentration of haemolytic streptococci (HS).

ANIMALS, MATERIAL AND METHODS

The study was conducted on a farm with 80 reproductive sows of a common breed (db.Victoria, BHZP GmbH, Dahlenburg-Ellringen, Germany), managed in five-week intervals. A group housing system (GH) with a common area, a single loose-housing system (LH), and single pens with farrowing crates (FC; all: Big Dutchman International GmbH, Vechta, Germany) were installed. The systems provided room for six sows in GH (pen size: 5.0 m²; common area: 14 m²) and LH (pen size: 7.0 - 7.3 m²), and for eight sows in FC (pen size: 5.2 m²). Air conditioning was provided by an automatically adjusting air ventilation system with side vents (Big Dutchman, Germany) and a hot-water based heating. Fully slatted floors were installed in each room with deep slurry pits underneath. Cleaning and disinfection were performed by the standard farm routines following each batch. This study was based on the data of eight batches with 148 farrowings in total. More detailed information of all relevant test conditions can be found in Lühken et al. [3].

Sampling took place at day 5, 19, and 33 following introduction of sows to the systems. All air samples for microbiological examination were collected with a Coriolis Micro-Air Sampler (Bertin Technologies SAS, Montigny-le-Bretonneux, France). Samples were cooled during transport and storage and prepared in laboratory the same day. Before further processing, the cone was stirred up and a dilution line (by using 9 mL PBS and 1 mL original dispersion) was applied. The dispersions were streaked out on tryptone soya agar, on sheep blood azide agar and on dichloran glycerol agar (all: Thermo Fisher Scientific, Waltham, USA). After incubation, colonies were counted and given as colony-forming units per cubic metre (cfu/m³). Temperature and humidity were measured by a high-precision PCE-THB 40 device (PCE Deutschland GmbH, Meschede, Germany). The dust samples were collected by SKC Universal PCXR8 pumps (SKC Inc., Eighty Four, PA, USA), which ran for 24 h at a flow rate of 2.5 L/h (3.6 m³ in total), and endotoxin concentrations were subsequently analyzed with the Kinetic-QCLTM Kinetic Chromogenic LAL Assay (Lonza Group Ltd., Basel, Switzerland). Colorimetric tubes (Dräger GmbH, Lübeck, Germany) were used to determine concentrations of ammonia and carbon dioxide. All results were statistically analyzed with SAS software for Windows 9.4 (SAS Institute Inc., Cary, USA). Data were logarithmically transformed for subsequent analysis. Statistical significance was considered at $p < 0.05$.

RESULTS AND DISCUSSION

TAB ranged from 4.22-5.67 log cfu/m³ (GH), 4.03-5.37 log cfu/m³ (LH), and 3.43-5.58 log cfu/m³ (FC). On day 5 and 19, the mean TAB concentration was highest in LH, and on day 33 in GH and FC, but housing system type revealed no significant influence ($p > 0.5$). A significant influence of the day of occupancy ($p < 0.001$) and batch ($p = 0.05$) was observed. Pairwise comparisons revealed that concentrations of TAB were significantly lower on day 5 than on day 19 ($p < 0.001$) and 33 ($p < 0.001$), but there was no detectable interaction between system and day. Concentrations of TAB were comparable to those reported for farrowing systems in other studies despite the reportedly large fluctuations [e.g. 4]. The differences between system types in this study are apparently not so decisive that they would constitute a measurable difference in TAB concentration, as it does for the comparison of farrowing vs. fattening units [4]. The main cause is likely to be the similarly controlled environment (ventilation, temperature, and humidity) in all three systems. By investigating the stable air on three dates, we confirmed the assumption that TAB concentrations significantly increased over time, which was also reported by Costa et al. [5].

The occurrence of HS was excluded in 4 of 72 samples and maximum single values were 4.78 log cfu/m³ (GH), 4.64 log cfu/m³ (LH), and 4.92 log cfu/m³ (FC). Highest mean values were found on day 5 in LH, on day 19 in GH, and on day 33 in FC. As with TAB concentrations, the housing system showed no significant influence ($p > 0.05$), but day of occupancy ($p < 0.01$) and batch ($p < 0.01$) were found to be significant. Pairwise comparison revealed that concentrations of HS were lower on day 5 than on day 33 ($p < 0.01$), but there was no interaction detectable between system and day. The finding that the concentration of HS on day 5 was significantly lower than on day 33 could be related to the fact that HS were present in pig feces [6] and, thus, concentration increased parallel to the soiling, as did the TAB concentration.

Molds were not detectable in 7 of 72 samples and maximum single values were 3.43 log cfu/m³ (GH), 3.50 log cfu/m³ (LH), and 3.64 log cfu/m³ (FC). Highest mean concentrations were found on day 5 and 19 in FC, and on day 33 in LH. The housing system type had no significant effect ($p > 0.05$). Concentrations of fungi differed significantly by day of occupancy ($p < 0.05$). Pairwise comparison revealed that concentrations of molds were significantly higher on day 5 than on day 19 ($p < 0.05$), but there was no interaction detectable between system and day. No yeasts were detected in the air in 11 of 72 samples of GH and LH, and in 13 samples of FC. Maximum single values were 3.54 log cfu/m³ (GH), 3.78 log cfu/m³ (LH), and 3.52 log cfu/m³ (FC). Mean concentrations were highest in LH on day 5 and 19, and in GH on day 33. The housing system type showed no significant effect ($p > 0.05$) whereas the batch did ($p < 0.001$). The concentration of yeasts had not increased or decreased over time, reinforcing the assumptions that non-animal factors, such as fluctuations in the barn's humidity and temperature [7], are also relevant.

Significant correlations were detected between TAB and HS (LH: $r = 0.68$; FC: $r = 0.63$) and between TAB and carbon dioxide (LH: $r = 0.52$; FC: $r = 0.47$). Only in FC, correlations between TAB with the parameters dust (FC: $r = 0.68$) and inside humidity (FC: $r = 0.53$) were significant. Only in GH, significant correlations were found between TAB with the parameters inside temperature (GH: $r = 0.42$) and total animal weight (GH: $r = 0.58$). LH appears to be closer to FC than to GH in terms of magnitude and orientation of correlation coefficients. This finding indicates that the conditions of group housing changed the interaction between the air parameters compared to individual husbandry. Correlations found between TAB and HS were to be explained by the fact that HS represent a fraction of TAB, although this was only significant in LH and FC and not in GH. Other studies come to differing conclusions on correlations between microclimate parameters and air contaminants [e. g. 4]. However, in our study, the changes in the microclimate parameters may be too small to affect the concentration of TAB because throughout the year the automated air conditioning technology provides largely constant conditions.

CONCLUSIONS

No significant differences in microbiological air quality between the analyzed housing systems for sows were found. Concerns may be raised that the lack of functional areas, the husbandry in groups, or increased activity of the animals could lead to poorer air quality. A conversion of the husbandry systems to free-farrowing has not necessarily to be accompanied by an increase in airborne germ contamination. From an animal hygiene perspective, free-farrowing systems can replace conventional pens with crates without the need for special adaptation of existing ventilation systems or hygiene routines.

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VIRUS-LIKE BOVINE MEAT AND MILK FACTORS - ASSOCIATED WITH HUMAN DISEASE?

Christina Hölzel¹, Robert Fux²

¹Institute of Animal Breeding and Husbandry, Department of Animal Health and Animal Hygiene, University of Kiel

²Chair of Virology, Department of Veterinary Sciences, LMU Munich

ABSTRACT

Bovine milk and red meat have been discussed as potential causes of human cancer for decades. This discussion is mainly based on epidemiologic associations, reporting high rates of breast and colon cancer in regions with high consumption of Eurasian cattle milk and meat. One model of pathogenesis discusses the role of virus-like circular DNA-particles, partly known as bovine meat and milk factors (BMMF) or CRESS-DNA. Some of these DNA-sequences share significant homology with bacteriophage-DNA. Small circular DNA-viruses are ubiquitous in the environment; however, the detection of distinct sequences has been connected to human disease, since such sequences were isolated from TSE-tissue-culture and from the brain of MS patients (MSI). Recently, homologous sequences were also isolated from milk and dairy products. Serological tests proved that healthy adults had been confronted with protein resembling that encoded by MSI. Up to now, no serological test is available for milk isolates.

As described above, the hypothesis that bovine meat and milk factors are involved in cancerogenesis is mainly proposed because of high cancer rates in "western civilizations". If CRESS-DNA is involved, CRESS-DNA sequences should be more common in individuals with such lifestyle, compared to indigenous communities. However, recent studies found that children of an indigenous community had high abundancies of CRESS-DNA in their faeces. Thus, broadened studies are needed, which, at the same time, go much deeper in order to assess the significance of virus-like BMMF in milk and dairy products. To this purpose, we currently investigate different livestock species and products. Generalized and specific approaches are applied in order to assess and compare the prevalence of virus-like BMMF in livestock. Positive findings will be evaluated carefully.

STRAIN- DEPENDENT REDUCTION OF BROILER COLONISATION WITH ESBL-/ AMPC- PRODUCING E. COLI USING ALTERNATIVE HYGIENE- AND MANAGEMENT MEASURES

Caroline Robé¹, Katrin Daehre¹, Sophie Fiedler², Christa Ewers², Sebastian Guenther³, Uwe Roesler¹

¹Freie Universitaet Berlin, Institute for Animal Hygiene and Environmental Health

²Justus- Liebig- Universität Giessen, Institute of Hygiene and Infectious Diseases of Animals

³Universität Greifswald, Pharmaceutical Biology

ABSTRACT

The colonisation of broilers with ESBL- and AmpC- producing Enterobacteriaceae is well-known and close contact to broiler flocks or through contaminated retail meat could lead to the transfer to humans. We used a recently established broiler colonisation model to investigate potential intervention strategies regarding hygiene- and management measures to reduce the colonisation of broilers with these resistant bacteria.

Groups of 90 broilers were housed in conventionally (39 kg/sqm, no enrichment, food and water ad libitum), alternating one measure each. Alternative parameters included the acidification of water, usage of an alternative breed, the reduction of stocking density to 25 kg/sqm, an increased amount of litter and the application of a Competitive Exclusion (CE-) culture of one defined non-pathogenic bacterial strain. One fifth of the ESBL-/ AmpC- negative day- old broilers were orally co-infected on their third day of life (seeders) with 102 cfu of one ESBL- and one AmpC- producing E. coli strain. Colonisation success of all infected broilers (seeder, n=18) and non- infected broilers (sentinel, n=28) was proven by cloacal swabs over the period of the trial and a final necropsy at a target weight of two kilograms. Statistical analysis reveals a strain- dependent reduction of colonisation for the ESBL- producing E. coli strain concerning the reduction of stocking density and the application of a CE- culture. In contrast to this, water acidification seems to increase the colonisation with both bacterial strains.

Apparently, none of the tested parameters led to a reduction of colonisation with both bacterial strains. To reduce the spread of ESBL- and AmpC- producing Enterobacteriaceae in conventional chicken fattening farms more targeting measures, directly addressing the gut, seem to be more meaningful approaches.

ANTIMICROBIAL ACTIVITY OF ESSENTIAL OILS AGAINST SELECTED BACTERIA ISOLATED FROM TURKEYS

Joanna Żebrowska, Dorota Witkowska

University of Warmia and Mazury in Olsztyn

ABSTRACT

In consideration of increasing resistance of pathogenic microorganisms to available antibiotics and chemotherapies administer on poultry farms, the possibility of essential oils use, as a factor that modulates microbial resistance or reduces virulence is intensively investigated. The aim of this study was to assess the antimicrobial activity of natural essential oils against to selected G- and G+ bacterial strains isolated from turkeys. The activity (against Escherichia coli, Enterococcus faecalis and Staphylococcus aureus) of 9 different concentrations (from 1.5% to 20%) of 14 oils diluted in distilled water with the addition of emulsifier (selected on the basis of own investigations) were evaluated by disk diffusion method, microdilution method and well method. 10 replications were made for each dilution and oil. Statistical summary of the results was based on MS Excel 2016 and Statistica 12 softwares. The highest antibacterial activity (+++) against Gram-negative and Gram-positive bacteria showed thyme, clove and cinnamon oils. E.coli bacteria was less sensitive (+ or ++) to basil, eucalyptus, mint, lavender and geranium oils. In contrast, Gram-positive rods were less sensitive (+ or ++) to eucalyptus and melissa oils. In addition, the study showed differences in the effectiveness of the oils used at different concentrations. Thyme oil was the most effective at a concentration of 1.5%, while clove and cinnamon oils were also effective, but at higher concentrations. The obtained results indicate that Gram-negative bacteria were more sensitive to the action of aqueous solutions of selected essential oils compared to Gram-positive bacteria. In view of the growing resistance of bacteria and the difficulty in their inactivation, the use of effective essential oils in the prevention of bacterial infections seems to be useful, prompting us to continue research concerning the sensitivity of pathogenic bacteria to essential oils.

INACTIVATION OF ESBL/AMPC-PRODUCING ESCHERICHIA COLI IN CHICKEN MANURE DURING AERATION AND ANAEROBIC DIGESTION

Corinna Thomas, Christine Idler, Christian Ammon, Christiane Herrmann, Thomas Amon

Leibniz Institute for Agricultural Engineering and Bioeconomy e.V. (ATB)

ABSTRACT

The high prevalence of extended-spectrum-β-lactamase (ESBL)-producing Escherichia (E.) coli in European broiler farms leads to the possible dissemination of antibiotic-resistant strains into the environment when using contaminated feces as organic fertilizer. The aim of the present study was to determine the effects of aerobic and

anaerobic mesophilic treatments on the survival of two artificially added ESBL/AmpC-producing *E. coli* strains during lab-scale aeration and anaerobic digestion of chicken manure.

Two-liter-reactors were filled with chicken manure and either water for the aeration trials or digestate for the anaerobic digestion to get initial dry matter contents below 5 %. All reactors were then spiked with either an ESBL-producing or an AmpC-producing *E. coli* strain, both isolated from chicken feces. The reactors were then incubated aerobically or anaerobically at 37 °C and 42 °C, and the number of *E. coli* was determined over a period of 35 days. In addition, all samples were analyzed for total ammoniacal nitrogen, volatile fatty acids (VFA) and pH.

Starting with initial levels of 107 colony forming units (cfu) per milliliter, both *E. coli* strains were below the detection limit (< 100 cfu/ml) after 35 days for both treatments and temperatures. At 37 °C, *E. coli* reduction was faster during aeration than during anaerobic digestion, while at 42 °C, there was no significant difference between treatments. Both 37 and 42 °C led to similar reduction kinetics during aeration while the 5 °C-difference led to a significantly faster reduction during anaerobic digestion. During aeration, the pH was significantly lower and the concentrations of VFA higher than during anaerobic digestion.

Aeration and anaerobic digestion of chicken manure are suitable treatments to reduce antibiotic-resistant *E. coli* in chicken manure. The results may help define time-temperature guidelines for biogas plants and aeration may be a potential solution for wastewater treatment.

INFLUENCE OF THE IMMUNE SYSTEM ON THE AIRBORNE LA-MRSA COLONIZATION OF PIGLETS

Kerstin Rosen, Friederike Ebner, Anika Friese, Uwe Roesler
Freie Universitaet Berlin

ABSTRACT

More than one decade ago, a new type of MRSA emerged in livestock. Having its main reservoir in pig farming, this so-called livestock-associated (LA)-MRSA was regularly detected in air samples. In a newly established animal model, we determined the necessary airborne MRSA concentration for persistent and transient MRSA colonized piglets. Here, we investigated possible predisposing factors for the airborne MRSA colonization - focusing on the piglets' immunological state.

Therefore, two groups of nine MRSA-negative tested piglets each were exposed to an airborne MRSA concentration of 104cfu/m³ for 24 hours in our aerosol chamber. In the previously conducted study, this airborne MRSA concentration resulted in transiently MRSA colonized piglets.

To determine a possible influence of the immune system on the MRSA colonization, one group was treated with dexamethasone (1 mg/kg body weight) at nine consecutive days for stress imitation. The other group was additionally exposed to airborne lipopolysaccharides from *E. Coli* affecting the respiratory health. During the observation period of 21 days, blood and different swab samples of the animals were taken to investigate immunological parameters and the MRSA status of the piglets. At the end of the observation period, the animals were euthanized and different tissues and organs were analyzed for the presence of MRSA.

Neither the animals of the dexamethasone treated group nor the animals of the group exposed to airborne bacterial endotoxin were longer MRSA colonized compared to the untreated control group. While the endotoxin exposure seems to not influence the MRSA status, the MRSA colonization of the dexamethasone treated group was significantly reduced.

There is some evidence that low-dose dexamethasone administration increases the clearance of MRSA. Further research is required to investigate other possible predisposing factors for MRSA colonization and the effect of low dexamethasone doses on the piglets' immune system.

AIR QUALITY IN PIG BUILDINGS: A STUDY IN 128 NURSERY ROOMS

Christelle Fablet, Fabrice Bidan, Virginie, Florent, Eric Eveno, Nicolas Rose

French Agency for Food, Environmental and Occupational Health & Safety, Unit of Epidemiology and Welfare in Pigs

ABSTRACT

A study was carried out in 128 swine herds to i) describe the air quality in nursery rooms by five parameters (temperature, humidity, respirable dust concentration, CO₂ and NH₃ levels) and ii), identify and quantify the effect of factors related on the one hand to building design, management practices and internal equipment and on the other hand, to external climatic conditions on air quality in the nursery rooms. Temperature, relative humidity, CO₂ concentration and respirable dust levels were continuously monitored over a 20-hour period in 128 nursery rooms. Ammonia concentrations were measured with a one-spot electro-chemical device. A questionnaire was filled in to collect data on hygiene measures, management, feeding practices and housing conditions in the nursery rooms selected for measuring climatic conditions. Relationships between the climatic parameters were investigated by principal component analysis and air quality levels were defined by hierarchical clustering. Multifactorial analyses were used to identify factors associated with sub-optimal air quality in 94 of the 128 nursery houses. The overall mean air temperature, relative humidity, CO₂, NH₃ and respirable dust levels were 25.7°C, 63.3%, 2162 ppm, 5.2 ppm and 0.13 mg.m⁻³ respectively in the nursery rooms. Three levels of air quality were identified by hierarchical clustering. Eleven factors were associated with sub-optimal air quality in nurseries. They may be grouped into three main areas related to external climatic conditions; building design and engineering; and building management practices. These findings should be considered when designing and developing strategies to enhance environmental conditions in pig buildings.

POSTER PRESENTATIONS

USE OF IMMUNOSTIMULANTS TO EXCLUDE ANTIBIOTICS IN BROILER POULTRY FARMING

Alexander Gorbach, Lyudmila Reznichenko

Belgorod State Agricultural University named after V. Gorin (Belgorod SAU)

ABSTRACT

The spread of antimicrobial resistance is one of the most acute problems of our time, which carries biological and economic threats for all countries, therefore the cultivation of farm animals without the use of antibiotics is an actual direction of modern science. Was first studied the effect of cycloferon and gemiv on the body of broiler chickens. It was found that these Immunostimulants increase the growth and preservation of poultry, increase the natural resistance of the body. The use of cycloferon in the absence of antibiotics in the diets of broiler chickens causes an increase in the growth of poultry and increases its safety and natural resistance, while the presence of antibiotics adversely affects the body. The optimal dose of cycloferon for broiler chickens should be considered to be 0.003 mg / kg body weight, taking into account the complete exclusion of antibiotics from the diet of poultry. The use of chickens gemiv rate of 0.4 g / kg body weight also has a growth stimulating effect and increases the phagocytic activity of pseudoadenoviral and bactericidal activity of blood serum. Recommendations on the use of cycloferon in the diets of broiler chickens with complete rejection of antibiotics are given.

GUARANTEE HYGIENIC STANDARDS FOR PREVENTION ANIMALS' DISEASES AND INCREASING THEIR PRODUCTION

Mykola Chorny¹, Oleksandr Mitrofanov¹, Olena Sherbak¹, Olga Machula¹, Yuriy Shchepetilnikov¹, Volodymyr Voronyak²

¹ Kharkiv State Zooveterinary Academy

² Lviv National University of Veterinary Medicine and Biotechnologies named after S.Z.Gzhytskiy

ABSTRACT

On the rate of non-contagious animals' diseases on there are 60 – 90 % cases of diseases. In enterprises of all farm management categories the loss of cattle farming are determined from one side non hygiene keeping, 65% of them are from technology breeding break of young, on the other hand high contamination microflora air and defending constructions On statistic case and our own observations, the basic diseases - are the disturbance of metabolism, mass diarrhea, respiratory diseases, obstetric gynecological diseases.

On pig farms diarrheas are registered, the diseases of breath organs (35–40%), the diseases of limbs, and the efficiency of application medicine is practically zero, especially in the aerostasis zones, when microbial contamination is more than 500000 COE/m³; dust pollution more than 14-20 mg/m³, ammonia concentration is more than 20 mg/m³.

Pigs of meat breed are more sensitive to hypoxia than greasy, because fabric hypoxia is registered at meat breed before breath is 18 % of oxygen, and greasy only – 14 %, it drives to immunodeficiency and decline of organism resistance.

It is noticed; those helminthiasis with diarrhea are registered at 26 – 28 % weaned piglets, sows, boars in association with respiratory diseases and exoparasites.

Pig farming losses of 20–30 % are depend on non-observing microclimate and sanitary state on farms, of 50–60 % on breeding technology, weak selection of uterine herd and manufactures.

Under modern conditions in Ukraine (not only), veterinary service is "asymmetric", it is bent into side of struggle with animals' diseases, and not into the side of their prophylaxis. None of medicines, biological active substances, stimulators do not give positive results in production, nor due scarce monotonous breeding, especially of shortage protein, none changed amino acids in the ration especially in non-infectious etiology.

EMERGENCY BIOSECURE DISPOSAL OF ANIMAL CARCASSES

Jacek Koziel

Iowa State University, Ames, USA

ABSTRACT

A review of recent research on integrated livestock housing and management systems which incorporate biosecure animal mortalities disposal will be presented. This is a critical issue for global agriculture, and particularly food security and preparedness to manage and contain outbreaks of infectious animal diseases. The talk with cover overview of eight peer-reviewed publications focused on this topic. Dr. Koziel has co-lead two projects in this area funded by Canadian and Republic of Korea governmental agencies. We have focused on developing on-farm disposal of infectious carcasses. In addition, we have developed a novel in-trench burial concept that combines forced aeration as means to accelerate decomposition and to minimize the environmental impact of emergency carcass disposal. Ultimately, developed management approaches may enable the faster return of agricultural land and animal housing to production.

AFRICAN SWINE FEVER IN POLAND – EPIDEMIOLOGICAL REPORT

Przemyslaw Cwynar, Klaudia Wlazlak

Wroclaw University of Environmental and Life Sciences

ABSTRACT

African swine fever (ASF) is a greatly virulent infection of domestic pigs and wild boars. Since the first occurrence in Georgia in 2007 the disease has spread unexpectedly to other countries finally reaching Poland, where since

2014 the spread of ASF virus was stopped in the Eastern voivodships. It should be noted that ASF notifications in Eastern European regions caused numerous of preventive actions in Polish territory in order to prevent new disease outbreaks. At the same time the ASF monitoring programme was implemented by the government estimating the buffer zones in case of ASF virus spread from Belarus or Lithuania. The study presents a historical outline of the African Swine Fever spread in Poland during the years 2014 – 2018 with a particular impact on current ASF situation and future perspectives. The first ASF virus outbreak was reported in Polish territory on February 17, 2014 and up to the end of December 2018 there were totally 3,341 cases of the disease in wild boars. The presence of ASF was also confirmed in domestic pigs, mainly in a backyard farms, but also in a large pig holdings and since the first notified case on July 19, 2014 the number of 213 confirmed outbreaks of ASF in pig farms was reported, mainly as a result of low biosecurity level. Nevertheless, there are widespread possibilities of the ASF virus transmission to other countries and present epidemiological situation in Poland has to be considered as a priority in Europe.

REMOVING AND DISPOSING THE DEAD WILD BOARS AS A FORM OF FIGHTING WITH AFRICAN SWINE FEVER. MOST FREQUENTLY PROBLEMS.

Małgorzata Bruczyńska, Izabela Czerwonka-Krajewska
District Veterinary Inspectorate in Piaseczno

ABSTRACT

Pursuant to Art. 4. 1. of the Act of 29 January 2004 on the Veterinary Inspection (Journal of Laws of 2016 item 1077), the Inspection bodies, in the performing of their tasks, cooperate with appropriate government administration bodies and local government units as well as veterinary chamber. In November 2017, the first case of African swine fever in wild boars occurred in the Piaseczno district. They were dead cadaver found at the Vistula River. In such a situation, quick response and commitment of many institutions and organizations is always important. In the Piaseczno district until June 30, 2019, 1237 cases of wild boars were found, in 972 the occurrence of the African swine fever virus was confirmed. An information campaign about the obligation to report every fall of a wild boar was ordered. An indispensable element was organizing the search of the Vistula region, and later also the entire district as a result of which 137 fallen boars were found. Hunters, volunteers and employees of the Veterinary Inspectorate in Piaseczno as well as neighboring inspectorates, the army, police and fire brigades took part in the search. In such situations it turns out that both state and volunteer fire brigades are not allowed to provide assistance in the form of auxiliary staff in securing and transferring corpses, which is a serious problem, despite the regulation in art. 19 par. 1a of the Act of 24 August 1991 on fire protection (Journal of Laws of 2017, item 736), according to which the volunteer fire service is a uniformed unit, equipped with specialized equipment, intended in particular to fight against local threats. Likewise, the police and the military are institutions that can support Veterinary Inspection only in a way that does not allow them to contact a fallen animal.

The adjustment of the Polish law turns out to be an indispensable element, so that in a situation of danger, an example of which is the occurrence of ASF, one could count on the cooperation of many services according to their competences. It is important to adjust the law in a clear manner so that the poviats veterinary officer can act effectively and that he can be sure he works and allocates finances to fight infectious disease in accordance with the letter of law.

ISSUES RELATED TO SAFETY OF MILK PRODUCED ON ORGANIC FARMS

Nada Sasakova¹, Jan Venglovsky¹, Ingrid Papajova², Daniela Takáčová¹, Gabriela Gregova¹, Tatiana Szaboova¹, Eva Holotova¹

¹University of Veterinary Medicine and Pharmacy in Kosice

²Parasitological Institute of the Slovak Academy of Sciences

ABSTRACT

The personnel on organic cattle farms must ensure thorough observation of legislative provisions regarding cleaning and sanitation processes during primary milk production to avoid the risk of its contamination that can affect the safety of the final products.

The aim of the study was to examine drinking water from an individual source supplying water for agricultural farm, which must comply with the requirements of the Governmental Order of the Slovak Republic No. 296/2010 of the Code, stipulating requirements on drinking water and examination of drinking water.

Within the physico-chemical examination of collected water samples, we determined the relevant chemical parameters which may indicate pollution of water and eventually cause health problems.

Bacteriological examination involved determination of CFU of microorganisms characterising general pollution of water and determination of *E. coli* and enterococci which indicate contamination of water by excrements. Regular monitoring and disinfection is essential for ensuring good quality of drinking water. All the measures important for good quality of water in primary milk production should be observed to ensure safety and quality of milk and milk products.

Microbiological examination of milking equipment (teat liners) showed the importance of its disinfection as the sanitation with suitable disinfectants can affect considerably the counts of microorganisms in milk. Analysis of swabs taken from teat liners showed an increase in counts of CFU with every subsequently milked cow.

INTRODUCTION

Organic farming as a part of sustainable agricultural practice allows one to avoid unreasonable costs and reduce energy requirements. The main objectives of organic dairy farms do not include reaching high milk yields. Instead, these farms aim to ensure longevity of dairy cows.

Organic milk production is based on availability of pasture, support of cow's good health and welfare, improved quality

of milk and reduction of the ecological trace of cow rearing. Decreased stress and healthier green fodder increase the longevity of cows and improve nutrient value of milk. Production performance of dairy cows is essentially affected by genetics but their nutrition and health also play an important role. As far as the rearing of dairy cows is concerned, the farmers focus mostly on nutrition of these animals as it plays an important role in their productive abilities [1, 2]. The quality of milk, its safety and nutrition value is affected by many factors. One of them is the process of milking that must ensure minimization of undesirable contaminating microbiota [5].

Technological-biological processes during primary milk production comprise a set of measures and factors that considerably affect the quality of milk and effectiveness of its production.

After machine milking, water soluble substances must be eliminated from the milking equipment, such as milk sugar and minerals. This can be achieved already by first rinsing with lukewarm water. Then alkaline solutions of temperature 40–70°C will dissolve albumins and casein. The higher concentrations of alkaline solutions are used the more rapid dissolution is expected. Alternation of alkaline and acidic preparations is a common practice that helps to reduce development of resistance of microorganisms. Moreover, acidic preparations are effective in removal of milk and water stone [3].

The aim of our study was to determine the quality of drinking water used on the relevant farm and the efficiency of disinfection by preparation Iodonal. This was achieved by taking swabs from teat liners and examining them for relevant bacterial counts.

MATERIAL AND METHODS

Investigations were carried out in spring, summer and autumn of the same year on an organic farm keeping cattle and sheep, focusing on the hygiene of milk from cows. This farm was located in the area exposed to a very low anthropogenic pollution. The quality of water obtained from an individual source used on this farm was investigated from the physico-chemical and microbiological points of view. All results were compared with the provisions of the Governmental order of the Slovak Republic No. 496/2010 of the Code on requirements on drinking water and examination of drinking water [6]. Samples of water were collected in individual seasons on farm premises (drinkers in animal houses, water taps, hoses for rinsing hands and cow udders).

Within the physico-chemical examination of water samples we determined the relevant chemical parameters (pH, ammonium ions, nitrites, nitrates, free chlorine, chlorides, phosphates, COD, oxygen saturation and hardness), which may indicate pollution of water, even cause health problems or affect the quality of milk during its primary production (milking).

Bacteriological examination of water involved determination of CFU of microorganisms characterising general pollution of water (BC22 and BC37), and determination of *E. coli* and enterococci which indicates potential contamination of water by excrements (gastrointestinal tract of animals and people) or runoff

Bacteriological swabs were taken from teat liners during milking and examined for counts of coliform bacteria (CB) and bacteria cultivated at 37 °C (BC37). The first swab was taken from teat liners before milking the first cow and the following swabs were taken after milking the first cow and each of subsequent five cows. The teat liners were not disinfected between the cows. Before milking, the teats of each cow were wiped with a cloth dipped in a disinfectant Iodonal 2% solution. The same solution was used throughout the milking of all six cows and was not changed after each cow.

Table 1. Results of microbiological examination of teat liners

Sample collection	Samples	Parameter	
		CB (CFU/10 cm ²)	BC37 (CFU/10 cm ²)
Spring	0	0	0
	1	1 x 10 ²	1.5 x 10 ³
	2	2.3 x 10 ²	3.5 x 10 ³
	3	3.2 x 10 ²	2.9. 10 ³
	4	4 x 10 ²	5. 1 x 10 ²
	5	4.3 x 10 ²	9.8 x 10 ²
Summer	0	0	0
	1	1,1. 10 ²	1,2.10 ⁴
	2	NC	NC
	3	2,5. 10 ²	2,9.10 ⁴
	4	NC	NC
	5	NC	NC
Autumn	0	0	0
	1	2,1. 10 ²	2,1. 10 ²
	2	3,1.10 ³	2. 10 ³
	3	9,2. 10 ³	5.10 ²
	4	4,6. 10 ³	7.10 ²
	5	8,4. 10 ³	1,7. 10 ³
	6	NP	2,9.10 ⁴

0 – swab before milking; 1–6 – swabs from 6 subsequently milked cows;
CB – coliform bacteria; BC37 – bacteria cultivated at 37°C; NC – non-countable

RESULTS AND DISCUSSION

Evaluation of results of physico-chemical examination of drinking water from the individual water source (well) showed that limits for COD were exceeded, particularly in summer, indicating pollution of water with organic substances. The legislative limits for *E. coli* and enterococci in drinking water were exceeded particularly in the samples from drinkers in the animal houses and occasionally also in water used in the milking parlour, tap water and in the source itself. This indicated some risk of potential faecal contamination of water that can affect quality of milk and contribute to transfer of diseases.

We also took swabs from teat liners before and during milking (Table 1). The bacterial counts in these swabs increased as the milking equipment was used for subsequent cows.

Besides potential transfer of pathogens from one udder to another, colonization of the teat liners with microorganisms can cause deterioration of the quality of milk. On the investigated farm, the udders of 6 subsequently milked cows were cleaned with the same cloth dipped in a disinfectant solution. This is not an optimum practice as using of individual towels ensures better hygiene of the udder [4]. In general, it is recommended to wipe the udder with disposable paper towels saturated with disinfectant of correct concentration and never use the same towel for more than one cow. In case of textile towels, one towel should not be used for more than 5 cows but there is still the risk of unstable concentration of the disinfectant and transfer of mastitis causing agents.

CONCLUSIONS

Results of our study point to the importance of regular monitoring and prevention of contamination of drinking water on dairy farms and thorough cleaning and disinfection during milking. Contaminated milking equipment can result in deterioration of the quality of milk and transfer of mastitis and other disease agents from one cow to another with some serious economic and health consequences.

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INCREASING OF MILK PRODUCTION BY EVAPORATIVE COOLING IN DAIRY COWS

Jan Broucek¹, Stefan Ryba², Marta Dianova³, Michal Uhrincat¹, Miloslav Soch⁴, Lubos Zabransky⁴

¹National Agricultural and Food Centre, RIAP Nitra, Slovakia

²Ministry of Agriculture and Rural Development, Bratislava, Slovakia

³The Breeding Services of the Slovak Republic, Bratislava, Slovakia

⁴South Bohemia University, Ceske Budejovice, Czech Republic

ABSTRACT

The purpose of the study was to demonstrate the effect of high temperatures and a mitigation technique on milk production of dairy cows in southern Slovakia in 2015. The hypothesis was tested whether the milk yield is influenced by evaporative cooling (fogger and fan) of the animal house air. Production data of 227,500 test-day records from 34 Holstein breed herds situated in lowlands (115 m to 150 m above sea level) and kept in free-stall housing. The first group of cows (19 herds) was cooled using evaporative and mechanical ventilation; the animals in the second group (15 herds) were cooled using only mechanical ventilation (automatically controlled fans in housing and feeding areas). During the period from May to September, 36 summer and 22 tropical days were recorded, 37 days had a mean temperature-humidity index (THI) value above 72.0, while on 34 days we recorded mean THI values above 78.0. Dairy cows cooled by fans with water foggers produced significantly more milk than cows cooled only with forced ventilation (9,650.4 kg vs 8,528.0 kg; $P < 0.001$). Fat and protein production differed also significantly (364.0 kg vs 329.5 kg, $P < 0.001$; 312.2 kg vs 279.7 kg, $P < 0.001$). It can be concluded that heat stress can cause significant production reduction. Evaporative cooling combined with air movement is a very good protection against heat stress.

INTRODUCTION

Heat stress in dairy cows has long been recognized as having significant negative impacts on milk production, and therefore is a substantial economic cost to dairy producers. Periods of heat stress mostly occur between June and September in Slovakia. When subjected to heat stress, cows respond by reducing their feed intake, changes occur in their endocrine status, there's a reduction in rumination and nutrient absorption, and increased maintenance requirements, resulting in a decreasing availability of nutrients for production and subsequent losses in body weight or milk yield [11,18].

The temperature-humidity index (THI) which is a combination of ambient temperature and humidity is a way to determine the degree of heat stress for lactating cows [2].

Evaporative cooling decreases body temperature and respiration rate of dairy cows [14, 17, 6] and improves feed intake and milk yield [13, 7].

The main evaporative cooling methods currently used are sprinkling, cooling pads with fans, and fog [1]. According to Fournel et al. [9], the THI in the barn with foggers was slightly lower compared with the other treatments, resulting in lower body temperatures of cows. Dairy cows are chilled as cooled air is blown over their bodies and as they inspire cooled air [12, 16].

MATERIAL AND METHODS

Production data included 227,500 test-day records belonging to 34 Holstein breed herds (free-stall housing) situated in lowlands of southern Slovakia. Herds (size from 220 to 860 heads) were allotted into two groups according to manner of cooling. The first group of cows (19 herds) was cooled evaporatively (foggers and mechanical ventilation), while the second group (15 herds) was cooled using only mechanical ventilation without evaporative cooling (automatically controlled fans in housing and feeding areas).

Meteorological data were recorded continuously at each farm by electronic probes, which were positioned at animal height (inside of barn) and connected to a data logger. The temperature-humidity index (THI) was calculated as proposed by Nienaber et al. [15] by combining maximum temperature (in °C) and average relative humidity (%). The number of summer days (maximum daytime temperature above 25.0°C) and tropical days (maximum temperature above 30.0°C) from 24 h records were determined.

The first group of cows was evaporative cooled by water fogger cooling equipment installed in the housing and feeding areas. The equipment was activated automatically when the ambient temperature exceeded 25.0°C and ran continuously as long as this temperature lasted. The forced ventilation systems were also activated when the ambient temperature reached 25°C. The second group of cows was cooled using only forced ventilation (automatically controlled fans without misting in housing and feeding areas).

All selected herds had TMR from good quality components, with a similar nutritive value, feeding twice a day and according to lactation stage. Individual milk yields were recorded once per month for a morning and evening milking over the period from January through December by Tru-tests.

The data were analyzed using a General Linear Model ANOVA by the statistical package STATISTIX, Version 10.0.

RESULTS AND DISCUSSION

During the period from May to September, 36 summer and 22 tropical days were recorded; 37 days had a mean THI value above 72.0, while on 34 days we recorded mean THI values above 78.0.

From primiparous cows, evaporative-cooled cows produced more milk than cows cooled with fans only (8,528.7±83.9 kg vs. 7,807.3±69.8 kg; $P<0.001$). Evaporative cooling of dairy cows increased the amount of produced fat and protein (323.9±3.1 kg vs. 300.2±3.2 kg, $P<0.001$; 276.8±2.53 kg vs. 256.6±2.1 kg, $P<0.001$), while the milk fat and protein contents were higher for cows cooled only with fans than for evaporative cooled dairy cows (3.79±0.02% vs. 3.85±0.02%; $P<0.05$; 3.24±0.01% vs. 3.29±0.01%; $P<0.01$).

Multiparous dairy cows cooled by fans with water foggers produced significantly more milk than cows cooled only with forced ventilation (9,650.4±83.5 kg vs 8,528.0±84.6 kg; $P<0.001$). Fat and protein production differed also significantly (364.0±3.08 kg vs 329.5±3.3 kg, $P<0.001$; 312.2±2.4 kg vs 279.7±2.4 kg, $P<0.001$). Differences were also recorded in the evaluation of fat and protein contents (3.78±0.02% vs. 3.87±0.02%, $P<0.01$; 3.24±0.01% vs. 3.28±0.01%; $P<0.001$).

Results suggest that dairy cattle, when given the opportunity, will make considerable use of a fogger to reduce heat load. These effects were more pronounced among higher-parity cows compared with primiparous cows. Compared to cows cooled on with fans, primiparous dairy cows increased production by 9.2%, while older dairy cows increased by 13.6%. However, each cooling system and type of barn construction has both advantages and disadvantages. When relative humidity approaches 100% at night, the effectiveness of evaporative cooling is greatly reduced. According to Bucklin et al. [5], sprinkling systems can also continue to provide sensible cooling; however, providing comfortable environmental conditions for cows housed in an area with hot, humid climates is difficult using only evaporative cooling and ventilation.

When a high thermal gradient exists, heat is readily transferred from the cow to the surrounding environment [4, 10]. However, as summer temperatures rise to 25°C and above, the gradient is too small to effectively cool cows by non-evaporative means. During these conditions, evaporative cooling is most effective at keeping cows comfortable [3, 8].

We assume that the observed Slovakian summer conditions with 34 days recorded mean values above 78.0 could cause temporal discomfort and that provision of evaporative cooling to prevent this can be very useful.

CONCLUSIONS

The milk yield reduction is in a close relationship with maximum daily temperature and THI. Therefore, appropriate housing facilities and equipment to protect dairy cows from climatic extremes have significant importance in maintaining of production. We can affirm that dairy cows cooled by fans with water foggers produced significantly more milk than cows cooled only with forced ventilation.

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BARN CLIMATE AND HYGIENE IN TWO DIFFERENT HOUSING SYSTEMS FOR FATTENING RABBITS

Sarah Kimm, Sally Rauterberg, Nicole Kemper, Michaela Fels

Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour,
University of Veterinary Medicine Hannover, Foundation, Germany

ABSTRACT

Gases, dust and odour from animal farming influence climate, animal welfare and human health. Knowledge about formation and emission of those substances is important, but underrepresented in rabbit farming. In the present study, a novel (NO) and a conventional (CO) rabbit housing system were investigated concerning barn climate and floor hygiene. In CO about 176 rabbits per batch were kept in wire cages with wire mesh floor, where the excrements were collected in slurry pits and removed at the end of each batch. In NO, about 240 rabbits were housed in pens on 11 mm slatted plastic floor and the system was daily cleaned from excrements by a conveyer belt. Two times per batch, barn climate was measured and floor cleanliness was scored from 0 (clean and dry) to 3 (dirty and wet). Emissions in NO were measured for one week continuously per batch. The concentrations of harmful gases were higher in CO than in NO (NH₃: 5.7 ppm vs 2.3 ppm; CO₂: 1038.8 ppm vs 921.8 ppm). Emission rates (ER) per livestock unit (LU) of NH₃, CO₂, dust and odour were 5.1 g LU-1h-1, 2559.4 g LU-1h-1, 0.3 g LU-1h-1 and 48.1 OU LU-1s-1 on average. Concerning floor cleanliness, in CO score 1 was assigned significantly more often ($p < 0.05$) than score 2 and 3, while results for NO were contrary to that. The development of harmful gases was lower in NO, although floors were less clean. Harmful gases were in a low range and did not reach (legally) prescribed limit values, nevertheless could be reduced by removing excrements daily.

INTRODUCTION

Emissions from livestock can disturb the ecological balance and impair animal and human health. In order to assess the risk posed by livestock buildings, it is essential to gain knowledge about the production and emission of harmful gases by farm animals. Extensive data is available on cattle, pig and poultry housing [7], but little is known about the rabbit's contribution to emissions from livestock. The aim of this study was to compare two housing systems concerning barn climate and floor hygiene and to characterize the emission load of rabbit farming.

ANIMALS, MATERIAL AND METHODS

The study was carried out in five batches on a rabbit farm in northern Germany where fattening rabbits (HYPLUS PS 19 x PS 59, HYPHARM S.A.S.) were kept in two different housing systems located in two different buildings with forced ventilation. The animals were kept there from the 31st to 78th day of life. A total of 176 fattening places were available in a conventional housing system (CO) where the animals were kept in wire cages with wire mesh floors. The excrements were collected in slurry pits which were cleaned after the end of a fattening cycle. In a novel housing system (NO), 260 fattening places were available in pens with perforated plastic floor (11 mm slats). The excrements were removed daily by a conveyer belt. The animals were fed ad libitum with hay and pelleted feed and had unrestricted access to water. NH₃ and CO₂ were measured twice per batch (21st and 46st fattening

day) in the immediate vicinity of the animals by means of a mobile gas measuring instrument (Dräger X-am 5000, Dräger, Germany). Temperature and air humidity were measured with a data logger (PCE-THB 40, PCE Instruments, Germany). On the same days the cleanliness of the floors was scored as well by a scoring system from 0 (clean and dry) to 3 (dirty and wet). Emission measurements were carried out in NO over three batches in different seasons (summer, autumn, winter). The measurements were taken on an exhaust air shaft ($d=0,5$) at a height of 2.5 m after the measuring fan and 4 m before the exhaust outlet. NH₃ and CO₂ were measured continuously by use of a Fourier transform infrared spectrometer (Gasmeter DX 4015, Temet Instruments, Finland) over a period of two weeks per batch according to DIN EN 15259 [4]. Additionally, at the beginning and the end of each measuring week, dust and odour were collected. The total dust measurement was carried out by gravimetric determination of the dust load according to VDI 2066-1 [9] and DIN EN 13284-1 [2] with an isokinetic sampling system with plan filter device (Paul Gothe, Germany). Odour emissions were measured by dynamic olfactometry according to DIN EN 13725 [3] using an olfactometer T08 (Ecoma GmbH, Germany). The volume flow was measured by a Fancom ATM 50 throttling and measuring unit (Fancom BV, The Netherlands) in the exhaust air shaft, the indoor temperature by a temperature sensor (Fancom FS.7, Fancom BV, The Netherlands) at animal height, the outdoor temperature by an outdoor temperature sensor (Fancom SM.7, Fancom BV, The Netherlands) on the north side of the barn and the humidity by a humidity sensor (Dol-104, DOL-sensors, Denmark). With the measured concentrations and the volume flow emissions per LU were calculated. Statistical analysis was carried out using the software IBM SPSS Statistics, version 24. A chi-square test was performed to test the frequency distribution of the floor hygiene in the housing systems.

RESULTS AND DISCUSSION

On day 21, the mean concentrations of CO₂ and NH₃ were as follows: 950 ppm CO₂ and 1.87 ppm NH₃ in NO, and 1050 ppm CO₂ and 2.3 ppm NH₃ in CO. On the 46th fattening day the mean concentrations increased in both systems: 1187.5 ppm CO₂ and 3.3 ppm NH₃ in NO and 1216.7 ppm CO₂ and 5.4 ppm NH₃ in CO. The temperature averaged at 15.4 °C (NO) and 16.2 °C (CO) and the relative air humidity in both housing systems was between 63 % and 84 %. Regarding floor hygiene scores 2 and 3 were more often assigned in NO than in CO (83.3 % vs 12.9 %, $p<0.05$), while score 0 and 1 were detected more often in CO than in NO (16.7 % vs 87.1 %, $p<0.05$). Emission rates (ER) related to livestock unit (LU) are shown in Fig.1 for different seasons. During the entire measuring period, the ER obtained average values of 5.1 g NH₃ LU⁻¹ h⁻¹, 2559.4 g CO₂ LU⁻¹ h⁻¹, 48.1 OU odour LU⁻¹ s⁻¹ and 0.3 g dust LU⁻¹ h⁻¹. The indoor and outdoor temperatures were 19.3 °C and 17.5 °C in summer, 12.9 °C and 7.2 °C in autumn and 10.3 °C and 0.9 °C in winter.

and outdoor temperatures were 19.3 °C and 17.5 °C in summer, 12.9 °C and 7.2 °C in autumn and 10.3 °C and 0.9 °C in winter.

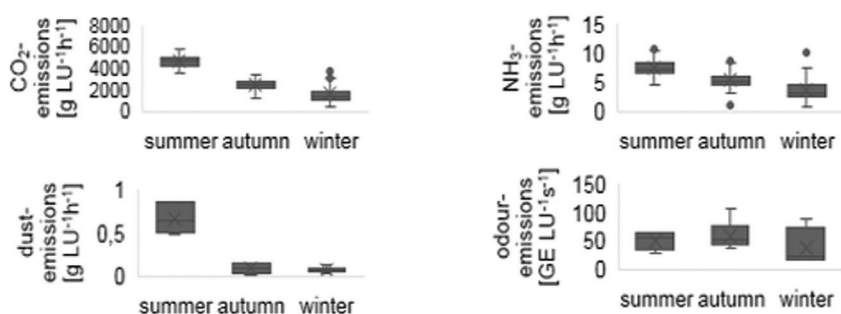


Fig.1 CO₂-, NH₃-, dust-, and odour-emissions per LU and hour in different seasons of the year. Mean concentrations are displayed as x.

Although less animals were kept in CO, the concentrations of NH₃ and CO₂ were higher in CO than in NO at similar temperature and air humidity. The formation of NH₃ occurs on excrement-contaminated surfaces by urease-forming bacteria. [7]. Due to the daily presence of urine and faeces in slurry pits in CO, NH₃ could accumulate in higher concentrations than in NO. Furthermore, the higher CO₂ concentration in CO can be caused by a worse ventilation flow compared to NO. Since in CO manure was not removed until the end of the housing period, NH₃-concentration increased with time [7]. Despite daily removal of the excrements in NO, the NH₃-concentration increased there over time as well due to increasing floor soiling [8]. Excrements remaining on the 11 mm floor represented an emission source for NH₃. The increase of CO₂- concentrations in both housing systems was probably caused by the increasing metabolic rate with increasing body weights of rabbits at constant ventilation rate [5]. However, the concentrations of harmful gases in both housing systems were below prescribed limits for farm animals (NH₃: 10 ppm, CO₂: 3000 ppm). The highest average emission per LU of dust, NH₃ and CO₂ was found in summer while the lowest emission was detected in winter. The higher air flow rate in summer compared to the winter promoted the escape of metabolic metabolites and dust from the barn and supported the release of NH₃ from faeces-contaminated surfaces [7]. No clear seasonal effects of odour were determined with the present data, however it has to be taken into account that odour measurements are influenced by subjective sample evaluations [1]. Compared to other animals was the NH₃ ER for rabbits high. This is likely due to alkalinity of rabbits' urine (pH>8) [6], which increases the pH dependent release of NH₃ out of excrements [7]. With NH₃ as a main odour source [7], also high odour ER was found for rabbits. Furthermore, the high CO₂ ER could be interpreted as a sign for high metabolic intensity in rabbits [5]. Despite the high ER of rabbits, the total emissions from the rabbit barn were low due to their low body weight. To reach for example the NH₃-emission of a barn with 600 cows assuming 500 kg body weight per animal (240 mg NH₃ h⁻¹ animal⁻¹) [7]

around 7800 rabbits with 2-3 kg per animal (18 mg NH₃ h⁻¹ animal⁻¹) would be necessary.

CONCLUSIONS

Both systems, the daily removal of excrements and the collection in slurry pits did not lead to health-endangering values of harmful gases in rabbit farming. However concentrations of harmful gases were reduced by removing the excrements daily. Slatted floors can be a source of NH₃ if there is no efficient faeces and urine drain. ER per LU from rabbits were higher than for cows or pigs and should not be neglected, but the total impact of emissions on the environment was low compared to other farm animals.

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MICROBIOLOGICAL SELECTION BY TEAT DISINFECTION - IMPLICATIONS FOR UDDER HEALTH AND THE SPREAD OF RESISTANT BACTERIA

Julia Anna Schwenker, Julia Louisa Tetens, Christina Hölzel

Institute of Animal Breeding and Husbandry, Department of Animal Health and Animal Hygiene, University of Kiel

ABSTRACT

Bovine Mastitis is an intramammary infection (IMI) of the mammary gland and is one of the major health problems in dairy herds. To prevent new IMI, teat disinfection has been successfully used – particularly for environmental mastitis pathogens. Teat disinfectant is mostly applied after the milking process, when the teat canal sphincter is still open. Post-milking teat disinfection has been shown to reduce bacterial colonizers, such as *Streptococcus uberis* and Coagulase-negative staphylococci on teat skin and lead to a significant lower prevalence of mastitis rates. However, it is discussed that teat disinfectants could select bacteria; thus, shifts in microbiome are conceivable. Furthermore, this selection could foster the spread of antibiotic-resistant bacteria, if tolerance to both kinds of agents is linked. The aim of our study is to get insights into the interaction of microbiome and mastitis and to get new information about efficacy and possible side effects of teat disinfectants. For this purpose, individual quarter foremilk samples and swabs will be taken to receive a status quo of the present microbiome and the prevalence of mastitis pathogens. To determine the bacterial population samples are examined by cultural and molecular microbiome analyses. Additionally, teat disinfectants and antibiotics are tested in order to assess minimum inhibitory concentration (MIC) *in vitro*. First results showed that there is a possible selection as bacteria species and strains differ in their MIC values so that they might be differentially selected by teat disinfectants. In the main experiment, using a split udder design, three different disinfectant strategies are examined in a longterm-cohort study. Sampling starts 8 weeks before dry-off and keeps on until day 120 of lactation. Status quo and first results of the main experiment will be presented.

SEASONAL IMPACT ON FUNGAL CONTAMINATION OF POULTRY LITTER

Mario Ostović¹, Ivica Ravić², Matija Kovačić³, Anamaria Ekert Kabalin¹, Kristina Matković¹, Ivana Sabolek¹, Željko Pavičić¹, Sven Menčik¹, Danijela Horvatek Tomić¹

¹Faculty of Veterinary Medicine, University of Zagreb, Zagreb

²Veterinary Department, Mostar

³Kovačić Family Farm, Sopron, Kalnik

ABSTRACT

In this study, fungal contamination of poultry litter was compared between different seasons. The study was conducted in a broiler house under commercial production conditions during 5-week production cycle in warm (July-August) and cold (December-January) periods of the year. During each cycle, there were 18,000 broilers of Ross hybrid kept in the house on deep litter containing chopped straw and sawdust, with stocking density up to 33 kg/

m2. Concentration and composition of fungi were investigated weekly, along with litter temperature, moisture and pH. Study results revealed the litter concentration of fungi to have significantly increased ($P < 0.05$) with weeks of fattening period in both seasons, with no significant between-season difference in the mean concentrations. Season had no significant effect on the mean yeast concentration, which showed highest concentration in both seasons. Of the moulds identified, there was no significant seasonal difference in the mean concentration of *Cladosporium* sp., *Fusarium* sp. and *Rhizopus* sp.; yet, the litter concentration of *Aspergillus* sp. was significantly higher in warm season, and that of *Mucor* sp. and *Penicillium* sp. in cold season ($P < 0.001$ all). Fungal concentration showed high positive correlation with litter temperature, moisture and pH ($P < 0.05$ all). The results obtained suggested seasonal impact on fungal composition of poultry litter. Moreover, these results can prove useful on assessing the potential adverse health effect of fungi on both animals and humans working in poultry farming.

ANTIBIOTIC RESISTANCE PROFILE OF E. COLI ON CATTLE FARMS

Tatiana Szabóová, Gabriela Gregová, Jan Venglovský, Nada Sasáková, Ingrid Mindžáková
University of Veterinary Medicine and Pharmacy in Košice,
Košice, Slovak Republic

ABSTRACT

The aim of the study was to detect and monitor the antibiotic resistance of *E. coli* strains isolated from faeces (different age categories: calves in milk nutrition; calves in vegetable nutrition; dairy cows; cows in calving period) on cattle farm. After the confirmation and identification of *E. coli* strains isolated from excrements, we focused on the detection of minimal inhibitory concentrations (MIC) for 19 tested antibiotics. Of all *E. coli* isolates, the highest percentage level (35 % of strains) of antibiotic resistance was detected for streptomycin. This was followed by resistance of *E. coli* to neomycin (27.5 %), ampicillin 25%, but also to gentamicin (22 %). Antibiotic resistance of *E. coli* to cephalosporins (cefotaxime resistance) and fluoroquinolones was detected only in samples from calves in milk nutrition and vegetable nutrition. In conclusion, the obtained results of the presence of antibiotic-resistant bacteria on cattle farm indicate risks to humans and other animal species.

INTRODUCTION

Resistance to antibiotics, particularly to third-generation cephalosporins, beta-lactam antibiotics and fluoroquinolones, is a major issue for animal and human health. Knowledge of the prevalence of resistant bacteria in all categories of cattle is an important factor for estimation of the related risk to food production chain and the exposure of the human population [2]. The first *E. coli* isolate producing extended-spectrum beta-lactamases originated from a cattle farm in Germany. This finding was reported by Guerra et al. (2007) [5].

E. coli acquire ESBL by mutation or by plasmid-mediated horizontal gene transfer, which results in resistance to oxyimino-cephalosporins. For example, the ESBL enzymes of the TEM and SHV families are mutant derivatives of established plasmid-mediated β -lactamases, the ESBL enzymes of the CTX-M family, however, are acquired from environmental bacteria [6].

In the last years, the spread of β -lactamases, and especially the enzymes of the CTX-M type, has rapidly emerged. Before the year 2000, most reports of infections with ESBL-producing Enterobacteriaceae concerned TEM and SHV and occurred in hospitals; currently CTX-M is the most dominant type found not only in humans but also on a cattle farm [3].

MATERIAL AND METHODS

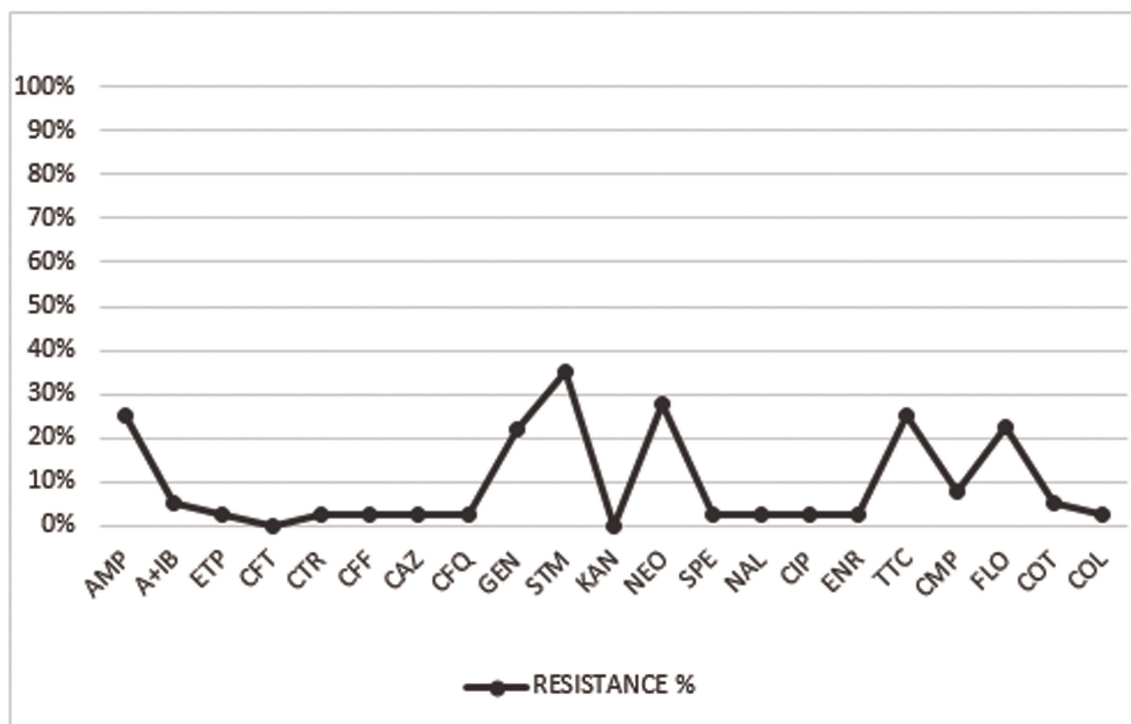
The main aim of our study was to investigate antibiotic resistance and ESBLs production in *E. coli* isolated from excrements collected on cattle farm. In the first stage, we identified the relevant bacteria present in excrements of cattle. Each sample was inoculated and multiplied in buffered peptone water (Oxoid, Basingstoke, United Kingdom). Identification of bacteria was carried out by a cultivation on MacConkey agar overnight at 37°C and Uriselect. The second way of identification of bacteria was performed by a Maldi Tof biotyper.

Our study was mainly focused on the detection of minimal inhibitory concentrations (MIC) of *E. coli* strains isolated from excrements of all categories of cattle (calves in milk nutrition, calves in vegetable nutrition, dairy cows and cows in a calving period), which subsequently pass to the environment. At each sampling, all faecal *E. coli* isolates from excrements of calves, dairy cows and cows in the calving period were analysed for antibiotic susceptibility to 19 antibiotics using a commercially modified NCCLS microdilution method.

Minimal inhibitory concentrations (MIC) were determined according to CLSI 2018: VET01-S2 [1]. The antibiotics, which were in a panel followed in a subsequent order: ampicillin (AMP); ampicillin+sulbactam (A+Ib); ceftiofur (CFF); ceftriaxone (CTR); ceftazidime (CAZ); cefquinome (CFQ); kanamycin (KAN); gentamicin (GEN); streptomycin (STM); neomycin (NEO); spectinomycin (SPE); nalidixic acid (NAL); enrofloxacin (ENR); ciprofloxacin (CIP); chloramphenicol (CMP); florphenicol (FLO); tetracycline (TTC); colistin (COL); trimethoprim+sulphonamide (COT). The MIC test results were read by means of a scanner and a digital analysis software MIDITECH [4]. By means of relevant software we also evaluated percentage proportions of resistance mechanisms.

RESULTS AND DISCUSSION

Escherichia coli resistant to ampicillin, streptomycin and gentamicin were frequently isolated from the samples of excrements. Of all tested *E. coli* isolates (19 antibiotics), the highest percentage of antibiotic resistance was found for streptomycin (35% of strains). Also relatively high percentages of resistance of the tested *E. coli* strains were detected for the following antibiotics: neomycin 27.5%, in the representative of the beta-lactam antibiotics of the penicillin group – ampicillin 25%, gentamicin 22%. Very common problem is also occurrence of resistance in *E. coli* bacteria to another group of beta-lactam antibiotics – cephalosporins (2.5% of strains). The European Center for Disease Prevention and Control (ECDC) reported that beta-lactam antibiotics - penicillins and cephalosporins have been the most widely used therapy in Slovakia [2]. *E. coli* resistance to carbapenem antibiotics is not yet widespread, but our tests revealed resistance in 2.5% of isolates. Antibiotic resistance of *E. coli* to fluoroquinolones



(enrofloxacin and ciprofloxacin) was found in 2.5% of the samples. However, resistance of *E. coli* to cephalosporins and fluoroquinolones was detected in samples from calves in milk and vegetable nutrition but not in adult cattle - dairy cows and cows in the calving period. The percentage of *E. coli* resistance to the antibiotics tested is shown in Fig. 1. Increased attention was paid to the prevalence of ESBL- extended spectrum beta-lactamases the presence of which was demonstrated phenotypically in most isolates. In our study, phenotypic analysis more often showed also the presence of TEM and SHV beta-lactamases. ESBL-positive isolates contained beta-lactamase resistance of the CTX-M type. This significant CTX-M type of resistance was demonstrated in 2.5% *E. coli* strains only in calves in milk and vegetable nutrition but not in adult cattle. Compared to another study, cefotaxime-resistant *E. coli* was found in a high proportion in beef and dairy cattle units (70% and 85%, respectively) [7].

CONCLUSIONS

Antimicrobial resistance (AMR) is one of the major challenges the world is facing nowadays. Indeed, the acquired resistance to some antimicrobials is already widespread to such an extent that their value for the treatment of certain life-threatening infections is already compromised.

In conclusion, the obtained results indicate importance of monitoring of the presence of antibiotic-resistant bacteria that may present serious risk to humans and animals. Detection of CTX-M-producing *E. coli* in cattle faeces raises important questions as far as public health is concerned.

ACKNOWLEDGMENT

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DIFFERENTIATION OF SPECIES OF MYCOPLASMA SPP. ISOLATED FROM CLINICAL CASES OF BOVINE MASTITIS AND BULK TANK MILK

Bruna Churocof Lopes, Helio Langoni

FMVZ UNESP - Universidade Estadual Paulista

ABSTRACT

Mastitis is the main condition affecting livestock destined for milk production, which causes losses to the producer and industry. It is a multifactorial disease of multiple etiology including microorganisms such as bacteria, viruses, fungi, yeasts, and algae. Among the bacterial micro-organisms the most important are coagulase-positive staphylococci (CPS) including *Staphylococcus aureus* and negative staphylococci (CNS), *Corynebacterium bovis* and *Streptococcus* spp. are contagious agents with high infectivity. *Mycoplasma* spp. are also an important contagious microorganism related to mastitis, particularly *M. bovis*, *M. californicum* and *M. bovigenitalium* all are considered important pathogens in other countries (Kobayashi, 1998), however, less studied in Brazil. Due to the high degree of contagiousness of the agent and the economic aspects, it is important to monitor the occurrence of mastitis caused by *Mycoplasma* spp, as well as the differentiation of the species involved and adoption of disease prevention and control measures in the property. The objective of the present study is to evaluate the presence of the Mollicutes class and to perform the species differentiation in milk samples from cows with clinical mastitis and, as a screening, for milk samples from bulk tanks milk (subclinical mastitis) by molecular techniques as PCR and microbial cultivation of positive samples in the PCR and genetic sequencing of the isolates. Until now were processed 450 milk samples from clinical mastitis from four properties from Sao Paulo state and five from Minas Gerais state beyond 30 samples from bulk tanks milk of the same properties. Until the moment, all evaluated samples were negative for Mollicutes class. The study continues until 2019 to evaluate a higher number of samples.

ANTIMICROBIAL RESISTANCE FOR STREPTOCOCCUS DYSGALACTIAE AND STREPTOCOCCUS UBERIS ISOLATED FROM CLINICAL MASTITIS IN BRAZIL

Simone Lucheis¹, Felipe Guimarães², Samea Joaquim³, Gustavo Moraes⁴, Helio Langoni⁵

¹Paulista Agency of Agribusiness Technology – APTA, Bauru, Brazil;

²Department of Veterinary Hygiene and Public Health, São Paulo State University, Botucatu, Brazil

ABSTRACT

This study aimed to identify *Streptococcus uberis* (*S. uberis*) and *Streptococcus agalactiae* (*S. agalactiae*) isolated from bovine clinical mastitis cases from different dairy farms in the state of Sao Paulo, Brazil and establish the antimicrobial profile using nine commercially available antibiotic disks by Kirby-Bauer disk diffusion method. Identification of *Streptococcus* spp. was performed using conventional microbiology.

INTRODUCTION

Bovine mastitis is considered to be one of the most economically important diseases in the dairy industry [8], due to reduced milk production and lower milk quality, increased cost of labor, drugs, and veterinary services. The *Streptococcus* spp., including *Streptococcus agalactiae* (*S. agalactiae*) and *Streptococcus uberis* (*S. uberis*), are major mastitis pathogens in the dairy industry worldwide [12].

Many species in the cow environment belong to the group of environmental udder pathogens, including major Gram-positive species, such as *S. uberis* and *S. dysgalactiae*. These pathogens are the most important causes of mastitis in countries around the world, including Brazil, United States, United Kingdom, New Zealand, Canada and Australia. *S. uberis* and *S. dysgalactiae* can be found in cow habitat (soil, water, hay, faeces) and cattle are constantly exposed to risk of infections [6].

Determination of antimicrobial susceptibility patterns of bovine mastitis pathogens is important for guiding antimicrobial treatment decisions and for the early detection of emerging antimicrobial resistance among different bacterial species [10].

MATERIAL AND METHODS

In the laboratory, microbiological tests were performed with 0.01 mL of Petri dishes containing agar media sheep at 5% and MacConkey, incubating at 37 °C. Plate readings were performed at 24, 48 and 72 hours, observing the morphology of the colony forming units and then prepared slides with smears stained by the Gram method, to verify under microscope, the bacterial morphology and its characteristic tintorial. The microorganisms were transferred to Brain-Heart Broth (BHI) to perform the tests according to Carter and Cole Junior [3] and Quinn et al. [9], for taxonomical classification: esculin and sodium hippurate hydrolysis, CAMP test, and carbohydrates and alcohols, represented by inulin, lactose, mannitol, raffinose, salicin, sorbitol and trehalose, and growth in NaCl at 6.5%.

The antimicrobial sensitivity profile was studied from 19 *S. uberis* and 24 *S. dysgalactiae* samples, isolated from bovine clinical mastitis cases from different dairy farms in the state of São Paulo. The antibiogram was performed according to Bauer et al. [1] on plates containing Mueller-Hinton agar, enriched with 10% bovine blood, to facilitate the growth of the microorganisms.

The disk-diffusion agar method was in accordance with the Clinical and Laboratory Standards Institute (CLSI) recommendations [5]. Nine antimicrobial agents were tested: streptomycin (10ug), cephtriaxone (30 ug), cephalexin (30 ug), oxacillin (1ug), gentamicin (10ug), neomycin (30 ug), tetracycline (30 ug), penicillin G (10 ug) and ampicillin (10 ug).

RESULTS AND DISCUSSION

The results of the drug susceptibility test showed that 10 (52.6%) *S. uberis* isolates and 12 (50%) *S. dysgalactiae* isolates expressed resistance to more than one antimicrobial agent. Antimicrobial resistance was highest against oxacillin (78.9%) for *S. uberis* and against tetracycline (50%) for *S. dysgalactiae*.

We observed highest resistance for tetracycline in 50% of the *S. dysgalactiae* isolates and in 78.9% of the *S. uberis*.

Tetracyclines have been used extensively to treat many types of infections in both humans and animals for numerous years [10]. Many of the genetic determinants of tetracycline resistance have been shown to be actively transferred between bacterial genera and between hosts, both human and animal, and as a result, resistance to tetracycline is found in almost all bacterial genera. Also, tetracycline has limited distribution in the udder [4]. Tian et al. [11] also observed that *Streptococcus* isolates had the highest resistance rate to tetracycline (98.44%) and oxacillin (98.44%), concluding that the issue of drug resistance of *Streptococcus* is still a great concern in cattle health in China. Considerable further work is required to validate other antimicrobials for use in veterinary medicine, as observed by Mc Dougall et al. [7].

CONCLUSION

This study concludes that *S. uberis* and *S. dysgalactiae* isolated from clinical mastitis at the farms evaluated showed high resistance rates to oxacillin and tetracycline. So, antimicrobial susceptibility surveillance is a necessity to get optimal therapeutic results by the correct use of antimicrobials, that cannot be neglected.

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- the scarce knowledge of epidemiology and pathogenesis. The data are scarce in relation to the microbial sensitivity of these strains isolated in milk production, both in animals and in bulk tanks. The objective of the present study is to determine the "in vitro" microbial profile of enterococci isolated from bulk tanks milk samples with the aim of evaluate the potential risk to human health of these multiresistant strains. Convenience samples of ten different dairy herds were used, and study herd inclusion criteria was: mastitis control programs with data storage, bulk tank somatic cell count < 400.000 cells/mL, average milk yield > 20 kg, minimum of 200 lactating cows and use of machine milking. One hundred and one *Enterococcus* spp. isolates from milk bulk tanks were submitted to standard antimicrobial disc diffusion test usually prescribed for treatment or prophylaxis of mastitis in cows: vancomycin, enrofloxacin, ampicillin, teicoplanin, cephalixin, ciprofloxacin, tetracyclin, sulphamethoxazole trimethoprim, penicillin, cephoxitine, oxacillin, marbofloxacin, neomycin, gentamycin. The higher detected resistances were against oxacillin (99%), neomycin (98%) cephalixin (98.1%), cefoxitin (98%) and sulfamethoxazole trimethoprim (82.8%). Fortunately, none *Enterococcus* spp. isolated showed resistance to vancomycin. On the other hand, 22 showed intermediate resistance against vancomycin, therefore may constitute a risk to the health of handlers and/ or consumers of dairy products, once part of the milk sold and consumed in Brazil comes from the informal market, that is, without pasteurization, which highlights the need for research related to public health in raw milk.

ANTIMICROBIAL RESISTANCE IN ENTEROCOCCUS SPP. ISOLATED FROM BULK TANKS MILK

Felipe Guimarães, Gustavo Moraes, Samea Joaquim, Simony Guerra, Felipe Dalanezi, Bruna Churocof Lopes, Jose Pantoja, Márcio Ribeiro, R.T. Hernandez, Vera Rall, Simone Lucheis, Helio Langoni

¹Sao Paulo State University, Botucatu, Sao Paulo, Brazil

ABSTRACT

Vancomycin-resistant enterococci (VRE) are often resistant to multiple antimicrobials, have a wide geographical distribution, and represent a major cause of nosocomial infections. Enterococci are present causing intramammary infection, cases of clinical and subclinical mastitis in dairy herds and contaminating bulk tanks. The difficulty of establishing effective treatment protocols are due to the high antimicrobial resistance and particularly, caused by the scarce knowledge of epidemiology and pathogenesis. The data are scarce in relation to the microbial sensitivity

of these strains isolated in milk production, both in animals and in bulk tanks. The objective of the present study is to determine the "in vitro" microbial profile of enterococci isolated from milk samples in bulk tanks in order to evaluate the potential risk to human health of these multiresistant strains. Convenience samples of ten different dairy herds were used, and study inclusion criteria was: mastitis control programs with data storage, bulk tank somatic cell count < 400.000 cells/mL, average milk yield > 20 kg, minimum of 200 lactating cows and use of machine milking. A total of 101 *Enterococcus* spp. isolated from bulk tanks were submitted to standard antimicrobial disc diffusion test indicated in the treatment / prophylaxis of cows with mastitis: vancomycin, enrofloxacin, ampicillin, teicoplanin, cephalixin, ciprofloxacin, tetracyclin, sulphamethoxazole trimetropin, penicillin, cephoxitin, oxacillin, marbofloxacin, neomycin, gentamycin. The highest detected resistance were against oxacillin (99%), neomicyn (98%) cephalixin (98.1%), cefoxitin (98%) and Sulfamethoxazole trimetropin (82.8%). Fortunately, none *Enterococcus* spp. isolated showed resistance to vancomycin. On the other hand, 22 showed intermediate resistance against vancomycin, that constitute a risk to health of handlers and/ or consumers of dairy products, as we know part of the milk sold and consumed in Brazil comes from the informal market, that is, without pasteurization, which highlights the need for research related to public health in raw milk.

INTRODUCTION

Enterococci are present in the intestinal commensal microbiota of animals and humans. The incidence of enterococcus as a nosocomial pathogen has increased [1]. One of the main reasons for the persistence of these microorganisms in the hospital environment is the intrinsic resistance to several antibiotics commonly used, such as β -lactams, clindamycins, fluoroquinolones. Also, for their ability to acquire resistance to other antibiotics such as aminoglycosides and glycopeptides, through the acquisition of genetic material by the transfer of plasmids and transposons [2,3].

Mastitis is the most common disease of dairy cattle, responsible for major economic losses in dairy industry, and caused by different pathogens. Enterococci are present causing intramammary infection (IMI) cases of clinical and subclinical mastitis in dairy herds and contaminating bulk tanks. However, the data are scarce in relation to the microbial sensitivity of these strains isolated in milk production, both in the animals and in bulk tanks [6]. The objective of the present study is to determine the "in vitro" microbial profile of enterococci isolated from milk samples in bulk tanks in order to evaluate the potential risk to human health of these multiresistant strains.

MATERIAL AND METHODS

Convenience samples of ten different dairy herds were used, and study inclusion criteria was: mastitis control programs with data storage, bulk tank somatic cell count < 400.000 cells/mL, average milk yield > 20 kg, minimum of 200 lactating cows and use of machine milking. The milk samples were collected aseptically, kept at -24°C and transported frozen to the laboratory, where they were submitted to microbiological examination and classified according to NMC,1999. *Enterococcus* spp. isolated in milk samples from bulk tanks were submitted to standard antimicrobial disc diffusion test indicated in the treatment / prophylaxis of cows with mastitis and humans: vancomycin (10 μ g), enrofloxacin (10 μ g), ampicillin (10 μ g), teicoplanin (30 μ g), cephalixin (30 μ g), ciprofloxacin (10 μ g), tetracyclin (30 μ g), sulphamethoxazole trimetropin (25 μ g), penicillin(10U.I.), cephoxitin (10 μ g), oxacillin (10 μ g), marbofloxacin (5 μ g), neomycin (30 μ g), gentamycin (10 μ g). The interpretation was performed according to the National Committee for Clinical Laboratory Standards [5]. This study was approved by the São Paulo State University's Animal Use Ethics Committee, Botucatu, SP, protocol number 0136/2017.

RESULTS AND DISCUSSION

A total of 101 *Enterococcus* spp. isolated from bulk tanks were submitted to standard antimicrobial disc diffusion test indicated in the treatment / prophylaxis of cows with mastitis. The highest detected resistance were against oxacillin (99%), neomicyn (98%) cephalixin (98.1%), cefoxitin (98%) and Sulfamethoxazole trimetropin (82.8%). Fortunately, none *Enterococcus* spp. isolated showed resistance to vancomycin. On the other hand, 22 showed intermediate resistance against vancomycin, that constitute a risk to health of handlers and/ or consumers of dairy products, as we know part of the milk sold and consumed in Brazil comes from the informal market, that is, without pasteurization, which highlights the need for research related to public health in raw milk.

Table 1. Results from "in vitro" disk-diffusion antimicrobial resistance among 101 *Enterococcus* spp. isolated in milk samples from bulk tanks. 2019.

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Antibiotics	Susceptible	%	Intermediate	%	resistance	%
vancomycin	79	78.2	22	21.8	0	0
enrofloxacin	12	11.9	76	75.2	13	12.9
ampicillin	101	100	0	0	0	0
teicoplanin	101	100	0	0	0	0
cephalexin	2	1.9	0	0	99	98.0
ciprofloxacin	18	17.8	75	74.3	8	7.9
tetracyclin	75	74.3	3	0	23	22.8
sulphamethoxazole trimetropin	12	11.9	6	5.9	83	82.8
penicillin	98	97.0	1	1.0	0	2
cephoxitin	0	0	2	1.98	99	98.0
oxacillin	0	0	1	1	100	99.0
marbofloxacin	22	21.8	71	70.3	8	7.9
neomycin	2	1.9	0	0	99	98.0
gentamycin	41	45.6	20	19.8	40	40.4

NANOSILVER-BASED PREPARATION EFFECT ON POULTRY LITTER MICROBIOLOGICAL QUALITY

Katarzyna Czyż, Zbigniew Dobrzański, Robert Bodkowski, Monika Kowalska-Górska, Anna Wyróstek, Paulina Cholewińska

Wrocław University of Environmental and Life Sciences

ABSTRACT

The study aimed to examine an effect of the preparation based on nanosilver suspension on mineral carrier on poultry litter microbiological profile.

The study was conducted on Ross 308 broiler chickens. Three groups were formed, 28 birds in each. Birds were maintained on straw-sawdust litter, the groups were differentiated due to preparation application: Control (C) - without preparation; I - preparation addition in amount of 15 L (i.e., 1.5 L of nanosilver suspension in the volume) under litter surface once at the beginning; II - preparation addition in amount of 15 L mixed with litter, next once a week during litter addition.

Pooled litter samples were collected from top layer of the litter (days 0, 5, 10, 15, 20 and 25) in order to determine mesophilic bacteria count. Additionally, on the last day of the experiment litter samples were collected from three points (by drinker, feeder, pen corner) to analyze total number of microorganisms, *Salmonella* spp., *Escherichia coli*, Enterococci, yeasts and molds.

In case of mesophilic bacteria count, the highest decrease was noted for group II, when preparation was added a few times. Total number of microorganisms determined in various points of the pen did not give clear relationship, in some cases even an increase was found.

Salmonella spp. decreased as a result of preparation addition, the highest decrease was noted for samples collected by feeders. The results for *Escherichia coli* are not unequivocal, however a decrease was found in case of drinkers and feeders compared to control, especially in group II. An addition of preparation caused a decrease in Enterococci, especially for samples collected by feeders in group II. Similar tendency was found for yeasts and molds. The study demonstrated that the preparation exhibits bactericidal properties, however its effect varies depending on microorganism kind and sample collection point.

NANOSILVER ADDITION TO SHEEP LITTER AND SILVER CONTENT IN BIOLOGICAL MATERIAL SAMPLES

Robert Bodkowski, Katarzyna Czyż, Monika Kowalska-Górska, Piotr Nowakowski, Zbigniew Dobrzański, Paulina Cholewińska, Anna Wyróstek

Wrocław University of Environmental and Life Sciences

ABSTRACT

The study aimed to determine an effect of nanosilver-based preparation addition to sheep litter on silver and antagonistic elements (copper, selenium, zinc) content in biological material obtained from animals.

The study was conducted on Polish Merino sheep maintained on the farm in Mokrzyszów (Poland) for 15 weeks. Two groups, 26 animals in each, were created. The sheep stayed in a sheepfold in separate pens on a deep straw litter. An addition of nanosilver-based preparation (Nano-Ag solution sprayed on vermiculite mineral carrier) in amount of about 100 g/m² was applied six times in the experimental group, at the beginning, then every 3 weeks. At the end of the experiment, the samples of wool (from abdominal and back part of body), blood, feces and hooves scrapings were collected to analyze the content of Ag and antagonistic elements, i.e., Cu, Se and Zn in them. The samples were wet mineralized, and the content of elements was determined using atomic absorption spectroscopy method. Silver content results showed that its increased the most, i.e., 6.5-fold, in hooves scrapings samples, in case of wool an increase was 3 and 2.5-fold for abdominal and back part, respectively, and 2.5-fold in case of feces. This element content increase was the lowest (about 33%) for blood compared to the control. No significant changes were found for copper, selenium and zinc content in hooves scrapings and blood. The highest decrease in these elements content was found for wool from abdominal part, it was 13, 33 and 19%, respectively. Two-fold decrease in case of Se was only noted in back wool samples, and 31% for Cu in feces samples. The study demonstrated that nanosilver addition to sheep litter caused a varied increase in its content in biological material samples collected from the animals, and importantly, the lowest increase was found for blood.

THE HEALTH AND WELFARE ISSUES OF PIGS CAUSED BY UNSUITABLE HOUSING SYSTEM AND VENTILATION DEFICIENCIES

Gabriela Gregova, Jan Venglovsky, Tatiana Szaboova, Nada Sasakova, Ingrid Mindzakova
University of Veterinary Medicine and Pharmacy in Kosice, Slovakia

ABSTRACT

Pigs are very sensitive to many environmental factors (humidity, temperature, air flow, bioaerosols, dust, light, noise, etc.) which can significantly affect their health, welfare and behaviour.

High animal density in a confined space, the type of housing system, removal of excrements, low level of hygiene and deficient ventilation are specific factors that can affect essentially the quality of pig housing environment and cause health problems.

The aim of the study was to find solution to poor hygiene and health resulting from deficiencies in the housing system for fattening pigs. We measured basic microclimate parameters and collected samples of air and excrements for detection of microorganisms and investigation of antibiotic resistance.

Poor ventilation and management deficiencies caused deviations of many microclimate parameters, and also presence of antibiotic resistant *E.coli* isolates.

INTRODUCTION

One of the most important requirements in pig rearing is establishing good microclimate conditions. Due to the fact that pigs are kept throughout their life in closed housing facilities, providing the required microclimate parameters is a prerequisite for good health and welfare and overall performance.

A well-managed, functioning and efficient ventilation system It controls the oxygen supply, prevents over-heating, prevents gaseous build-up that may be detrimental to health and welfare, and decreases the risk of airborne pathogens finding a host. Inefficient ventilation is detrimental to pig and staff performance (particularly on hot days) and costs more to run.

Any air control systems within fan chimneys need to be checked regularly as they can seize up and motors can fail. This can result in over-ventilation of the building if the control system has failed in the open position or under ventilation if in the closed position.

MATERIAL AND METHODS

In the present study we evaluated the hygiene status in the housing system for 300 fattening pigs. The animals were divided to four sections according to their age and body weight. All-in all-out group system was used with partly concrete and partly slotted floor, without bedding which is not the best solution for animal comfort. Pigs were feed wet mashed feed that decreases air dustiness compared to dry feed. Negative pressure ventilation was installed in the housings and the produced slurry was collected in channels under the slatted floor.

We carried out physical and chemical measurements of microclimate parameters and determined microbiological quality of the air.

Microbiological contamination (total bacterial counts, coliform bacteria and fungi) of the air was determined employing MAS 100 Eco for air sampling.

Samples of air and excrements were taken not only for determination of microbial contamination but also for investigation of antibiotic resistance of *E.coli* isolates.

RESULTS AND DISCUSSION

Each housing system should comply with essential requirements for promoting the welfare, health and performance of pigs. Important criteria in animal housings are temperature, ventilation and individual area and space. These criteria are specified for different animal categories [6]. Temperature and humidity for fattening pigs should be kept within the range 10 – 22°C a 50 – 75 %, respectively.

The measured air temperatures were within the acceptable limits, but the air humidity reached level as high as 97,1%. High humidity accelerates heat release from animal bodies and disturbs their heat balance with unfavourable consequences [5].

The air flow in every examined housing section was optimal (0,4m³s⁻¹), but this was not a guarantee of sufficient ventilation of the buildings, which is also indicated by concentrations of noxious gases in the air.

The level of chemical indicators in the air provides overall picture of hygiene in the housings. The maximum acceptable concentrations of noxious gases are as follows: ammonia 25 ppm; hydrogen sulphide 10 ppm; CO₂ 3000 ppm. Our measurements showed that the maximum limits of ammonia and carbon dioxide in the animal zone were exceeded but hydrogen sulphide was absent.

In the animal houses with slotted floor ammonia and hydrogen sulphide may accumulate in the air close to animal slurry during its long-term storage in slurry channels below the slotted floor. During removal of slurry or unsuitable

Tab. 1 Microclimat parameters in pig farming

Physical parameters	
Temperature	17,6°C - 21,8°C
Relative humidity	78,5% - 97,1%
Air movement	0,4 – 0,5 m.s ⁻¹
Lighting	51,9 lx - 127,4 lx
Noise	maximum 84 dB - 93,1dB; average 64,9dB - 79,3 dB
Chemical parameters	
Dust particles	average 0,43 mg·m ³ - 0,94 mg·m ³ ; maximum 2,53 mg·m ³ - 3,12 mg·m ³
NH ₃	12 ppm - 25 ppm
CO ₂	2500 ppm - 4400 ppm
H ₂ S	0 ppm
LEL	2 ppm
Microbiological parameters	
Total count bacteria (CFU·m ³)	2,86·10 ⁵ - 1,3·10 ⁶
Coliform bacteria (CFU·m ³)	2·10 ² - 7,5·10 ³
Moulds (CFU·m ³)	3·10 ³ - 1,2·10 ⁴

ventilation (negative pressure), gasses from underneath the slots may pass to the zone of animals and accumulate there. In housings with solid floors hydrogen sulphide occurs only rarely in the animal zone [2].

Well-managed ventilation technologies can help to provide better thermal comfort in pig housings and also reduce pollutants, gases (CO₂, NH₃, H₂S), dust and microorganisms [1].

The recommended maximum concentration of respirable dust particles in housings on pig farms in Germany is 1,5 mg/m³, in England and USA 4 mg/m³ [1].

It was found out that a concentration of 0.9 mg/m³ of respirable dust particles increases the incidence of pneumonia and a value of more than 1,1 mg/m³ increases the prevalence of pleuritis in fattening pigs [4].

In our study, high counts of airborne microorganisms were recorded. The total bacterial counts ranged from 2.86.10⁵ to 1.3.10⁶ CFU/m³ of air and coliform bacteria and moulds from 10³ to 10⁴ CFU/m³.

In air and excrements of pigs we detected E. coli isolates resistant to many antibiotics (mostly ampicillin, streptomycin, fluoroquinolones resistant E. coli isolates).

The average noise level was approximately 64.9 dB with a maximum reaching 93.1 dB, thus the maximum noise (85dB) requirements in pig rearing were occasionally exceeded [3].

In order to decrease the risk of diseases in litterless housing systems it is necessary to make sure that the surface of the pens is dry, regularly cleaned, environmental temperature monitored and the correct stocking density maintained. This is also part of welfare requirements. Management of rearing can be very important in terms of biosecurity, especially in colder climates where excrements are stored indoor (channels below slotted floor) for longer periods.

CONCLUSION

Insufficiently maintained ventilation system resulted in increased levels of gases (ammonia 22 ppm, carbon dioxide 4400ppm), high relative humidity 90%, exceeded level of noise (85 dB) and aerial microorganisms >10⁶.

Combination of deficient ventilation system and ineffective manure storage system can produce multiple stresses in any animal house, due to increased air contamination (gases and microorganisms) and also increased noise. This will put extreme load on the animal immune system, affect the health of pigs and increase demands for medication including antibiotics.

In conclusion, deficient ventilation system markedly contributed to the low level of hygiene in the investigated animal house and resulted in reduced health and welfare housed animals.

ACKNOWLEDGEMENT

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SEROCONVERSION AND ASSOCIATED RISK FACTORS IN DOGS PRESENTED FOR ANTI-RABIES VACCINATION AT SELECTED VETERINARY CLINICS IN LAGOS STATE, NIGERIA

Olayinka Ishola, Olajumoke Enebeli, Babasola Olugasa

Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Ibadan, Nigeria

ABSTRACT

This study was designed to investigate the seroconversion in dogs against rabies vaccines administered at four selected veterinary clinics in Lagos State, Nigeria. A cross-sectional study was carried out between May and June 2016 on apparently healthy and confined dogs presented to veterinary clinics in four out of the five administrative areas (Lagos Island, Badagry, Ikorodu, Epe and Ikeja) of Lagos State. A total of 76 dogs were purposively selected for rabies vaccine seroconversion test. Some 5ml of blood was collected from each dog. An OIE certified commercial kit for quantitative indirect-ELISA for rabies antibody detection was used. In addition, each of the dog owners was interviewed on the breed, age, sex and vaccination history of dogs, including type and source of vaccine. Data were categorically analyzed at $p \leq 0.05$. A total of 24 (31.6%) of the 76 tested dogs had antibody levels ≥ 0.5 eu/ml, while 52 (68.4%) had antibody levels < 0.5 eu/ml. Rabies antibody level that was lower than 0.5 eu/ml was considered inadequate seroconversion. Dogs so categorized were below protective level against rabies. Sero-conversion was significantly associated with the type and source of vaccine administered (OR = 1.4-27.3, $p=0.02$). Majority of rabies vaccines used originated from Asia. Sex, breed and body conformation of dogs were not significantly associated with antibody level. Majority of dogs vaccinated against rabies in selected veterinary clinics in Lagos State, Nigeria had low rabies seroconversion. This situation calls for urgent public health attention to ensure quality of vaccines used for control and prevention of rabies in the State.

Keywords: Antibody level, ELISA, Vaccine, Rabies, Nigeria.

INTRODUCTION

Rabies is a highly fatal zoonotic disease caused by the rabies virus, responsible for estimated 70,000 annual human deaths worldwide (6). It is one of the oldest communicable, widespread, neglected and under reported disease of human for more than 4,300 years. Domestic dog is the most common reservoir of the virus, with more than 99% of human deaths caused by dog-mediated rabies (6). The disease is endemic in most developing countries of Africa (3). Yet, rabies is 100% vaccine-preventable. Eradication of dog rabies is reported to be the most logical solution to eliminate the risk of rabies to humans (Hambolu et al., 2014). Eradication programs often revolve around mass dog vaccination campaigns, where at least 70% of the dog population should be covered in order to break the cycle of transmission in dogs, and to humans (6). The WHO, OIE, FAO and the Global Alliance for Rabies Control (GARC) have set a global target of "zero human rabies deaths by 2030" (6). This study was therefore designed to investigate the seroconversion in dogs against rabies vaccines administered at selected veterinary clinics in Lagos State, Nigeria.

MATERIALS AND METHODS

Study Area

The study area was Lagos State in southwest Nigeria, located between Latitude 6 $^{\circ}$ 2'N and 6 $^{\circ}$ 4'N and between Longitudes 2 $^{\circ}$ 45'E to 4 $^{\circ}$ 20'E. The State has a total human population of about 9 million people (1), being the second most populated State in Nigeria (2). The State has five administrative divisions, namely Lagos Island, Badagry, Ikorodu Epe and Ikeja.

Study design, sampling and specimen collection

A cross-sectional study was carried out between May and June 2016 on apparently healthy dogs presented at four veterinary clinics in Lagos State. Using multistage sampling technique, two private clinics in Ikeja and Alimosho and two government-owned clinics in Agege and Surulere Local Government Areas (LGAs) within Ikeja and Lagos Administrative Divisions were selected. A total of 76 dogs were randomly sampled from these clinics. Using sterile syringes and needles, 5 mL of blood was collected from each dog through the cephalic vein into plain sample bottles without anticoagulant. The blood was allowed to clot at room temperature for about 5 to 6 h. Sera obtained were stored at -20 $^{\circ}$ C until tested. An OIE certified commercial kit for quantitative indirect-ELISA (i-ELISA) technique for rabies antibody detection, PlateliaTM Rabies II kit (Bio-rad, Marnes-la-Coquette) was used and observed the protocol earlier described by Olugasa et al (4).

Furthermore, the owners of the 76 sampled dogs were interviewed using a structured questionnaire to obtain data on the demographic characteristic of the dogs presented for routine clinical examination at the selected clinics, including the breed, age, sex, and anti-rabies vaccination history. Other questions asked included ownership, socio-economic variables of dog owners, type and source of vaccine. Consent of dog owners was sought and ethical approval was granted by Lagos State Ministry of Agriculture. Data were categorically analyzed using Microsoft Excel and Chi² test on SPSS version 20 at $p \leq 0.05$.

RESULTS AND DISCUSSION

The results revealed that 24 (31.6%) of the 76 dogs tested had optimal rabies antibody levels ≥ 0.5 eu/ml while 52 (68.4%) had antibody levels < 0.5 eu/ml (Table 1). Rabies antibody level that was lower than 0.5 eu/ml was considered inadequate seroconversion. Dogs so categorized were below protective level against rabies despite being vaccinated. The demographic data of the dogs showed that more than half (56.0%) were male and mostly 2 years of age and above. The most common breeds were Alsatian (30.3%) and Boerboel (26.3%). These breeds were mostly used for security purpose. This agrees with the findings of Oluwayelu et al., (2015) (Table 2).

The vaccination history of the dogs (n=76) showed that almost all (91.8%) had been vaccinated against rabies. While majority (77.6%) were vaccinated with foreign (imported) antirabies vaccines, only 13.2% were vaccinated with the local vaccine produced in Nigeria by the National Veterinary Research Institute (NVRI), Vom, Nigeria; and 9.2% were not vaccinated. More than half (51.3%) of the vaccines used were manufactured in Asia (China and Korea), 23.6% in Europe (Fig 1). Seroconversion was significantly associated with the type of vaccine used (OR = 1.4-27.3, $p=0.02$)

(Table 2). Hence, the significant risk factors identified for rabies vaccination seroconversion was the type and source of vaccines. This finding is similar to the low sero-prevalence and seroconversion earlier reported (5.7% in confined dogs) in Ibadan (5) and 42.6% in Ilorin (4) Nigeria.

CONCLUSION

Seroconversion to antirabies vaccination was low (31.6%) in confined dogs presented at veterinary clinics in Lagos State, despite the fact that majority of the dogs had been vaccinated against rabies. This portends a public health challenge. Dogs were vaccinated mainly with foreign antirabies vaccines. There is need for urgent public health attention to ensure quality of vaccines used for control and prevention of rabies in Lagos State.

Table 1. Seroconversion against rabies vaccination in dogs presented at selected Veterinary Clinics in Lagos State

Dogs	Number sampled (%)	Number positive (%) ≥ 0.5eu/ml	Number Negative (%) < 0.5eu/ml
Male	43 (56.6%)	15 (19.8%)	28 (36.8%)
Female	33 (43.4%)	9 (11.8%)	24(31.6%)
Total	76 (100.0%)	24 (31.6%)	52 (68.4%)

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Table 2. Demographic and risk factors associated with adequate anti-rabies vaccination seroconversion in dogs presented at selected Veterinary Clinics in Lagos State

Variables	Positive Seroconversion ≥0.5eu/ml (%)	Negative seroconversion <0.5eu/ml (%)	Total	OR (95% CI)	P value
Breed of dogs					
Others (local cross)	6 (31.6)	13 (68.4)	19	Reference	
Alsatian	6 (26.1)	17 (73.9)	23	1.3 (0.3 – 5.0)	0.96
Boerboel	8 (40.0)	12 (60.0)	20	0.7 (0.2 – 2.6)	0.83
Rottweiler	3 (33.3)	6 (66.7)	9	0.9 (0.2 – 5.0)	>0.99
Bull Mastiff	0 (0.0)	3 (100.0)	3	0.0 (0.0 – 6.7)	U
Caucasian	1 (50.0)	1 (50.0)	2	0.5 (0.0 – 8.7)	>0.99
Sex of dogs					
Male	15 (34.9)	28 (65.1)	43	1.4 (0.5 – 3.9)	0.64
Female	9 (27.3)	24 (72.7)	33		
Age of dogs					
> 2 years	18 (36.0)	32 (64.0)	50	1.9 (0.6 – 5.5)	0.37
≤ 2 years	6 (23.1)	20 (76.9)	26		
Source of dogs					
Bought	15 (27.8)	39 (72.2)	54	0.6 (0.2 – 1.6)	0.40
Not bought	9 (40.9)	13 (59.1)	22		
Vaccination status					
Vaccinated	23 (33.3)	46 (66.7)	69	3.0 (0.3 – 26.4)	0.54
Not vaccinated	1 (14.3)	6 (85.7)	7		
Type of vaccine					
Local	7 (70.0)	3 (30.0)	10	6.3 (1.4 – 27.3)	0.02*
Foreign	16 (27.1)	43 (72.9)	59		
Type of anagement					
Intensive	18 (28.6)	45 (71.4)	63	0.5 (0.1 – 1.6)	0.36
Semi-intensive	6 (46.2)	7 (53.8)	13		
Contact with other animals					
Yes	14 (28.0)	36 (72.0)	50	0.6 (0.2 – 1.7)	0.50
No	10 (38.5)	16 (61.5)	26		

*Significant at $p \leq 0.05$ U= Undefined

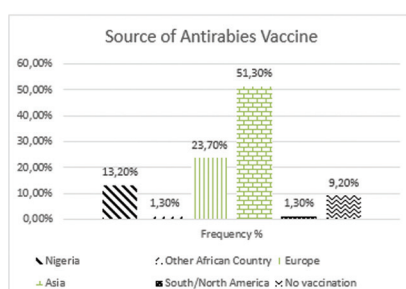


Fig. 1 Sources of Antirabies Vaccines Used in Selected Clinics in Lagos State

APICULTURE AND PROBLEM OF BEEKEEPING

KEYNOTE LECTURE

HYGIENIC BEHAVIOUR: THE CRUCIAL ISSUE FOR DISEASE RESISTANCE IN THE HONEY BEE

Kaspar Bienefeld

Institute for Bee Research Hohen Neuendorf and Humboldt University of Berlin, Germany

ABSTRACT

Hygienic behaviour against diseased brood is likely to be controlled by a small number of loci, which affect a bee's sensitivity to the stimulus of diseased brood.

INTRODUCTION

The European honey bee (*Apis mellifera*) is one of the most ecologically and economically important pollinators and its pollination service to agriculture is valued at 153 billion Euro worldwide [2]. Honey bees are exposed to a number of damaging pathogens and parasites. The most destructive among them, affecting mainly the brood, is the ectoparasitic mite *Varroa destructor*. A promising approach to prevent its spread is to breed for *Varroa* tolerant honey bees. A trait which has been shown to provide significant resistance against the *Varroa* mite is hygienic behaviour, a behavioural response of honey bee workers to brood diseases in general. Hygienic behaviour is defined as the ability of honeybee workers to detect and remove pupae that are infected with brood diseases before the causative organism reaches the infectious stage, thereby limiting the spread of infection. In several behavioural and genetic studies we were able to provide more detailed insight into this most interesting selection trait.

MATERIAL AND METHODS

A novel, infrared camera technology [1] for long-term undisturbed investigation was used to detect typical pattern of hygienic behaviour of individual worker bees towards artificially *Varroa*-infested brood cells. Using this technology we monitored 22 000 worker bees in 11 experiments and subjected the 122 top performing hygienic bees and 122 negative controls to a SNP genotyping assay (44K SNP chip) specifically developed for the analysis of *Varroa* resistance traits [4].

RESULTS AND DISCUSSION

During our behavioural studies we identify different behaviours prior to and during the opening of *Varroa* parasitized brood cells. Prior to the uncapping of an infested cell, a hygienic worker bee inspected the surface of the wax cap of surrounding cells with its antennae. Likewise, during the examination of a parasitized cell, the surface of the cap was closely inspected by a hygienic worker bee with its antennae. A very peculiar behaviour of the hygienic worker bees was a typical to-and-fro movement of head during the inspection prior opening the infested brood cells. A systematic sequence of behavioural activities followed by the bees for detecting and uncapping the infested brood suggests that hygienic behaviour is a type of fixed action pattern that is typical of instinctive behaviours [5]. Additional studies showed this behaviour to be depending on the olfactory sensitivity individual bee, as well as on the odor profile and the stimulus intensity from the parasitized brood. In the large genetic study we found that uncapping behaviour towards *Varroa* infested cells is extremely rare in *A. mellifera*, and it varies from 0% to 5% in colonies that have been strongly subjected to selection. After false discovery rate correction of the p-values, six SNP markers had highly significant associations with the trait investigated ($\alpha < 0.01$). Inspection of the genomic regions around these SNPs led to the discovery of putative candidate genes involved in odour reception neuronal sensitivity to external stimuli [3].

CONCLUSIONS

Breeding for disease/*Varroa* resistance is more a search for sensitive bees with low olfactory thresholds rather than for bees generally performing the hygienic behaviour.

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ORAL PRESENTATIONS

NORMAL REPRODUCTIVE PARAMETERS IN HONEY BEE DRONES MATURING UNDER UNFAVOURABLE CONDITIONS

Aleksandra Langowska¹, Monika Fliszkiwicz¹, Bożena Chuda-Mickiewicz², Paweł Chorbiński³, Weronika Banaszak-Cibicka¹, Karol Giejdasz¹

¹Poznań University of Life Sciences, Institute of Zoology, Department of Apidology

²West Pomeranian University of Technology Szczecin

³Wrocław University of Environmental and Life Sciences

ABSTRACT

There are several factors known to influence the reproductive quality of drones and one of them is food. In bees spermatogenesis finishes at the pupal stage and it was shown that limited access to pollen during larval development negatively affects the reproductive performance of drones. During sexual maturation drones are fed with proteinaceous food for the first six days of their adult life. Here we report on several reproductive parameters of fourteen-days old males maintained from the first day of their imaginal life under conditions of caging, without queen but with workers of the same age, and fed exclusively with carbohydrate food (Laboratory Drones LDs). We found no differences between LDs and drones reared in colonies in the number and viability of spermatozoa in seminal vesicles (however, in one out of three years there was a lower number of sperm in LDs), the number and viability of spermatozoa in ejaculates and the volume of ejaculates. The number of drones needed to collect 8 µl of semen was lower when LDs were used. There was no difference in sperm viability collected from queens' spermathecae and in the acceptance of queens inseminated with semen of both origins. Three out of four queens inseminated with semen of LDs underwent a supersedure against one of four inseminated with semen of drones reared to maturity in colonies.

The seemingly unfavorable rearing conditions created in the laboratory resulted in surprisingly good reproductive parameters of drones. Queenlessness and lack of the ability to lay eggs by workers when no protein food was available probably forced extensive drone care including royal jelly production. On the other hand the high proportion of supersedure of queens inseminated with LDs' semen suggests the conditions created could influence other sperm parameters, however due to the low sample size more research is needed.

AN OUTLOOK ON ONE HEALTH WITH RESPECT TO THE SECOND-MOST-IMPORTANT INSECT POLLINATORS IN POLAND: BUMBLEBEES

Anna Gajda¹, Andrzej Bober², Robert Paxton³

¹Warsaw University of Life Sciences

²National Veterinary Research Institute

³Martin Luther University Halle-Wittenberg

ABSTRACT

Pollination is an ecosystem service vital for agriculture and environmental balance. The overall profit generated through insect pollination in Europe is estimated at over 150 billion Euros annually. The most widely known, and the commercially most important, insect pollinator is the honeybee (*Apis mellifera*), whose colony numbers are declining across temperate zones. Many so-called drivers are responsible for the decline, but science points to pests and pathogens as the main factor. But behind the scenes of „empty hives”, wild bumblebees, considered to be extremely important pollinators in temperate regions, are also facing serious declines. They are susceptible to many pathogens of honeybees, underscoring the importance of considering the One Health approach, and the global population of bumblebees is dwindling rapidly, which may result in an environmental catastrophe. There are many blanks on the global map of bee One Health. We decided to fill one in Poland's central voivodship – masovian. Bumblebees from 3 sites (30/site) were checked for the presence of 19 pathogens (using molecular biology). We found only 5: *Nosema bombi*, Acute bee paralysis virus, Deformed wing virus, Black queen cell virus and Sacbrood virus. Many factors could contribute to this surprisingly low prevalence of pathogens. First are the relatively healthy honeybees in masovian, which means that they don't pass as many diseases on to bumblebees on flowers as seems to occur elsewhere in Europe. Another factor might be the abundance of flowers, which means good nutrition and improved overall bee health. As Poland is a large, climatically diverse country, climate might also play a role in determining the prevalence of pathogens in bumblebees and honeybees. In conclusion: bumblebees from central Poland are relatively healthy, but broader investigation is needed to have an overview of the situation across the entire country and of the factors causing bee decline.

BEHAVIORAL CHANGES IN HONEY BEE EXPOSED ON THE ELECTROMAGNETIC FIELD – LABORATORY RESEARCH

Paweł Migdał, Adam Roman, Agnieszka Murawska, Ewa Popiela

Wrocław University of Environmental and Life Sciences

ABSTRACT

The study of all factors that can negatively affect the honey bee in an ever – changing environment is a very important element to protect this pollinator. So far, threats have been identified as threats to the bees' living environment: pesticides, including plant protection products, climate change, breeding work, and new disease entities. The aim of this study was to determine the degree of electromagnetic field impact at behavioral parameters on the honeybee. In the research, honey bee workers aged 2 (± 6h) days obtained from bee colonies in good condition were used. Workers were placed in cages, they were fed sugar syrup 1 mol / dm³. After 24h, the bees were placed together with the cages inside the electromagnetic field emitter. Workers were subjected to the influence of the electromagnetic field: 5.014 kV/m; 11.5 kV/m; 23 kV/m; 34.5 kV/m. The set time was 1h – corresponding to the time which bees

spend in the field during fed collection, 3h – time spent by the bee in the situation of obtaining nectar from further sources, and 6h as a time that requires a large amount of energy to remain by the workers after the beehives – rarely found in natural conditions. Selected behavioral parameters (immobility, walking, cleaning, individual contact, flight, wing movement) were analyzed. During analyzing of the behavioral data, one can observe a disturbance of the behavior pattern of bees in groups treated with electromagnetic field in relation to that obtained in the control group. The selected behaviors in terms of the number of occurrences were reduced relative to the control group, only in the case of walking, flight and wing movement, an increase in the 11.5kV/m 3h group was noted. Which translated simultaneously to the general and average time that bees spent of a selected behavior.

THE USE OF SEMICONDUCTOR SENSORS OF VOLATILE ORGANIC COMPOUNDS (VOCS) IN CLASSIFICATION OF BEE BROOD INFESTATION AFFECTED WITH VARROA DESTRUCTOR MITE

Jakub Wilk¹, Beata Bąk¹, Jerzy Wilde², Maciej Siuda¹, Andrzej Szczurek², Monika Maciejewska²

¹Apiculture Department, Warmia and Mazury University in Olsztyn

²Wroclaw University of Science and Technology

ABSTRACT

Varroa is a serious parasitic disease of brood and adult bees caused by *V. destructor* mites. It is currently the most widespread infectious disease of the honey bee (*Apis mellifera*). Untreated bee families die after 2-3 years. The mite feeds on both brood and adult bees.

To optimize the healing process of bee colonies, it is advisable to monitor the degree of infestation with the mite. The use of semiconductor gas sensors of volatile organic compounds may be a chance to develop a quick method of diagnosis of brood infestation with the *V. destructor* mite. It is known that bee diseases affect the chemical composition, both qualitative and quantitative, of the gas atmosphere inside the hive. The brood diseased with *Varroa* is characterized by a different composition of cuticular carbohydrates in comparison to a healthy brood. The series of laboratory tests were carried out in the Apicultural Division of the University Warmia and Mazury in Olsztyn. The researchers used semiconductor sensors of volatile compounds manufactured by the Japanese company FIGARO mounted in a prototype multi-sensor detector of volatile compounds constructed in the Wroclaw University of Science and Technology. The research aimed at comparing the response of sensors to the odour of sealed brood: diseased (infested with the *V. destructor*) and healthy one. Ten samples of brood were collected from each experimental families and placed, for the time of testing, in special chambers equipped with test probes. It was shown that the images of the sensors readings for particular elements differ. The tests aimed at capturing significant differences in the response of sensors and creating patterns of the tested material, which would contribute to the development of methods for classification of infestation with the *V. destructor* mite of bee brood using the above mentioned sensors.

THE INFLUENCE OF PROBIOTIC MICROORGANISMS ON THE GROWTH AND DEVELOPMENT OF APIS MELLIFERA WORKER HONEY BEES LARVAE IN VITRO

Ihor Dvylyuk¹, Sarah Wood², Ivanna Kozii², Colby Klein², Roman Koziy², Igor Moshynskyy², Igor Medici de Mattos², Elemir Simko²

¹Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies Lviv

²University of Saskatchewan, Western College of Veterinary Medicine

ABSTRACT

Modern methods of diagnosing the effects of exogenous factors on the worker honey bees larvae are considering methods of laboratory research in vitro, as a model with a minimal variational component.

In particular, in our research, we have taken as a basis the method developed by a group of scholars led by D.R.Schmehl (2016).

Analyzing the results of studies on the influence of the probiotic additive "Aprotect-Plus" on the growth and development of larvae and pupae of worker honey bees, it was found that, in addition to the points mentioned in the method, the critical and determining period, in the conditions of the experiment, is the larval stage of development. So, the larvae of the working honey bees, growth and development of which, under the influence of the probiotic additive "Aprotect-Plus," passed within the normal limits and which reached the stage of pupae, successfully completed its metamorphosis. It should be noted that the use of probiotic supplement "Aprotect-Plus" in concentration 1×10⁹ CFU (colony-forming unit) in 1 ml of diet led to disturbances in the processes of the metamorphosis of the worker honey bee larvae, which were characterized by a marked lag in growth and development among all the larvae, which, respectively, at the final stage of the larynx period led to their death. Obviously, this effect is caused by the direct influence of microorganisms on the larvae and on the products of their metabolism, as well as on the violation of the percentage ratio of dietary components. It should be noted that the concentration of probiotic supplement "Aprotect-Plus" in a dose of 1×10⁶ CFU in 1 ml of diet did not cause a statistically significant deviation in the growth and development of larvae, although there were sporadic cases of delay in their development, within the tolerance up to 5%.

IMPACT OF VARIOUS PESTICIDE COMPOSITIONS ON THE HONEY BEE

Paweł Migdał, Adam Roman, Agnieszka Murawska, Ewa Popiela

Wroclaw University of Environmental and Life Sciences

ABSTRACT

Honey bee (*Apis mellifera* L.) is one of the most important link in food production. Bees during work on the field has a contact with different threats (chemical fertilizers and pesticides). Pesticides have become an important element in the modern agriculture. Increasingly, farmers mix up two or more pesticides. Compositions of crop protection

products gives more broad than a single pesticide and it has many economic advantages. However, unsuitable combination of pesticide formulas can negatively affect on the pollinators. Therefore the purpose of the research was to determine the effect of different pesticide compositions on the honey bee mortality and accumulation of selected elements (Ag, Cu, Mn, Fe, Ni and Zn) in their organisms. This study was conducted in the form of laboratory experiments using cages. In the research there were used three pesticides which representing the following groups: insecticides, herbicides and fungicides. Bees were fed pesticide mixtures and single pesticides mixed with sugar syrup (1 mol/dm³) and single sugar syrup (control group) was given. During the experiment there was noticed the decrease in bees and the amount of feed taken. After 7 days of experiment, bees were mineralized and the metal levels were determined using the FAAS method. After consumption pesticides by the bees, the largest mortality was observed in a group with mix of insecticide, herbicide and fungicide (I2H1F3) and the lowest in the herbicide group compare to control group. Moreover, in tests with mixtures of pesticidal formulas, negative reactions between the active substances, imidacloprid, and tebuconazole were visible, also they have appeared increased mortality. Among the elements the highest changes in accumulation was observed in Mn and Fe. Results of this research showed that it is necessary to develop this area.

POSTER PRESENTATIONS

TRANSFER OF TOXIC TRACE ELEMENTS FROM ORGANISM OF HONEYBEE TO HONEY

Yekaterina Zonova, Adam Roman, Paweł Migdał

Wrocław University of Environmental and Life Sciences

ABSTRACT

The natural environment is exposed to chemical pollution, the emitter of which is intensive development of industry, transport, industrialization and agricultural chemistry. The biggest problem is posed by elements with toxic properties, whose concentrations often far exceed the needs of organisms, which is a serious problem due to their toxicity, bioaccumulation and migration in the food chain. Under this influence is also a honeybee and bee products, among others honey. The aim of the study was to assess the impact of the industrialization of the region on the content of silver, copper, zinc, nickel, cadmium, lead, manganese in the honeybee's organism and bee honey, and determination of the degree and direction of transfer investigated trace elements from the honeybee to honey. The research was conducted in the years 2015-2016 in two areas of different degrees of anthropopressure: ecological - Landscape Park "Dolina Baryczy" and industrialized - Legnica-Głogów Copper District. In each season samples from 20 apiaries were collected in each region, and the total number of samples was 80. The concentration of the studied elements was examined by means of atomic absorption spectroscopy, after previous microwave mineralization of the samples. The relationship between the degree of industrialization of the area and the content of zinc in the organism of the honeybee and cadmium in honey has been demonstrated. The existence of the transfer of the studied elements in the direction from the organism of the honeybee to honey was found, however, the level the transfer was low. The content of toxic elements limited in honey (lead, copper, zinc and cadmium) did not exceed the highest allowable standards regardless of the area of origin of the samples.

ACTIVITY OF CABBAGE (BRASSICA OLERACEA) EXTRACT ON NOSEMA SPP. UNDER LABORATORY CONDITIONS

Paweł Migdał, Adam Roman, Ewa Popiela, Agnieszka Murawska

Wrocław University of Environmental and Life Sciences

ABSTRACT

The aim of this study was to determined activity of cabbage (*Brassica oleracea*) extract on *Nosema apis* and *Nosema ceranae* which cause common disease of adult bees called nosemosis. Nowadays, *Nosema* spp. infection is found among every beekeeping country. Newly emerged bee workers were obtained from Apiary of the Wrocław University of Environmental and Life Sciences. Bee workers were infected with spores of *Nosema* spp. Bees were placed in experimental cages and fed with sugar syrup (1mol/dm³) enriched with two concentrations of cabbage extract: 0.5% and 1%. Each group consisted of 10 cages in which 100 (± 2) bees were placed. The experiment was carried out for 6 days. After this time, bees were taken for microscopic analysis for the number of *Nosema* spp spores (from each cage, 10 bees were taken for three replications). Quantitative analysis of *Nosema* spp. spores was performed using hemocytometric method, in which spores in each bee are counted in the same way as in the calculation of the number of red blood cells. Honeybee abdomens were ground in 1 ml of demineralized water. A drop of liquid was taken from the prepared samples and applied to the Burkner chamber. Analysis of the impact of the cabbage extract on *Nosema* spp. spores under laboratory conditions gave very good results, causing practically complete limitation of spores in the intestines of bees (up to 90%). After using the sugar syrup solution for 6 days with the addition of 0.5% and 1% of the cabbage extract, respectively 16.5 and 23 times reduction in the number of *Nosema* spp. spores was noted.

BEEHIVES AND LOGS LOCATED IN THE FOREST DISTRICTS OF NORTH-EASTERN POLAND

Beata Madras-Majewska¹, Łucja Skonieczna¹, Rajmund Sokół², Maria Michalczyk²

¹Apiculture Division, Faculty of Animal Science, Warsaw University of Life Sciences

²Department of Parasitology and Invasive Diseases, Faculty of Veterinary Medicine, University of Warmia and Mazury in Olsztyn

ABSTRACT

The main objective of the research was to determine the overall health of bees that inhabit the wild beehives and logs

located in Polish northeastern Forest Districts. The study was conducted in Augustow Forest District (1 wild beehive and 9 logs), Suprasl Forest District (3 wild beehives), Maskulinskie Forest District (1 log). All objects mentioned above inhabited by bees were included to studies. For this purpose, from each colony twice collected a sample of 60 living worker bees taken directly from wild beehive entrance outside or after opening wild beehive and also collected brood comb sized of 10cm x 10cm. Acquiring the brood combs smoke operations were limited to the absolute minimum. To obtain a brood samples pieces of external combs were first cut off to get inside the wild beehives in such a way to the least affect the construction of the colony. Next there were laboratory analysis of the presence of pathogens in samples of honey bees and bee brood to detect: In the samples with PCR methods (according to the OIE) and using specific primers species of *Nosema* spp. and the type of virus (ABPV, CBPV and DWV) were determined, the presence of american foulbrood AFB and *V. destructor* in brood and in bees were detected. In the collected material there were not found anatomical and developmental anomalies in worker bees indicating the pathognomonic symptoms of diseases (eg. paralysis, weight loss, etc.) or the presence of american foulbrood (AFB) in brood. However there were found *V. destructor* in seven tested objects, and carried by this mite the virus of deformed wings DWV in six objects. It was also ascertained the presence of infection with a pathogenic fungus *N. Cerance* in three objects. Because of pioneering character of research it should be continued in the future.

EVALUATION SELECTED HONEYS MICROBIAL ACTIVITY

Beata Madras-Majewska¹, Elzbieta Rosiak²

¹Warsaw University of Life Sciences – SGGW

²Chair of Food Hygiene and Quality Management, Warsaw University of Life Sciences – SGGW, Poland

ABSTRACT

Honey is an antimicrobial and health-oriented substance. Mechanisms and antimicrobial properties of honey are resulted from, first of all, the presence of glucose oxidase. Another enzyme that affects the antimicrobial activity of honey is methylglyoxal. Another important antimicrobial factor is the acidity of honey; a water activity, kind of nectar flow and therefore its products in honey, mainly non-oxidized flavonoids. There are a number of honey sensitive pathogens including *Pseudomonas aeruginosa*, *Salmonella*, *Shigella*, *Staphylococcus aureus*, *Streptococcus faecalis*, *Streptococcus mutans*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, and *Vibrio cholerae*. Gram - positive bacteria are generally more sensitive to the effects of honey than Gram - negative bacteria. The aim of the study was to assess the microbial activity of selected honeys available on the Warsaw market. Analyses were performed on the honeys available in retail outlets. Because of the commercial availability of many varieties of honey for the evaluation were selected nectar honeys with opinion of high antibiotic activity. Microbiological analyzes were performed by diffusion method. Determination was made towards designation of inhibition zones of studied microbes in BIO lavender honey from Spain; BIO Manuka honey from New Zealand and honeydew honey from Poland. 11 microorganisms were tested: *L. monocytogenes*, *S. aureus* 4.4, *S. aureus* 25925, *S. aureus*, *E. coli*, *P. vulgaris*, *P. mirabilis*, *L. acidophilus*, *Enterococcus*, *P. fluorescens*, *B. subtilis*. Microbiological analyzes of all honey samples was performed in triplicate. On the basis of analysis it was ascertained that the most sensitive to the effects of tested honey were gram-negative bacteria: *E. coli*, *P. fluorescens*, *P. vulgaris*, *P. mirabilis*. Gram-positive bacteria proved to be more resistant: *Enterococcus*, *S. aureus* 4.4; *S. aureus* 25925, *B. subtilis*. There was not found the honey activity on the microorganisms *L. monocytogenes*, *L. acidophilus*, *S. aureus*.

EFFECT OF AMITRAZ FUMIGATION ON QUEEN BEE LARVAE AND ADULT BODY WEIGHT

Jakub Gąbka, Joanna Trzeciecka

Apiculture Division, Faculty of Animal Science, Warsaw University of Life Sciences

ABSTRACT

Health of rearing colonies is an important factor affecting the quality of queen honey bees. Infestation of brood by *Varroa destructor* causes developmental deformations of adults and a decreasing of weight and lifespan. Queen cells are rarely infected by the mite. Infestation, however, happens in heavily infested colonies or those containing no brood. Rearing colonies usually have no open brood, instead more introduced larvae are accepted. Apiwarol, containing amitraz, is a treatment used to control *Varroa destructor*. The aim of this study was to investigate the effect of fumigation with amitraz on the survival rate of queen larvae and adult queen body weight. Larvae less than one day old were introduced into 13 rearing colonies. Altogether, 268 larvae were accepted and investigated. The experimental groups were: 4 rearing colonies fumigated when the developing queen larvae were 2 days old, 4 colonies fumigated when the larvae were 4 days old, and 5 control colonies which were not fumigated. One day after sealing, queen cells were put into an incubator at 34.5°C. The number of sealed queen cells were compared with the number of larvae initially accepted. Queens emerged in the incubator. They were weighed within 8 hours after emergence. Mortality of larvae treated at the age of 2 days, treated at the age of 4 days, and those untreated was 5.7, 11.5, and 15.1%, respectively. Queens did not emerge from 8.4, 7.8, and 12.7% of queen cells, respectively. Mean body weight of queens from larvae fumigated at the age of 2 days, 4 days, and the non-fumigated, was 206, 212, and 208 mg, respectively. All these differences were not statistically significant. Amitraz fumigation of honey bee colonies did not affect the survival rate of queen larvae nor the body weight of obtained queens.

ONSET OF OVIPOSITION BY VIRGIN HONEY BEE QUEENS

Jakub Gąbka

Apiculture Division, Faculty of Animal Science, Warsaw University of Life Sciences

ABSTRACT

It is widely known that carbon dioxide treatment accelerates egg laying in instrumentally inseminated honey bee queens. However, anaesthesia with CO₂ shortens the lifespan of bees in direct relation to increased exposure. The aim of the study was to compare the effect of three different treatments: anaesthesia with carbon dioxide, anaesthesia

with nitrogen, and oxygen deprivation by submersion in water, on the onset of oviposition in virgin queens. The effect of the number and duration of CO₂ treatments was also investigated. The study was carried out on virgin queens to eliminate the influence of insemination. Altogether, 134 queens in mating nuclei were investigated. The entrances were covered by queen excluders to prevent natural mating. Queens that were anaesthetised once, were at the age of 8 days. Queens anaesthetised twice were 7 and 8 days old. Those anaesthetised three times were 6, 7, and 8 days old. This means that all the queens were at the same age during the last treatment. Queens treated twice with either carbon dioxide, or nitrogen, or water started to lay eggs after 7.4, 10.4, and 6.8 days, respectively. No significant differences were found. Two and three CO₂ treatments had the same effect on the onset of oviposition (after 8.9 and 8.4 days, respectively). These treatments, however, significantly accelerated oviposition compared to one anaesthesia (21.5 days from the treatment). Untreated non-mated queens started to lay eggs at the age of 41.8 days, on average. Queens anaesthetised twice or three times for: 5-6 seconds, 1, 2, and 10 minutes started to lay eggs after 10.4, 8.3, 7.9, and 8.1 days, respectively, from the last treatment. The differences were not statistically significant. I speculate that ovary activation in queens is not the effect of CO₂ or any other gases but the effect of a lack of oxygen.

THE EFFICIENCY COMPARISON OF THE IN VIVO AND POST MORTEM DIAGNOSTIC METHODS FOR ESTABLISHING THE LEVEL OF VARROA DESTRUCTOR MITE INFESTATION OF BEE SAMPLES FROM PARASITIZED BEE COLONIES

Beata Bąk, Jakub Wilk, Jerzy Wilde, Maciej Siuda

Apiculture Department, Warmia and Mazury University in Olsztyn

ABSTRACT

Varroosis is the most dangerous disease of bees, leading to massive falls of bee colonies. The key element of Varroa control is the constant and frequent monitoring of the level of bee colony infestation with this parasite. The aim of the study was to compare three methods of testing the level of bees infestation with the *V. destructor*. OIE and BEEBOOK recommend the testing of post mortem samples by flotation or shaking in vivo after sprinkling them with powdered sugar. It was noticed that the *V. destructor* mites are anaesthetised under the influence of CO₂ and fall out of the shaken sample of the bees that have been anaesthetised with this gas. It was decided to use this in controlling the level of bee infection as the third in vivo method. At the beginning, 16 bee colonies were assigned to the tests. Two samples of bees were taken from each colony. The first sample was tested using the powdered sugar method (shaken for 3 min) and the second one by flotation. Bees from the first sample, after shaking with powdered sugar, were checked by flotation method. Then, samples of bees from 12 bee colonies heavily infected were collected for the CO₂ tests. The bees were anaesthetised for one minute and shaken for one minute. Then, after counting the mites, the bees were killed and subjected to flotation testing. The average intensity of bee infestation by *V. destructor* in the samples tested by shaking with powdered sugar and by flotation was statistical similar and was 10.43 and 11.09, respectively. Thus, both test methods are equally sensitive and can be used interchangeably. Shaking CO₂-anaesthetised bees did not give satisfactory results. It allowed to obtain an average of 66% of parasites on the collected samples. The CO₂ method needs to be refined further.

MODERN ASPECTS DISINFECTION OF WOODEN BEEHIVES IN UKRAINE

Mykhailo Leshchynshyn, Ihor Dvylyuk

Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies Lviv

ABSTRACT

In recent years around the world an unprecedented decrease in the number of colonies of honey bees has been observed due to the influence of various etiological factors. That why Disease Management of honey bees could reduce the impact of pests and diseases and to prevent them from occurring in the apiary and also residues chemical in honeybees products. One of the conditions for providing the health of honey bees is disinfection. But most of disinfectant products have some level of hazard and depend from many factors affect the efficacy of the process. The present study was carried out to investigate the antimicrobial effect of commercial disinfectants intended and allowed for use in beekeeping in Ukraine. The analysis was carried out on the main microbiological indicators. It is investigated to dynamics of change of level of the general bacterial contamination of the presented samples. The object of the study was to study the effectiveness of disinfectants for the decontamination of wooden beehive elements. We undertook an examination the antimicrobial effect of new disinfectants chemical products to the wooden surface of beehives such as Biodes-20 - solution of benzyl-dimethyl-tridecyl-azanium chloride (stock solution - 200 mg/ml benzyl-dimethyl-tridecyl-azanium chloride), "Vetocs-1000" - solution of sodium hypochlorite (stock solution - 1,2 ± 0,1 mg/ml sodium hypochlorite) and "Shumerskesriblo" – solution of citrate-capped silver and copper nanoparticles (stock solution - citrate-capped 0,5mg/l AgNPs and 0,5mg/l CuNPs). In particular, the use of commercial 10% solution of disinfectant "Shumerskesriblo" observed the highest level of bactericidal activity compared with other disinfectants. The obtained results indicate that the disinfection of the wooden surfaces of beehives was more effective when disinfectant "Shumerskesriblo" was used.

RED MASON BEE COCOONS AS AN ALTERNATIVE SOURCE OF DIETARY FIBER

Agnieszka Murawska¹, Paweł Migdał¹, Barbara Zajdel², Ewa Popiela¹, Adam Roman¹

¹Wrocław University of Environmental and Life Sciences

²Warsaw University of Life Sciences – SGGW

ABSTRACT

The aim of this study was to determined the proximate composition, gross energy, the amount of amino acid and mineral content in red mason bee (*Osmia bicornis*) cocoons in order to defined possibilities of using them in human nutrition. This was the first study documenting the proximate composition and amount of amino acid in *Osmia*

bicornis cocoons. Like all other insects cocoons, red mason bee cocoons consist of silk. Cocoons used in this study came from the own breeding of the red mason bee conducted for the research. Samples were analyzed for proximate composition, amino acids and minerals by using AOAC standard methods. The dominant component of the examined cocoons was crude protein accounted for 53.89%. Examined cocoons were found to contain a considerable amount of crude fiber (30,69%). Red mason bee cocoons consisted of 18 amino acids, including 39% of essential amino acids (EAA). The most abundant amino acid was alanine (18.67%) followed by glutamic acid (15.59%). Examined cocoons had a considerable amount of minerals, both micro and macro elements. Silk proteins, which are mainly fibrous proteins, are practically inaccessible to proteolytic enzymes and thus has low nutritional value. However, this type of proteins presents also in red mason bee cocoons, can be used as an alternative source of dietary fiber. As it appears from comparison obtained results to other sources of dietary fiber in products of insect origin, cocoons of *Osmia bicornis* differ in composition. However, this fact may indicate its unique properties and does not exclude the possibility of using examined cocoons in nutrition. Further work can be done to examine the influence of addition of red mason bee cocoons to the laboratory animals diet.

THE CASE OF MORTALITY OF HONEYBEE – APIS MELLIFERA CAUCASICA COLONIES IN WESTERN GEORGIA LINKED TO CHEMICAL CONTROL OF INVASIVE STINK BUG -HALYOMORPHA HALYS

Giga Akopashvili

Institute of Entomology, Agricultural University Tbilisi

ABSTRACT

Beekeeping represents sustainable branch of agriculture in Georgia; however, recent changes in agricultural practice - especially intensified pest control measures has led to increased honeybee colony mortalities in western Georgia. Presented study aimed to reveal the drivers of the honeybee colony losses occurred in the autumn of 2018. The observed results are based on survey conducted among 61 beekeepers (3416 honeybee colonies), whose apiaries are located in the areas, where chemical control of stink bug - *Halyomorpha halys* (recently introduced to Georgia) have been applied.

Our findings include:

1. Unusual for Georgian apiaries, rapid depopulation and consequent mortality of honeybee colonies during early and late autumn. The mortality of the colonies varied between 14-86%.
2. The colony mortality markedly varies depending on the location; the same beekeeping management practice has been applied though.
3. There is positive correlation between the colony mortality with: *Varroa destructor* treatment and pesticide field use mode. High mortality of colonies coincides with fogging of deltamethrin/bifenthrin on maize fields during bee flight time and nonstandard use of water-dissolved fluvalinate formulations by beekeepers in the colonies. We have not performed pesticide residue analysis for hive materials; however, coincidence of the certain phenomena yields credible clue about drivers of high honeybee colony losses in western Georgian apiaries. The sudden changes in pest control strategy in agriculture is accompanied with increased mortalities of honeybee colonies. Therefore, thorough adherence to the rules of pesticide use in the field and in honeybee colonies must be achieved.

USING SPECIFIC BACTERIOPHAGE PREPARATION IN HONEY BEE INFECTIONS CAUSED BY PAENIBACILLUS LARVAE

Ewa Popieła¹, Paweł Migdał¹, Ewa Jończyk-Matysiak², Barbara Owczarek², Kinga Światała-Jeleń³, Paweł Chorbiński³, Katarzyna Hodyra-Stefaniak³, Adam Roman¹, Andrzej Górski², Dominika Kula², Norbert Łodej²

¹Wrocław University of Environmental and Life Sciences

²Bacteriophage Laboratory, Ludwik Hirsfeld Institute of Immunology and Experimental Therapy, Polish Academy of Sciences

³Pure Biologics Inc.

ABSTRACT

The aim of the study was the development and implementation of phage preparation intended for the prevention and treatment of American and European foulbrood. This disease entity is one of the most serious health problems affecting bees, leading to a significant weakening of the viability of bee colonies and, in consequence, to economic losses in the agriculture and horticulture sectors. Development of an effective bacteriophage preparation is the major goal in the protection of these key pollinators. The research objective will be achieved by the isolation and characterization of specific phages active against *Paenibacillus larvae* and *Melissococcus pluton*. In order to isolate the phage, different samples of water, soil, bee bodies and bee products were collected from the environment. Phage isolation, lytic spectrum, activity as well as phage amplification were prepared using plate method. We have obtained a unique collection of phages specific to *Paenibacillus larvae* - the main etiological agent of the American Foulbrood. During first period of the study isolated phages were selected and characterized. Conditions to prepare phage preparations were specified and three prototypes comprising various phages have been prepared to test their impact on bees during lab studies. The laboratory experiments were conducted in controlled environmental conditions. Bees were collected and transferred into cages and subsequently divided into experimental groups. Throughout the experiments, bees from the experimental groups were fed sugar syrup with the addition of a solution of selected phages preparations at specified concentrations. Next the best combination of phages was used in apiary during beekeeping season on honey bee colonies. This work was supported by the project POIR.04.01.04-00-0126/16 "The development and implementation of a bacteriophage preparation intended to use in the treatment and prevention of the American and European foulbrood of honey bee" funded by National Center of Research and Development.

FOOD QUALITY AND FOOD SAFETY OF ANIMAL ORIGIN

KEYNOTE LECTURE

MEAT AS A SOURCE OF ANTIOXIDANTS

Małgorzata Korzeniowska

Wrocław University of Environmental and Life Sciences

ABSTRACT

Muscle food is considered to be one of the main cause of the incidence of many cardiovascular diseases and even some types of cancers. That is why the recent WHO recommendation is to lower the amount of meat and especially processed meat products in our diet. However, fresh, unprocessed meat is a rich source of many valuable, beneficial and bioactive substances including vitamins, minerals and natural antioxidants. The latest one are substances present in food at relatively low concentration, comparing to easily oxidized molecules, which are able to decrease the dynamic of lipids, proteins, DNA and carbohydrates oxidation processes. The presence of active antioxidants determines both the quality and durability of food products, including meat. Antioxidants are generally divided, according their way of action, to protective inhibitors and proper antioxidants. Protective inhibitors are able to remove the primary active reduction products of oxygen or a transition metal converting an inactive form and inhibitors acting on secondary catalysts for the oxidation of lipids. Proper antioxidants intervening the chain reactions of lipid oxidation by reacting with the lipid radicals. Maintaining the balance between antioxidants and prooxidants is necessary for the proper functioning of a living organism and prevent negative effects of oxidative stress. Mechanisms of defense against reactive oxygen species can be divided into three groups consisting of: antioxidant enzymes (glutathione peroxidase, catalase and superoxide dismutase), the hydrophilic and hydrophobic low molecular weight antioxidants that disrupt free radical chain reactions, and as well proteins able to bind prooxidative transition metal ions. In meat the first line of defense i.e. enzymes, are not active, as a result of processing operations, in particular heat treatment and high concentrations of sodium chloride. So, the primary antioxidative defense system of meat is based on low molecular weight endogenous antioxidants, both hydrophilic and lipophilic. Naturally occurring in meat antioxidants capable to scavenge free radicals are lipid-soluble tocopherols, tocotrienols, ubiquinones and carotenoids, as well as water-soluble amines, amino acids, peptides i.e. carnosine and anserine, histidine related compounds, and protein thiols, glutathione, uric acid and polyphenols. Currently, in the technology of food of animal origin a strong trend to increase antioxidants compounds concentration is observed. It can be done directly by adding antioxidants during meat processing, as well as on the indirect way by the animals diet modification. However, due to dualistic properties of some antioxidants and potential reactions with other meat components during processing leading to the acceleration of oxidation processes and formation of toxic/harmful compounds, special attention should be put to this aspect of meat science and technology.

ORAL PRESENTATION

FUNGAL COMMUNITY IN AUSTRIAN VORARLBERGER HARD CHEESE DURING RIPENING

Monika Dzieciol

University of Veterinary Medicine Vienna/Institute for Milk Hygiene

ABSTRACT

Vorarlberger Bergkäse (VB) is an artisanal raw milk washed-rind hard cheese (manufactured in Western Austria) without adding external ripening cultures and has a protected designation of origin (PDO). In previous studies, the bacterial and fungal composition of the rind microbiota of VB was assessed by using 16S and 18S rRNA cloning and Sanger sequencing, revealing a high diversity on the VB cheese rind (Schornsteiner et al., 2014).

The aim of this study was to identify cheese-associated eukaryotes (yeast and filamentous fungi) present in the VB cheese rinds during ripening process.

Cheese rind samples (n=200) were taken from ripening cellars of two cheese producing facilities in Austria at the day of production and after 14, 30, 90 and 160 days of ripening. i) Illumina MiSeq sequencing, ii) TaqMan quantitative real-time PCR (qPCR) and iii) cultivation approaches were used.

Results: i) The culture-independent results, obtained using high-throughput Illumina ITS2 (ITS3/ITS4) sequencing summarized the current knowledge on yeast and filamentous fungi in VB rinds. ii) The quantitative analysis (part 2) using 18S rRNA qPCR provided information about the quantitative level of fungi during ripening and revealed differences between the two ripening cellars. iii) Fungi culture collection (part 3) provided isolates to understand the importance of interactions between fungi and bacteria in cheese rinds. These new findings enable us to understand the VB cheese-making process better and might allow the processing- and ripening conditions to be improved to enhance the quality of the product.

THE MECHANICAL EFFECT OF DIFFERENT COMPONENTS IN THE AUTOMATIC MILKING SYSTEMS ON THE FREE FATTY ACIDS FFA IN MILK

Fadi Alhomoch¹, Christian Ammon¹, Muhi El-Dine Hilali³, Susanne Demba¹, Sandra Rose², Reiner Brunsch¹

¹Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB)

²Hochschule Neubrandenburg, Department of Agricultural Machinery, University of Applied Science

³ICARDA - International Center for Agricultural Research in the Dry Areas, Jordan.

ABSTRACT

There is an increasing trend in the number of automatic milking systems (AMS) installed worldwide. Various quality milk problems have been linked with AMS. New technologies use complex sensor technology than ever before.

The robots use sensor technology to find the teats, clean them, and attach the milking clusters. Milking with an AMS is a fully automated process, in which visual control of the milk is not possible as with conventional milking systems. The content of milk FFA is affected when milked with AMS leading to an accumulation of free fatty acids (FFA). The main reasons of too high FFA-levels are quite complex and not yet fully covered in AMS.

Therefore, the aim of this study was to determine potential factors inside the AMS, which significantly influence the FFA content, such as the teat cups design, pulsation ratio, air inlet, and tubes layout. In this case, the comparison is between AMS themselves; two AMS of different manufacturers were compared. The investigations were carried out in the milking laboratory of the International Committee for Animal Recording (ICAR) in Groß Kreutz, Brandenburg, Germany. The laboratory was equipped with different components of the chosen AMS. The bulk milk from the AMS was taken for testing the influence of different AMS components on FFA. The milk samples were regularly obtained (four to five times per month from February 2008 to February 2019) from the dairy herds for the milk quality determination in State Control Associations (LKV).

FFA levels increasing were noticed likely to milking machine components of AMS, some components imply more importance than technical parameters of the AMS. The results of the regression analysis showed that the FFA values differed significantly between teatcups with different designs and the different setting of AMS's.

THE EFFECT OF POLYPHENOLS AND VITAMIN E ON THE PERFORMANCE, MEAT QUALITY AND ANTIOXIDANT STATUS OF MONOGASTRIC ANIMALS UNDER NORMAL AND STRESS CONDITION

Krzysztof Lipiński¹, Magdalena Mazur-Kuśnirek¹, Zofia Antoszkiewicz¹, Sylwia Kotlarczyk¹, Daniel Korniewicz²

¹Department of Animal Nutrition and Feed Science,
University of Warmia and Mazury in Olsztyn, Poland,

²Cargill Poland

ABSTRACT

The aim of the studies was to verify the hypothesis that the use of natural polyphenols (onion and grape seed extracts, ProviOX®) and increase in the content of vitamin E in the diets influence the performance, meat quality, and antioxidant status of monogastric animals. First experiment was conducted on 52 sows (4 treatments) to determine the effect of vitamin E and natural polyphenols on performance, vitamin E and antioxidant status in sows. Considering the results it can be concluded that the sows received diets with the vitamin E and polyphenol (50:50) supplements were characterised by similar fertility, mating effectiveness and litter performance compared to the group sows fed diets with vitamin E addition. Results from the study demonstrate that compared with sows fed 100/150 mg vitamin E/kg diets (gestation, lactation) the sows fed the with vitamin E and natural polyphenols and their piglets were characterised by similar or better vitamin E status and better antioxidant status (GPx, SOD, TAS) and vitamin E status (α-tocopherol concentrations). It can be concluded that the replacement of 50% of dietary vitamin E with polyphenols did not compromise the growth performance of sows or piglets and improved their antioxidant status. The studies with boiler chickens (four) involved 480-day-old broiler chickens Ross 308 (120 birds in each experiment), randomized into 4-6 experimental groups. The birds received basal diets without added vitamin E or diets supplemented with vitamin E, vitamin E and polyphenols or only with polyphenols. Broiler chickens were exposed to the following stress factors: elevated ambient temperature, the presence of ochratoxin or oxidized fat in diets or were without stress condition. Partial replacement of vitamin E with polyphenols in broiler chicken diets can improve the antioxidant status of birds as well as some carcass and meat quality parameters. The obtained results are comparable with those reported for dietary supplementation with high levels of vitamin E in preventing the adverse effects of stress in commercial poultry production.

FIGHTING VIRUSES WITH ANTIBIOTICS: A WORD OF CAUTION

Jan Paeshuyse

Laboratory of Host Pathogen Interactions in Livestock, Department of Biosystems, Faculty of Bioscience Engineering, KU Leuven University, Belgium

ABSTRACT

In recent years there was a paradigm shift using antibiotics to treat viral infections. However, we demonstrated previously for several semisynthetic derivatives of teicoplanin aglycon that they could interfere with the in vitro replication of the hepatitis C virus by means of multiple modes of action centred around the lipid and cholesterol metabolism and membrane composition. Hence, we urge caution to carefully verify the impact of antibiotics on the host cell during the follow-up of novel antiviral activities of antibiotics.

INTRODUCTION

In recent years there was a paradigm shift using antibiotics to treat viral infections. As eloquently reviewed by Colson and Raoult [1] about 11 papers reported on the antiviral activity of teicoplanin and its analogues against a myriad of viruses. Hence, the alternate use of antibiotics was deemed a valuable strategy in improving and expanding our antiviral armamentarium. Previously, we reported and characterized the in vitro anti-hepatitis C virus (HCV) activity of several semisynthetic derivatives of teicoplanin aglycon and more in particular of analogue LCTA-949 [2]. We demonstrated that glycopeptide aglycon antibiotics partially inhibit the early steps of the replication cycle of HCV and also inhibit HCV subgenomic replicon replication. Hence, we concluded that LCTA-949 has a dual mechanism (inhibition of entry and a post-entry event). Further unravelling the mechanism by which LCTA-949 interferes with HCV cell entry, we revealed that LCTA-949 has a tropism toward membrane. As was apparent of the work of Obeid et al [KU Leuven, Faculty of medicine 2014] LCTA-949 influenced the host cell lipid metabolism and cholesterol levels. Both phospholipid and cholesterol contents were increased in LCTA-949-treated cells. At the subcellular level, LCTA-949 treated cells were shown to carry several multilamellar bodies, a hallmark of phospholipidosis. Here we report on microarray data pointing toward host cell-specific alterations, resulting from LCTA-949 treatment, that combined are responsible for the inhibition of HCV replication. Hence, we urge caution to carefully verify the impact of antibiotics on the host cell during the follow-up of novel antiviral activities of antibiotics.

MATERIAL AND METHODS

Compounds

Semisynthetic derivatives of teicoplanin aglycon LCTA-949 and LCTA-901 were synthesized by the methods described and dissolved in DMSO [3].

3.2 Cells and viruses

The highly permissive cell line Huh 7.5.1 was kindly provided by Dr. F.V. Chisari (The Scripps Research Institute, La Jolla) were cultured in Dulbecco's modified Eagle's Medium (DMEM, Gibco, Merelbeke, Belgium) supplemented with 10% heat-inactivated fetal bovine serum (Integro, Zaandam, The Netherlands), 1× non-essential amino acids, 100 IU/mL penicillin (Gibco), 100 µg/mL streptomycin (Gibco), Cell cultures were maintained at 37°C with 5% CO₂.

3.3 Microarray experiments

Huh 7.5.1 cells that were either infected with HCVcc JFH1 or mock infected were treated with either DMSO or 20 µM LCTA-949 and were allowed to grow for 96 h. Total RNA of 1 × 10⁶ cells was isolated with TRIzol reagent (Invitrogen) according to the manufacturer's instructions. The RNA was further purified by RNeasy Mini Kit (Qiagen). RNA quality and quantity was measured using a Bioanalyzer system (Agilent). GeneChip® Human Gene 1.0 ST Arrays (Affymetrix) were used containing probes for >30,000 coding transcripts and >11,000 long intergenic non-coding transcripts. Microarray analysis was done at the VIB Nucleomics Core Facility (<http://www.nucleomics.be>). Bioinformatic analysis of differentially expressed genes was carried out using R (R Development Core Team (2008). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org>.) and bioconductor [4] to plot heat maps and dot plots and Ingenuity pathway analysis (Ingenuity@Systems, www.ingenuity.com). In brief, the technical controls were filtered from the data-set after which the variance for each gene over the four conditions was calculated. An arbitrary cutoff of 1000 genes with the highest variance was chosen. Next, dot plots and heatmaps were generated for the selected genes. Genes from which the expression was perturbed in one or more of the different conditions studied were used to identify the relevant pathways that might be perturbed by the different treatments.

RESULTS AND DISCUSSION

After pre-processing of the microarray data for all four conditions a subset of 1000 genes with the highest variance across the four conditions were plotted in scatterplots, Fig 1, Both the data obtained for Huh 7.5.1 cells treated with 20 µM LCTA-949 (CCCP) or infected and treated with 20 µM LCTA-949 (VCCP) show the highest correlation. This might indicate that in these condition a similar perturbation of the intracellular environment is achieved after LCTA-949 treatment. The gene expression in the mock treated control (CC) still correlates relatively well with both the compound treated conditions. The HCVcc JFH1 3 mut infected Huh 7.5.1 cells (VC) correlates the least with VCCP, CCCP and CC. The gene expression patterns observed in the VC when plotted against the three other conditions clearly show a bifurcated pattern. When the data obtained are plotted in a heat map (Fig 2) a similar clustering or correlation of the data is observed as for the dot plots. Furthermore can we derive from the heat map that the bifurcated pattern observed in the dot plots originates from gene clusters that are either highly up or down regulated in the VC and oppositely regulated in the three other conditions as compared to the VC but in a more moderate way.

CONCLUSIONS

Microarray analysis of cell infected with HCV and treated with the potent teicoplanin aglycon LCTA-949, showed differentially expressed genes involved in cholesterol metabolism, Fig 3.

ACKNOWLEDGMENT

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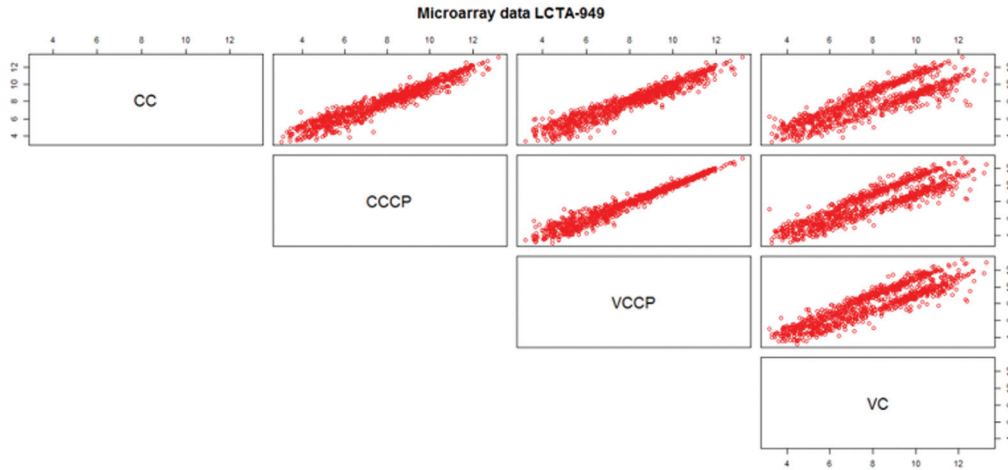


Fig 1 Scatterplot of a 1000 genes subset with the highest variance across the four conditions. CC: Huh 7.5.1 cells mock treated, VC: Huh 7.5.1 cells infected with HCV JFH1 3 mut, CCCP: Huh 7.5.1 cells treated with 20 μ M LCTA-949, VCCP: Huh 7.5.1 cells treated with 20 μ M LCTA-949 and infected with HCV JFH1 3 mut.

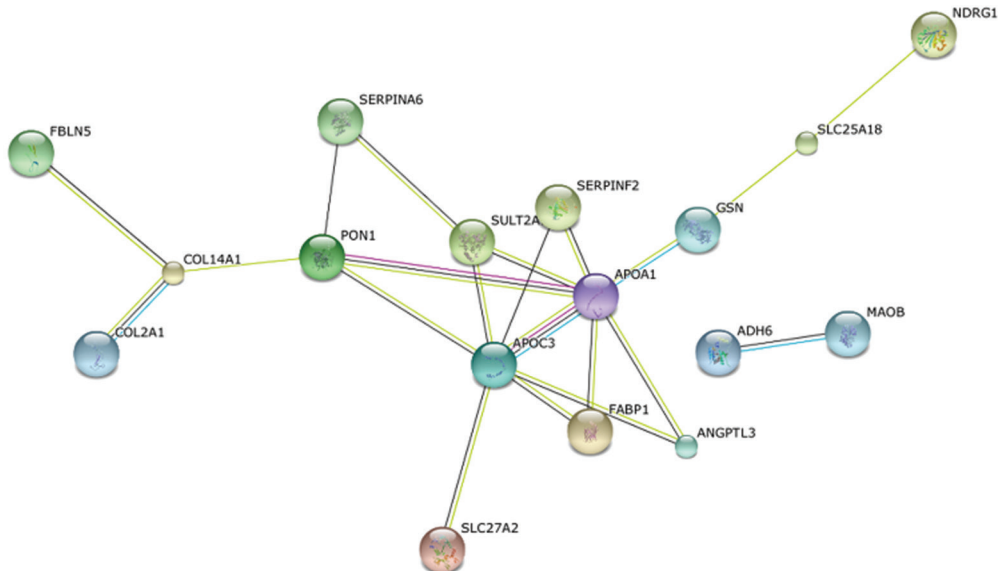
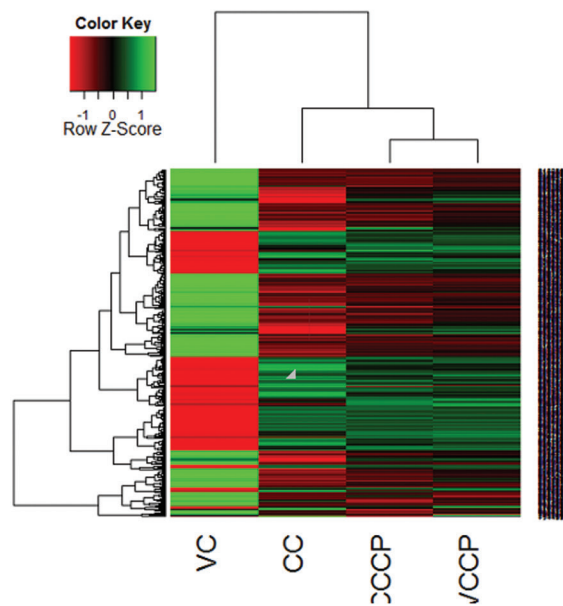


Fig 2 Heatmap of a 1000 genes subset with the highest variance across the four conditions. CC: Huh 7.5.1 cells mock treated, VC: Huh 7.5.1 cells infected with HCV JFH1 3 mut, CCCP: Huh 7.5.1 cells treated with 20 μ M LCTA-949, VCCP: Huh 7.5.1 cells treated with 20 μ M LCTA-949 and infected with HCV JFH1 3 mut. Green indicates upregulated gene expression and red indicates down regulated gene expression.

Fig 3 Selected genes among the 1000 genes subset with the highest variance across the four conditions related to lipid and cholesterol metabolism that were upregulated. Network was made using STRING v11 [5].



POSTER PRESENTATIONS

NON-TRADITIONAL ANIMAL PRODUCTS ON THE SLOVAKIAN MENU

NON-TRADITIONAL ANIMAL PRODUCTS ON THE SLOVAKIAN MENU

Daniela Takáčová, Peter Korim, Alena Nagyová, Nada Sasáková, Andrej Bugarský
University of Veterinary Medicine and Pharmacy in Kosice, Slovakia

ABSTRACT

The legislation on the authorized range of animal protein sources in the Slovak Republic is not complete from the point of view of supervision and control over them. Legislation of the SR lacks (it is not included) the regulation of the possibility of consuming non-traditional food products, e.g. insects. The increase of tourism is one of the reasons why citizens of the Slovak Republic are also interested in products that they have been able to consume on their foreign journeys. There is a growing number of citizens who do not consider it extraordinary not only to taste but regularly consume above mentioned sources of animal protein. We increasingly hear that it is a matter of time, even in countries with a traditional culture, that consumption of such animals becomes common practice.

INTRODUCTION

One of the main components of human nutrition is protein. The ideal composition of our food should contain 15% protein energy, 55% carbohydrate and 30% fat. The most common sources of full-fledged proteins are eggs, milk and poultry, pork and beef. In 2016, the annual consumption of meat and meat products in Slovakia was 59 kg, milk and dairy products 175.5 kg and 219 eggs per capita [4]. Over the last hundred years, meat consumption has increased by 60% due to the steady growth of the human population. By 2050, meat consumption is projected to rise to 455 million tonnes per year [10]. Many of us may not even realize it, but it is high time to think about alternative and, at the same time, the most complete sources of food. According to many scientists, such an alternative could be entomophagy, i.e. eating insects in any form.

EU LEGISLATION AND OTHERS

Insects intended for human consumption are increasingly produced in or exported to the Union, as they are used as a suitable alternative to mainstream food of animal origin. The general principles and requirements of food law in the European Union are laid down in Regulation (EC) No 178/2002. "Food" is defined as "any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans" [11]. European rules on food hygiene apply to all stages of food production, processing, distribution and placing on the market. Regulation (EU) 2015/2283 become the novel food regulation. The definition of "novel food" was established and consists of two cumulative conditions: (1) "any food that was not used for human consumption to a significant degree within the Union before 15 May 1997"; and (2) "food falling under one of the specified categories" [12]. The novel food may only be placed on the market following premarket authorization by the European Commission, with a strong emphasis on risk assessment. Insects and insect products for consumption have not yet been approved for placing on the European market, so they cannot be imported and sold in the Slovak Republic either. It follows from the above that there is no breeder of insects in the Slovak Republic that would be approved by the competent authority as a producer of insects for food purposes.

In some countries (UK, USA, Canada, New Zealand and Australia), for whom edible insects do not represent a novel food, the food agencies have authorized import and sales. There is no specific set of standards for edible insects in USA. To be allowed for market, the insects must have been bred for human consumption. Products containing insects must of course follow the standards required by the U. S. Food and Drug Administration (FDA) including bacteriological tests and good manufacturing practice certification [2].

Insects generally do not support the growth of pathogenic biological hazards but they may transmit pathogens from affected substrates to the consumer [14]. It is important to know that insects (especially crustaceans and mites) can cause allergic reactions, mainly in people with allergies to seafood (the composition of the insect exoskeleton is similar to seafood) and that for celiac "100% safe" is only silkworm or trumpet fruit, the other species kept in our country always have some cereal in feeding, they can be a source of secondary contamination [1].

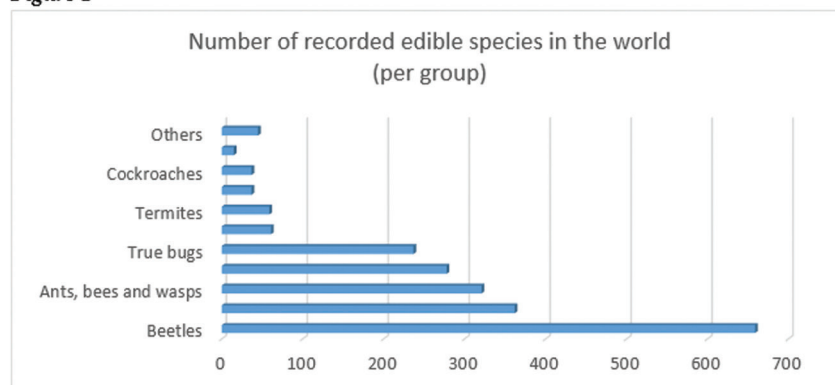
INSECTS AS A FOOD

Around the world there is 2111 edible insect species (Fig. 1) among which we can find beetle larvae, caterpillars, wasps, bees and ants, crickets, grasshoppers and locust, true bugs, dragonflies, termites, flies, cockroaches, spiders and others [9]. They are commonly eaten in all inhabited continents, with the exception of Europe and North America, where reservations are made or considered taboo [15]. Insects offer particular benefits to those who want to reduce their environmental footprint, because they are exceptionally efficient in converting what they eat into tissue that can be consumed by others – about twice as efficient as chickens and pigs, and more than five times as efficient as beef cattle [5]. It is a welcome and easily accessible source of protein instead of otherwise inaccessible meat in poor regions. At present, entomophagy is literally fashionable in the Western cultures and the work of luxury businesses, where you can taste selected insect specialties [7]. However, according to several studies, it will be necessary in the future to include insects for the majority of the population worldwide, due to the sustainability of food production [13].

According van Huis and Tomberlin [14] the most common insect species that are reared for human consumption are beetles (the yellow mealworm *Tenebrio molitor*, the lesser mealworm (*Alphitobius diaperinus*) and the superworm (*Zophobos morio*). Grasshoppers are being nutrient rich in proteins [10] and other nutrients and can be used for biomass production [8, 3]. Caterpillars, bees and wasps are used for human consumption, too.

The largest breeder of Crickets is located in North America in Canada and serves some local start-ups. If, however, an insect lacks a history of safe consumption, it might fall back into the novel food category pending an evaluation by the Bureau of Microbial Hazards in the Food Directorate. Both Australia and New Zealand share an agency for the maintenance of food safety (Food Standards Australia New Zealand – FSANZ). This agency has addressed some cases like the super mealworm (*Zophobas morio*), the domestic cricket (*Acheta domesticus*) and the moth (*Tenebrio molitor*), deciding that they are not novel foods, even though they cannot be considered traditional foods either. In particular, they have yet to encounter food safety problems and consequently have not been put to the consumption limits or import [2].

Figure 1



Source: Y de Jongema (2017) [9]

CONCLUSIONS

The growing population in the world and the resulting demand for animal proteins is not enough, it is necessary to search alternative protein sources. The field of rearing insects for human food is still new. Because insects may carry and transmit certain biological and chemical hazard to humans, they must belong to a species, which is authorised in accordance with Regulation (EU) 2015/2283 and is listed in Implementing Regulation (EU) 2017/2470, if insects are used for food. If all requirements are met, insects can be offered for consumption in the Slovak Republic as well.

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CONSUMPTION OF MEAT DIFFERENT FROM FARMED ANIMALS

Daniela Takáčová, Peter Korim, Nada Sasáková, Alena Nagyová
University of Veterinary Medicine and Pharmacy in Košice, Slovakia;

The rule of law contained in the Veterinary Care Act 39/2007 Coll. as amended, lists bill of particulars in which the animal can be killed. Among them there is also the possibility of killing animals for the consumption of their meat. The legal norm contained in the Veterinary Care Act is originally listed as: "A reason to kill an animal is among other things: "killing of a slaughter animal or other animal used to obtain products of animal origin ". This law has been amended by the Act 184/2018 Coll. and today's wording is: "A good reason to kill an animal is among other things: "the killing of farm animal used for obtaining a product of animal origin or animal by-products ", which limits the meat consumers. An option of eating meat different from slaughtered animals (dogs) was excluded.

INTRODUCTION

Animals that are traditionally used for human consumption belong to species including ruminants (cattle, sheep, and goats), pigs, poultry or others. Other animals killed for consumption are those of wild animals' species (deer, wild boar, rabbit/hare), fish, etc. There are countries where restaurants demand fresh dogs' meat that is increasingly regarded as delicacy. European legislation does not cover dogs as food animals so the placing on the market and sale of dog meat is prohibited. Self-consumption of dog's meat is allowed.

Legislation on killing of animals in the European Union

In 1998, Council Directive 98/58/EC on the protection of animals kept for farming purposes [4] gave general rules for the protection of animals of all species kept for the production of food, wool, skin or fur or for other farming purposes, including fish, reptiles of amphibians. Legislation has been further developed since that time to progressively improve the welfare status of farmed animals and to set standards for their transport and conditions at the time of stunning and slaughter. The EU legislation on the killing of animals aims to minimise the pain and suffering of animals through the use of properly approved stunning methods. It applies to farmed animals. In 2009 the Union adopted Council Regulation (EC) 1099/2009 on the protection of animals at the time of killing [5] which started to apply on 1 January 2013. This regulation does not apply to animals killed in the wild, or as part of scientific experiments, hunting, cultural or sporting events and euthanasia practiced by a veterinarian, nor to poultry, rabbits or hares for private domestic consumption. The authority, in laying down procedures in matters of food safety, has adopted two opinions on the welfare aspects of the main systems of stunning and killing. The procedures consider individuals of certain species of animals, namely the welfare aspects of the main systems of stunning and killing the main commercial species of animals (dogs do not belong to this group) and on the welfare aspects of the main systems of stunning and killing applied to commercially farmed deer, goats, rabbits, ostriches, ducks, geese and quail.

Killing and slaughtering of animals in the Slovak legislation

The Slovak Act on Veterinary Care [8] provides a comprehensive list of reasons that are considered a reasonable ground for killing an animal (The Act on Veterinary Care No 39/2007 Coll. as amended; § 22, Section 4). Killing of an animal for any other reason than that included in this list is considered unlawful.

The reasonable ground for killing of an animal includes the following: necessary self-defence and extreme necessity; killing a slaughter animal or other animal for the purpose of obtaining products of animal origin; killing of an animal within the approved procedures; painless killing of an animal because of its terminal illness, severe or widespread injury or its age, if its further survival is associated with continuous pain or suffering; painless killing of an animal after the previous loss of consciousness can be carried out only by a veterinarian except for the ending of animal's suffering in urgent cases when it is impossible to quickly secure help of the veterinarian; slaughter of an animal at eradication, control, prevention and diagnosis of diseases and rat control; killing of unwanted animals, if it is impossible to provide for them alternative care; this does not apply to service animals, hunting an animal in a legal manner; killing invasive non-native animal species under a special regulation. The regulation concerning the killing of animals for private use was laid down in the Section 23 of the Act on Veterinary Care, which applied only to cattle, pigs, sheep, goats and farmed game.

The law on veterinary care has been amended by the Act 184/2018 Coll. and today's wording is: "A good reason to kill an animal is among other things: "the killing of farm animal used for obtaining a product of animal origin or animal by-products ", which limits the meat consumers. An option of eating meat different from slaughtered animals (dogs) was excluded.

It is generally known that animals of other species are also killed as slaughter animals. If the products of animal origin obtained from such animals are placed on the market, they must be subjected to veterinary inspection.

The Government Regulation (No. 497/2003 Coll., Amending Act No. 315/2003 Coll.) [9] defines terms such as immobilization and killing. Dogs are not listed among animals that should be slaughtered in an abattoir. The legal regulations include requirements on slaughtering of animals for fur that are killed by a mechanical device involving brain penetration, by overdose of anaesthetics, electric current followed by cardiac arrest, gaseous carbon monoxide, chloroform or gaseous carbon dioxide. Despite the existence of such regulation, even in these cases, dogs are not mentioned.

Killing and slaughtering of animals in other countries

Nearly all the states in the USA provide by State Human Slaughter Laws that an animal must be "rendered insensible to pain" (e.g., made unconscious or killed) prior to being hoisted or shackled for slaughter. Most of these state laws also contain a religious/ritual slaughter exception whereby an animal may be killed by severing the carotid

artery, causing loss of consciousness prior to be hoisted [12]. The animals covered for the purposes of this act, are classified mostly within "domestic livestock" which means cattle, horses, donkeys, swine, sheep, goats, rabbits, poultry, fowl, and any other domesticated animal deemed by the State Board of Agriculture and the Department of Agriculture. About half of the states expand the definition of "livestock" to any animal used in the preparation of meat products, but dogs are not included in the Table of State Humane Slaughter Laws.

Dog meat is increasingly regarded as a delicacy with perceived medicinal properties to improve stamina and strength. Consumption is thought of as a sign of machismo. Men who are impotent eat dog meat to get an erection. Women assume that dog meat is healthy to feed their families when in fact it is not. Unfortunately it is not yet illegal to eat dog meat in Indonesia. But different Indonesian Criminal Code (KUHP) Articles apply to suppliers, sellers and buyers [1].

An estimated 30 million dogs across Asia, including stolen family pets, are still killed for human consumption every year, according to the Humane Society International. While not widespread, the charity says the practice is most common in China, South Korea, The Philippines, Thailand, Laos, Vietnam, Cambodia and the region of Nagaland in India [2].

In Canada it is legal to sell and serve dog meat, provided the dog was killed and his meat was processed under federal inspectors' supervision [3]. If a dog is killed illegally, this is considered a cruelty to the animal, such act violates the provisions of the Canadian Criminal Code, and the offender can be sentenced to imprisonment for up to 5 years [3]. In Switzerland, commercial slaughter of dogs and sale of their meat is illegal, but farmers may slaughter their dogs for own personal consumption [7].

Because the dog is not included in the list of food animals, the placing on the market and sale of dog meat in the Czech Republic is prohibited by law. Self-consumption of meat is allowed [6]. Relatively often dog meat is consumed by the Romas, in some cases also by the Vietnamese, while among Czechs the consumption of dogs is very unusual. The police have uncovered several cases of illegal slaughterhouses operated by Vietnamese in recent years [6]. For Czech Vietnamese, dog meat is a delicacy that is expensive and hard to come by. As such, it is highly unlikely to be used fraudulently in place of other ingredients and served to Czech customers. This is comparable to a customer in a Czech restaurant fearing that instead of a roast chicken he would get a pheasant or instead of beef goulash he would get game [10].

Such cases were published by various media also in the Slovak Republic, which cited unnamed individuals who praised the positive effects of both dog fat and meat on the human organism. The circumstances under which the dogs got into the pots were not mentioned. Such action could be considered unlawful only in those cases when the dog was unlawfully stolen and killed. There is no doubt that the killing of dogs for the purpose of their consumption takes place in a way not regulate by the legislation.

CONCLUSIONS

Most countries lack legislation on the breeding of companion animals and we won't even find an adjustment for all animals that are intended for consumption. People often classify animals into those that are eaten, and those that are not. If animals are farmed then they have to be eaten. Companion animals in contrast, are not eaten, because they are considered as members of the family, therefore people cannot imagine eating them for any reason. Dogs' consumption is not prohibited in some countries. Therefore, the stress must be taken on animal's welfare (all vertebrates excluding human) as well as on the way of their slaughtering. The view of people on the consumption of dog's meat differ, which is due mainly to the varying cultural perception of the breeding of various animal species.

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SCREENING OF RAW MILK FOR BACTERIAL PATHOGENS

Christina Zuebert, Ludwig E. Hoelzle
University of Hohenheim

ABSTRACT

An increasing number of farmers in Germany are selling raw milk directly to the consumers. This highly perishable milk can contain pathogenic bacteria. These bacteria pose a risk to human health, so the milk should be boiled before consumption - a warning that many consumers ignore.

The microbiological quality of raw milk from vending machines in the greater Stuttgart region will be investigated. The prevalence of hygiene indicator bacteria and the pathogenic bacteria *Salmonella* spp., *Listeria monocytogenes*, *Campylobacter jejuni* and verotoxin-producing *E. coli* (VTEC) will be measured. The results will be compared with the threshold and maximum values of the European and German legislation. In addition, we will investigate how the microbiological quality of the raw milk may be influenced by consumer behaviour.

MICROBIOLOGICAL CONTAMINATION OF SHELL EGGS PRODUCED IN VARIOUS HOUSING SYSTEMS

Zofia Sokołowicz, Anna Augustyńska-Prejsnar, Maciej Kluz –
University of Rzeszów

ABSTRACT

According to Council Directive 1999/74/EC, in all European countries eggs can be produced in cages, bar, free-range and organic systems. The housing system may affect the amount and type of microorganisms present on eggshell, which involves potential implications on food safety. Thus, the objective of this study was to characterize and compare the microbiological status of eggshell produced in organic, free-range, barn and cage housing systems by determining the levels and prevalence of total microorganism and *Salmonella* spp.

Eggshell cleanliness and microbial load of the eggs from the housing systems was evaluated at 26, 42 and 56 weeks of hen age. Eggshell cleanliness was scored in three categories: (1) eggs with clean shells (2) eggs with light dirty shells; (3) eggs with dirty shells. The shells from 3 eggs generated a single sample for microbiological determinations. The total bacterial count was determined using nutrient broth (BTL). Colony-forming units per g of eggshell were determined from the number of colonies on plates with 30 to 300 colonies. *Salmonella* species were detected using the horizontal method according to standard PN-EN ISO 6579:2003.

The housing system was found to influence the proportion of dirty eggs and the total number of bacteria on the eggshell. The proportion of eggs with dirty shells and the total number of bacteria of eggshell were higher in the free-range system and organic system than in the cage system. In the housing systems under study, the percentage of dirty eggs was small but it was higher in free-range and organic eggs compared to cage eggs. In our study, the total number of bacteria on the eggshell was lower in the cage and barn system than in the free-range and organic system, but the difference was small. In our study, we did not find the presence of *Salmonella* bacteria.

MICROBIOLOGICAL SCREENING OF ANTIBIOTIC RESIDUES IN TARGET MATRICES OF FOOD-PRODUCING ANIMALS

Ivona Kožárová, Zuzana Poláková, Daniela Juščáková
University of Veterinary Medicine and Pharmacy in Kosice

ABSTRACT

Microbial inhibition tests are highly valuable in the first stage of the antibiotic residue screening. The aim of our study was to detect the presence of antibiotic residues in animal matrices of food-producing animals with three broad spectrum microbial inhibition tests; Premi®Test, Total Antibiotics, and the Screening test for antibiotic residues (STAR). In order to assure the comparability of the test results, a uniform tissue sample preparation procedure was used. To determine more specific antibiotic after the positive results, all positive samples were further retested with a suitable neutralization solution. A total of 141 post-slaughter animal matrices and 45 samples of raw cow's milk collected from Slovakian slaughterhouses and dairy farms were screened. Our results revealed that by using the Premi®Test, 8 samples (6 chicken livers, 1 porcine muscle and 1 milk sample) were positive and 1 sample (chicken liver) dubious, and by using the Total Antibiotics, 9 samples (7 chicken livers and 2 milk samples) were positive and 1 sample (chicken liver) dubious. By using the STAR, 12 samples (8 chicken livers, 1 chicken heart, 1 porcine muscle and 2 milk samples) were positive on the plates specific for beta-lactams and sulfonamides, and 3 samples (2 chicken muscles and 1 chicken heart) on the plates specific for aminoglycosides. After retesting of positive samples with a penicillinase and para-aminobenzoic acid (PABA) to make a distinction between beta-lactams and sulfonamides, all chicken livers were positive for sulphonamides, and 1 porcine muscle and 2 milk samples for beta-lactams. By further testing of the positive chicken livers we revealed that chicken livers were not positive for sulphonamides but were positive for the coccidiostat salinomycin. PABA counteracted the inhibition of salinomycin on the specific test plate and confirmed the presence in chicken livers. Other tissue and milk samples were negative for antibiotic residues.

RISK FACTORS RELATED TO SALMONELLA CONTAMINATION ON POULTRY CARCASSES SLAUGHTERED IN ALGIERS, ALGERIA

Lynda Mezali¹, Siham Nouichi², Taha Mossadak Hamd¹

¹Ecole Nationale Supérieure Vétérinaire d'Alger

²Centre universitaire Abdelhafid Boussouf, Mila

ABSTRACT

Salmonella can contaminate poultry meat and put humans at risk especially that such product is nowadays widely consumed. A cross-sectional prospective study was conducted through a selection of 16 poultry slaughterhouses in Algiers, Algeria, to evaluate prevalence and quantify risk for *Salmonella* contamination in the final product. From July 2012 to June 2013, carcass contamination of 160 broiler chicken and 66 turkey batches was estimated by testing for each batch five neck skin samples at the post-chill stage of slaughter process. Variables of interest including batch and slaughterhouse parameters were collected via questionnaires. *Salmonella* identification was processed using conventional methods. Relationships between batch- and slaughterhouse-associated explanatory variables and *Salmonella* contamination were assessed by logistic regression analysis. Two models were built separately for

each combination Salmonella-poultry species (p value ≤ 0.05 and 1 \times 95% CIs of odds ratios as criteria for inclusion and retention in the regression models).

Salmonella was isolated from at least one of the five samples, with a batch prevalence of 63.1% (95% CI: 55.2-70.6) for chickens and 34.9% (95% CI: 23.5-47.6) for turkeys. Univariate analysis screened 3 variables for chickens and 5 variables for turkeys. Final multivariate regression models provided one potential risk factor for contamination in each poultry species. Presence of less than 6 broilers simultaneously in the traditional scalding tank of small scale slaughterhouses had a significantly reduced risk for Salmonella contamination (OR=0.31, $p<0.05$). Slaughtering turkeys in sites processing only this specie than in mixed poultry slaughterhouses increased significantly the probability of Salmonella contamination (OR=4.44, $p<0.05$). Our study indicates a high prevalence of Salmonella-contaminated poultry carcass. Moreover, potential risk factors identified for the first time in Algeria are found to be associated with the lack in hygienic management on production sites, representing a real threat for consumers.

NUTRITION, FEED AND ADDITIVES

KEYNOTE LECTURE

THE IMPACT OF EUBIOTICS ON THE PERFORMANCE OF BIRDS AND CHEMOTHERAPEUTIC USE IN BROILER CHICKEN

Paulina Abramowicz-Pindor¹, Henryk Róžański¹, Karolina Chodkowska²

¹Research and Development Centre of AdiFeed Sp z o.o.

¹Krzyżanowski Partners Sp. z o.o.

ABSTRACT

The aim of the study was the development and implementation of eubiotic program to be used in low chemotherapeutic broiler chicken farming. According to the FDA report 70% of antibiotics are consumed by farm animals and only 30% are used in human medicine. The perspectives show the increase of deaths due to antimicrobial resistance (AMR) up to 10 million a year in 2050. As the phenomenon of AMR became a global concern the effort to reduce it should be made by all the parties.

Several steps were taken to develop the presented eubiotic program. The first study conducted at Wrocław University of Environmental and Life Sciences proved effectiveness of phytogetic products in birds inoculated with mix of *Eimeria* oocysts. Body weight and mortality was found similar in both: experimental and control (chemotherapeutic program) group. The meat quality measured in second study held at Warsaw University of Life Sciences showed no significant differences in chemical and physicochemical properties of meat between positive control and tested group. The results obtained at University of Warmia and Mazury in Olsztyn showed significant immunomodulatory properties of herbal extracts. In turn the trial performed at Research Centre in Czech Republic proved effectiveness of herbal extracts in broiler performance improvement in birds challenged with *Eimeria*. Last step was to implement the developed program with phytogetic products combined with probiotic in the field study at commercial broiler farm. In both groups, experimental and control there were no significant differences in body weight, nevertheless the mortality was lower in tested group. No clinical symptoms of Coccidiosis were found. In both groups, final antibiotic concentration was 10,5 mg/kg bw. Obtained results suggest that eubiotics may have positive effect on antibiotics reduction in poultry broiler production. Nevertheless, the all the parties: feed manufacturer, meat processing factory, veterinary management and the farm need to take the effort to decrease chemotherapeutics use in broiler chicken farming to make it effective.

ORAL PRESENTATIONS

THE EFFECTS OF FEED SORTING ON THE OCCURRENCE OF KETOSIS AND ACID LOAD IN DAIRY COWS

Viktor Jurkovich, Laszlo Konyves, Mikolt Bakony

University of Veterinary Medicine, Hungary

ABSTRACT

This conference paper describes the possible association between feed sorting and the risk of some metabolic disorders in dairy cows. Feed sorting, that is selecting smaller size TMR particles over longer length fibers, can lead to imbalanced energy input. To detect a possible relationship between TMR sorting and the occurrence of metabolic disorders in large-scale herds, TMR separation and metabolic profile tests were performed in 22 Hungarian dairies. The prevalence of ketosis and subclinical acidosis differed between feed sorting and non-sorting groups. Inhomogenous TMR seems to be a predisposing factor for imbalanced energy status. TMR homogeneity measurements should be routinely included in herd health monitoring.

INTRODUCTION

Cows select between plants during grazing and such selecting behaviour is also observed when feeding total mixed rations (TMR). Cows prefer smaller particle size (grains) to fibers [6]. Feed sorting can lead to imbalanced energy input and lower nutritive value of leftover TMR [2]. Consumption of suboptimal amounts of fiber and higher amounts of readily fermentable carbohydrates can result in subacute rumen acidosis [8], while an energy deficient ration induces subclinical ketosis [7].

TMR sorting can be detected by fraction measurements using a 3-sieve Penn State Particle Separator [5].

Our hypothesis was that the presence of feed sorting is associated with a higher incidence of imbalanced energy intake manifested in higher prevalence of subclinical ketosis and acid load.

MATERIAL AND METHODS

Within the course of regular herd health and metabolic profile monitoring, 22 Hungarian large-scale dairy herds were visited. Blood and urine samples were taken from 526 clinically healthy cows from the following production groups: fresh cows (1-7 days postpartum (pp), n=74), early lactating cows (8-30 days pp, n=230) and peak lactating cows (60-100 days pp, n=222). Samplings took place 3-5 hours after the morning feeding. Plasma beta-hydroxybutyrate (BHB) and net acid base excretion (NABE) of urine was assessed. Subclinical ketosis was defined as BHB concentrations > 0.8 mmol/l in blood plasma, and acid load (subclinical acidosis) was defined as NABE < 100 mmol/l in urine.

Feed sorting was determined on the basis of differences in the mass proportion of TMR fractions between freshly distributed and leftover TMR. At the time of morning distribution of TMR (between 5.00-6.00 h), an approximately 1-1.5 kg amount of TMR was collected from the feed trough of each production group (by mixing handful amounts collected from 4-6 sites along the trough) at each visited farm. TMR samples were fractionated by a 3-sieve separator (Penn State Particle Separator; [3]). According to the recommendations [3], 2-8% of the sample should appear on the upper sieve ($\phi > 19$ mm), 30-50% on the middle sieve (ϕ 8-19 mm), 10-20% on the lower sieve (ϕ 4-8 mm) and 30-40% in the bottom pan ($\phi < 4$ mm).

The same sampling and fractionating procedures were repeated with orts (at 12.00-13.00h, 6-8h after the feed distribution and immediately after blood sampling). If the mass proportion of any of the TMR fractions showed a difference of at least 5% between fresh and orts, it was evaluated as an evidence of feed sorting [3]. Cows were considered as 'having opportunity for) feed sorting' if they belonged to a group where TMR separation indicated feed sorting, and 'non-sorting', if the TMR separation indicated no feed sorting. A dataset was compiled that included the biochemical parameters, ketosis/acid load status, production group, herd and 'feed sorting status' of each cow that was sampled during the farm visits.

All statistical analyses were performed by the R 3.3.1. statistical software [9]. A binomial generalized linear mixed model was fit to study the occurrence of metabolic disorders (dichotomized acid load and subclinical ketosis variables). The explanatory variables were 'feed sorting status' and production group. Production group nested in herd (group/herd) was included as a random factor, adding a random term to the intercept, that takes the correlation of data of animals from the same group and groups in the same herd into consideration. BHB (logarithmized), NABE values and milk yield data, respectively, were compared using linear mixed models with the mentioned fixed and random effects. Average mass proportions of TMR fractions were compared between farms where feed sorting was present and not present, using two-way analysis of variance, with time of sampling (fresh or orts), presence or absence of feed sorting, and their interaction component as fixed effects. The threshold for significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

The pre- and post-feeding proportion of middle and lower sieve fractions did not differ significantly in any of the studied samples. The proportion of the smallest particle size fraction in orts was considerably reduced while the proportion of the longest particles increased in all sampled groups on 12 farms (Table). Based on the criteria of Heinrichs [3], all production groups on 12 farms were identified as feed sorting groups, and all production groups from the other 10 farms were identified as non-sorting groups.

Feed sorting was associated with an increase in the risk of ketosis, as compared to non-sorting. Odds ratio (OR) of ketosis was on average 5.6 times higher among fresh cows (95%CI: 1.3-24.8; $p = 0.0154$), 3.8 times higher in cows in early lactation (95%CI: 1.2-11.6; $p = 0.0145$) and on average 3.5 times higher in cows in peak lactation (95%CI: 1.04-12; $p = 0.0393$).

BHB concentrations in fresh and early lactating cows were an estimated 0.6 and 0.2 mmol/l higher, if feed sorting was present, as compared to non-selecting ones ($p < 0.01$).

The odds of subclinical acidosis in association with feed sorting were on average 6.7 times higher among fresh cows (95%CI: 1.3-33.2; $p = 0.013$), more than 3 times higher among early lactating cows (OR: 3.3, 95%CI: 1.0-11.1; $p = 0.047$) and nearly 6 times higher among cows in peak lactation (OR: 5.9, 95%CI: 1.7-21; $p = 0.002$), as compared to cows from non-sorting groups. Average NABE concentrations did not significantly differ in association with feed sorting in any of the groups, except fresh cows. It was 73 mmol/l lower than in the group of fresh cows where feed sorting was present, compared to non-sorting (95%CI: 15-130 mmol/l; $p = 0.0063$).

If the preference of smaller size particles over longer chop length forages causes sorting of the TMR, the nutritive value of the consumed dry matter is suboptimal [4]. In this case the amount of consumed peNDF is reduced, which lowers chewing activity and increases the amount of readily fermentable carbohydrates in the rumen [6], leading to increased risk of subacute rumen acidosis. As a consequence of feed sorting the nutritive value of orts differs from that of freshly distributed TMR [2]. Higher NDF and lower energy content of orts reduces dry matter intake and it is also a disposing factor for ketosis [1]. In association with feed sorting, we observed a higher prevalence of elevated plasma BHB concentration (subclinical ketosis) and lower urinal NABE (subacute acidosis) in fresh and early lactating cows. The increased incidence of metabolic disorders suggests imbalanced rumen fermentation due to either suboptimal or excess concentrate intake which could be linked to the presence of feed sorting. Imbalanced energy and nutrient intake can also affect milk production [6].

We observed that feed sorting was present either in all or none of the studied groups in a given farm, that suggests that causes of feed sorting mainly derive from feeding technology.

In conclusion, TMR quality affects animal health and production. TMR composition and homogeneity are of key importance in dairy nutrition. Ketosis and subclinical acidosis are multifactorial metabolic disorders that can also occur independently from feed sorting, however, feed sorting seems to be a predisposing factor for imbalanced energy status. TMR separation should be routinely included in herd health monitoring to detect feed sorting.

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Table 1. Proportion of TMR fractions on different levels of the separator (% mean ± SD)

	Feed sorting		p	Non sorting		p
	Before feeding	After feeding		Before feeding	After feeding	
Upper sieve	16.5 ± 8.4	34.5 ± 15.0	< 0.001	12.6 ± 6.9	14.1 ± 7.6	ns
Middle sieve	34.9 ± 8.5	34.7 ± 12.8	ns	42.2 ± 7.8	42.2 ± 8.7	ns
Lower sieve	13.7 ± 4.6	11.2 ± 4.2	ns	15.9 ± 2.9	15.7 ± 2.5	ns
Bottom pan	34.8 ± 8.2	19.4 ± 9.8	< 0.0001	30.3 ± 5.3	29.2 ± 5.8	ns

ZOOTECNICAL AND ECONOMIC EFFICIENCY USING OF FODDER ADDITIVE "GIDROLAKTIV" IN PIGLETS' RATIIONS

Valeriya Zhabinskaya, Natalia Trubchaninova, Grigoriy Pokhodnya

Federal State Budgetary Educa-tional Institution of Higher Education "Belgorod State Agricultural University named after V. Gorin"

ABSTRACT

It was determined that feeding of fodder additive "GidroLaktiV" during 30 days from 1 to 2 months in an amount of 1,0; 1,5; 2,0% in addition to the main ration contributes to increase piglets' live weight: in two months accordingly on 2,4; 7,2; 8,4%, in three months – on 2,3; 5,9; 7,2%, and in six – on 3,4; 4,4; 4,6% in comparison with control group. Feeding the piglets of fodder additive "GidroLaktiV" during growing period from 1 to 3 months in an amount of 1,0; 1,5; 2,0% in addition to the main ration contributes increasing of piglets' live weight: in two months accordingly on 4,1; 5,3; 5,9%, in three months – on 6,3; 11,2; 11,6%, and in six – on 6,3; 11,2; 11,6%, in comparison with control group. Using of fodder additive "GidroLaktiV" in piglets rations when growing them during 1 to 3 months contributes not only increasing of their growth but decreasing of feed costs per 1 kilogram of liveweight gain in comparison with control group accordingly on 3,2; 4,2; 4,2%.

On the ground of carried out research was determined that the biggest efficiency of pork production was attained when using for piglets' feeding fodder additive "GidroLaktiV" in amount of 1,5% in addition to the main ration during 60 days.

INVESTIGATION OF AFLATOXIN B1 AND ESSENTIAL OIL ADDITION ON IN VITRO RUMINAL FERMENTATION OF RUMINANT RATIIONS

Maghsoud Besharati, Zabihollah Nemati

University of Tabriz

ABSTRACT

The purpose of this study was to evaluate the effect of aflatoxin B1 addition and ability of commercial essential oil to reduce inhibitory effect of aflatoxin B1 on in vitro ruminal fermentation of dairy cattle diet. This study was include two experiments. In the first experiment, groups included: control (non-additive basal diet), AF1: aflatoxin B1 0.5 mg/ml., AF2: aflatoxin B1 1 mg/ml., AF3: aflatoxin B1 1.5 mg/ml. The second experimental groups were Aflatoxin B1 contaminated diet (1 mg/ml) with different level of essential Oil respectively 0.01, 0.1 and 0.2 mg/kg. Approximately 0.5 g of sample of diet ground to 1 mm were placed in triplicate in 100 ml glass bottles. Gas volume of each bottles were recorded at 2, 4, 6, 8, 12, 24, 36, 48, 72, 96 and 120 hours of incubation. The data were analyzed in a completely randomized design with three replications. Results showed gas produced by insoluble fractions and the constant rate of gas production were lower in AF3 compared to the control group. The highest gas volume was related to control group and the lowest gas production was related to AF3 treatment. Aflatoxin addition decreased estimated parameters include ME, NEL and DOM. The additive essential oil has more gas than aflatoxin-containing control group. According to the results it conclude that, in vitro ruminal fermentation reduced by aflatoxin and addition of herbal essential oil was improved in vitro rumen fermentation of dairy cattle diet contaminated it aflatoxin B1.

POSTER PRESENTATIONS

EFFECTS OF GINGER POWDER ON GROWTH PERFORMANCE AND HUMORAL IMMUNITY OF BROILERS

Deniz Azhir

University of Tabriz

ABSTRACT

The study determined the effects of ginger powder on growth performance and humoral immunity of broilers. Ninety six broiler chickens of 1-day old were divided into 3 different feed treatment groups, namely: control feed without ginger (R-0) and (R-5 g/kg) and (R-10 g/kg). Each group was divided into 4 sub groups as replication, consisted of 8 chickens each. The chickens were raised for 5 weeks. All chickens were weekly weighed and feed consumption weekly measured in each sub groups. After 9, 23 and 35 days old, blood samples were collected and sent to laboratory for humoral immunity test (HI) and also total immunoglobulin measurement. The results showed that dietary treatments were not significantly influenced the final live weights and feed intake of broiler chickens but were significantly influenced the feed conversion ratio of broiler chickens. However dietary ginger did not affect the total immunoglobulin but 10 g/kg ginger in 35th day improved the amount of antibody against the Newcastle disease. In conclusion, in this study ginger powder has useful effects on growth performance and humoral immunity of broiler chickens.

OPTIMIZATION OF PH-VALUE REGULATION IN DOCOSAHEXAENOSIC ACID PRODUCTION FROM MICROALGAE

Tomasz Półbrat, Mariusz Korczyński

Wroclaw University of Environmental and Life Sciences,

ABSTRACT

World production of fish meal and fish oil has been declining from over five years now. Main reasons are tighter quota settings and high prices. At the same time, we notice rise of fish production from aquaculture, sector that makes the most use of fishmeal. It means that aquaculture needs alternative sources of bio compounds such as polyunsaturated fatty acids. One of those sources are microalgae. However, to increase price attractiveness of freeze-dried microalgae, it is necessary to carry out continuous work on biomass production optimization. One of the problems is seeking best regulation ways and suitable values of pH of medium, because environment pH has direct impact on microalgae production parameters. The microorganisms used in the production of PUFA have specific optimal pH values for the medium, different for individual production parameters. The preferred solution is therefore the use of a phasic change in pH, intensifying the increase in the number of cells in the early phase of production, and then increasing the production of fat in the late phase of growth.

PUFA production relies on two (independent from oxygen) enzymatic pathways - FAS (Fatty Acid Synthase Pathway) and PKS (Polyketide Synthase Pathway). Some of pH regulators may enter those enzymatic pathways as substrates, increasing the intensity of fatty acid synthesis.

The aim of the study was to review the literature regarding the possibility of increasing the biomass production by selected species of microalgae by optimizing of environmental conditions and intensification of selected metabolic pathways.

CHANGES IN OMEGA-6 AND OMEGA-3 FATTY ACIDS CONTENT IN THE BLOOD OF DOGS AS A RESULT OF LINSEED OIL ETHYL ESTERS SUPPLEMENTATION

Anna Wyrostek, Bożena Patkowska-Sokoła, Katarzyna Czyż, Wiesław Bielas, Paulina Cholewińska, Damian Konkol, Robert Bodkowski

Wroclaw University of Environmental and Life Sciences

ABSTRACT

The aim of the study was to determine an effect of the additive in the form of ethyl esters of linseed oil on the content of omega-6 and omega-3 fatty acids in serum and red blood cells membranes of healthy dogs.

Eight healthy adult beagle dogs took part in the experiment lasting 16 weeks. The experiment was divided into two 8-week periods. In the first period, all animals received a supplement in such an amount that the ratio of ALA to LA combined in the fodder and supplement was as close as possible to 1: 1. In the second period, however, animals received only fodder. Blood samples were collected on the day 0., 56. and 112. of the experiment. As a result of supplementation, the omega-6 fatty acid content increased on day 56., both in the serum and erythrocytes membranes (by 20% and 10%, respectively), however on day 112. their level was similar to day 0. On day 56., the total omega-3 acid content also increased by 111% and 53%, respectively, and the level of these acids was also higher on day 112. (34% and 32.5%), compared to day 0. On the day 56., the ratio of omega-6: omega-3 fatty acids was statistically significantly reduced, both in serum (5.36: 1) and in blood erythrocyte membranes (5.93: 1). Despite the increase on the day 112 (7.25: 1 and 6.8: 1), it was still lower than on the day 0. (9.44: 1 and 8.35: 1). A significant increase in the content of omega-3 fatty acids and a reduction in the ratio of omega-6: omega-3 acids important for health status of animals improvement can be observed as result of supplementation with ethyl esters of linseed oil with a high content of alpha-linolenic acid.

ASSESSMENT OF THE NUTRITIONAL VALUE OF FEATHER KERATIN HYDROLYSATES

Martyna Wilk, Barbara Król, Wojciech Łaba

Wroclaw University of Environmental and Life Sciences

ABSTRACT

The intensive development of animal production is associated with the discharge of large amounts of by-products into the environment. Chicken feathers are abundant (8.5 million tons per year) agro-waste product containing about 95% protein, mainly β -keratin. The dominant amino acids include: cysteine, proline and serine. The microbiological degradation techniques, due to the low cost and no biological risk are useful in the production of hydrolysates with a favorable amino acid balance. The aim of this study was to investigate the potential uses of *Kocuria rhizophila* p3-3 treated feathers (FH) as a feedstuff for ruminants. Feather degrading bacteria was isolated from living poultry. The bacteria strain exhibited keratinolytic properties and effectively degraded up to 52% of feathers during 4 days of culture (25°C). The proximate analysis and amino acid profile were determined according to AOAC. Essential Amino Acid Index (EAAI) and biological value of protein (BV) were calculated. The fermentation kinetics of FH was estimated by using ANKOM GPS during 24 hours of in vitro fermentation. Cumulative pressure values were calculated from measured pressure changes at given times, converted to units of volume (ml) using the ideal gas law. The produced gas (GP) volumes were corrected for the amount of dissolved gas according to Henry's law. The content of crude protein was over 89.84±2.38%, the limiting amino acid was tryptophan (CS 11.42±0.34%). BV of protein was on level 58.96±2.43% and EAAI was 48.82±2.25%. The results of fermentation shows that closed bottles produced an underestimation of actual GP. Cumulative pressure values were calculated from measured pressure changes at given times, converted to volume units (ml) using the ideal gas law. The produced gas (GP) volumes were corrected for the amount of dissolved gas according to Henry's law.

EFFECT OF SOURCE AND LEVEL OF ZINC ON DIARRHEA IN PIGLETS

Anna Szuba-Trznadel, Tomasz Hikawczuk, Bogusław Fuchs

Department of Animal Nutrition and Feed Management, Wroclaw University of Environmental and Life Sciences

ABSTRACT

Diarrhoea still remains a major problem in piglet production because in practice it is of serious economic concern due to increased losses of animals or growth rate inhibition. The use of preparations containing pharmacological doses of zinc is a commonly known method for reduction of diarrhoea incidence in piglets, accepted in the EU. The aim of the experiment was to evaluate the effect of zinc supplementation in different forms to weaners on diarrhoea control, growth rate and health status. The animals chosen for the experiment were housed in 30 pens of 10 pigs in each and were randomly assigned to three experimental groups. The piglets and weaners were fed prestarter (from the 28th to 47th day of life) and starter (from the 48th to 74th day of life) feed mixtures differing in zinc form and concentration. Group I (control) was given ZnSO₄ at 150 mg/kg of feed. Group II received prestarter and starter feed mixture containing conventional zinc oxide at 3000 and 150 mg/kg, respectively. Group III was fed feed mixtures containing 200 and 150 mg/kg of zinc oxide nanoparticles, respectively. This experiment indicates that low levels of nZnO produced a similar antidiarrhoeal action as high therapeutic doses of ZnO. The application of nanoparticles brought measurable benefits, including significantly accelerated growth rate, weight gain ($p < 0.05$). The weaners fed diets supplemented with nZnO showed significantly reduced feed conversion vs. groups I and II. The values of the biochemical indices under analysis also suggested a beneficial tendency in group III (nZnO). In addition, nZnO in the diet significantly decreased ($p < 0.01$) blood urea level. Pharmacological doses of ZnO significantly increased ($p < 0.01$) blood Zn concentration. Importantly, Zn emission to the environment was 18 - 30 higher in group II (therapeutic ZnO doses) compared with the remaining two groups.

PHYTOGENIC SUPPLEMENT TO REDUCE AMMONIA IN PIGGERY

Anna Szuba-Trznadel, Tomasz Hikawczuk, Bogusław Fuchs

Department of Animal Nutrition and Feed Management, Wroclaw University of Environmental and Life Sciences

ABSTRACT

Urine and faeces are main sources of ammonia at pigs farms. In the present experiment, the effect of a phytogetic supplement on the productive performance of fattening pigs, volatile ammonia concentration in pig houses. Animals were housed in two identical piggeries with comparable total volume. Fattening was divided into two phases: from 30 kg to 70 kg and from 70 kg to 110 kg of body weight (BW). The first piggery was used to maintain the control group which comprised fattening pigs fed complete feed mixtures with no additive. In the second building, the pigs were fed complete feed mixtures with a phytogetic supplement at 0.5 g/kg-1. Phytogetic supplement to feed had a beneficial effect on pig performance, e.g. BW ($p < 0.05$) and daily weight gain ($p < 0.01$) were significantly higher, while feed conversion per kg weight gain ratio was lower ($p < 0.05$) in animals receiving this additive in the feed. In addition, fattening pigs from the experimental group showed significantly higher meatiness ($p < 0.01$) compared with the control animals. The ammonia concentration was lower in the facility housing the animals fed the diet with the phytogetic supplement, both in every measurement period and in the whole experimental duration (by 30% - 40%). The young animals in particular strongly responded to an excessive concentration of ammonia in the pig house. In the finisher phase, not so violent reactions of the animals resulted also from the reduced ammonia level in the pig house.

The higher growth rate and meatiness of animals in the group fed the phytogetic supplement, containing non-steroidal saponins and encapsulated volatile oils, is indicative of a better health status of animals and more efficient conversion of nutrients to muscle and fat tissue.

THE EFFECTS OF POLYUNSATURATED FATTY ACID ON THE EFFECTIVENESS OF REARING AND PHYSIOLOGICAL INDEXES OF CALVES

Kinga Śpitalniak-Bajerska, Robert Kupczyński

Wroclaw University of Environmental and Life Sciences

ABSTRACT

The aim of the study was estimation of influence of linseed oil and the mixture of esters of polyunsaturated fatty acids received from linseed oil, added to milk replacer formulation, on biochemical, haematological, production parameters and health of the calves.

The experiment was performed on 27 Holstein-Friesian calves divided into 3 groups: control group, group receiving formulation with esters of α – linolenic acid (10g/d) and group receiving formulation with flax oil (10 g/d) from 14 to 45 days of age. The formulations are administered the milk replacer formulation in an amount of 1% SM/calf/day. Blood samples for laboratory tests were taken from the external jugular vein at 14,21,28,35 and 45 th day of life. Supplementation with formulation with ethyl esters had a positive influence on average daily gain of body, growth rate (GR) and feed efficiency (FE). Intakes of starter feed was lower in case of calves receiving formulation with linseed oil. In clinical survey there were found a good status of health in case of all calves during the experiment. In experimental groups, there was observed the lower level of RBC, HTC, HGB and higher in case of PLT.

Preparations used in feeding of calves had a beneficial influence on production and physiological parameters. There are however necessary a long-term and detailed surveys allowing to estimate the influence of preparation including n-3 acids and polyphenols on metabolic transformations and development of calves, among others development of adipose and gland tissue of udders of heifers.

STABILIZATION OF GASTROINTESTINAL MICROFLORA OF ANIMALS THROUGH NUTRITION USING FERMENTED RAPESEED MEAL

Łukasz Wlazło¹, Bożena Nowakowicz-Dębek¹, Anna Czech¹, Anna Korzeniowska¹, Marek Kułazyński², Marcin Łukaszewicz³, Anna Krasowska³

¹University of Life Sciences in Lublin

²Wroclaw University of Science and Technology

³University of Wroclaw

ABSTRACT

Feed additives with functional properties that support digestion processes and have a positive effect on the general animal health are an important element of modern animal production. Numerous studies confirm the high effectiveness of probiotic preparations and symbiotics in maintaining homeostasis of the gastrointestinal tract and eliminating unfavorable external stimuli. Probiotics containing bacteria of the genus *Lactobacillus*, *Bifidobacterium*, *Enterococcus* and *Saccharomyces cerevisiae* are most commonly used in animal nutrition. These microorganisms producing antibacterial substances in the form of organic acids, hydrogen peroxide and bacteriocins, reduce the number of pathogenic bacteria.

The aim of the study was to assess the impact of fermented rapeseed meal feed additive as a probiotic component in mink nutrition (Neovision vision).

Material and methods: The material for examination was faeces collected from animals immediately after expulsion and digestive tracts collected during slaughter. In each batch of the material the following parameters were determined: the total number of bacteria and fungi, the number of coliforms and *Escherichia coli*, the total number of lactobacilli, the total number of anaerobic bacteria from the genus *Clostridium perfringens* and the presence of *Salmonella* spp. Results: Microbiological analyzes indicate a beneficial effect of fermented rapeseed meal on the digestive microbiota. A decrease in the total number of coliforms and anaerobic spore flora was observed in the groups of animals receiving the tested additive.

INFLUENCE OF ILEX MESERVAE INFUSION AND ITS POLYPHENOL FRACTION ON INTESTINES STRUCTURE AND GOBLET CELLS SECRETION.

Anna Zwyrzykowska-Wodzińska, Renata Nowaczyk, Piotr Kuropka, Robert Kupczyński, Antoni Szumny

Wroclaw University of Environmental and Life Sciences

ABSTRACT

Infusions prepared from leaves of different species of *Ilex* are widely consumed around the world. The aim of this study was to assess the influence of *Ilex meserveae* infusion and its polyphenolic fraction on structure and activity of the goblet cells in rat gut

The experiment was carried out on 48 male Wistar rats. The animals were divided into 2 nutritional groups. Group 1 was fed with standard Labofeed B, and Group 2 where animals were fed feed with addition of cholesterol (20g/kg of feed). *Ilex meserveae* infusion (IM) (50g/l) and polyphenols (P) extracted from IM were used (10 mg/kg b.w) for 76 days.

The experiment was approved by the Local Ethics Committee for the animal experiments

The material after autopsy was fixed in a solution of 4% buffered formalin and then dehydrated in alcohol series and embedded in paraffin. Sections 5 μ m thick were routinely stained with Hematoxylin and eosin and PAS method. Morphometric studies concerned the number of goblet cells in mucosal glands, and at the base and apical part of the villus were performed. The study was carried out using a Nikon Eclipse 80i light microscope. Morphometric studies were carried out using the Nis-Elements Ar software. The statistical analysis of morphometric data was conducted with use of Statgraphic 16.0 software. The analysis revealed a significant influence of the polyphenols and IM infusion on number of the goblet cells in the rat intestines in both normal and high cholesterol diet.

RUMEN DEGRADATION (NYLON BAG) OF FIVE NATIVE TREES FROM MEXICAN DRY TROPIC

Samuel J. Castro Camacho, Juan Eulogio Guerra Liera, Luciano Abelino Lopez Juarez, Miguel Angel Gastélum Delgado, Hugo De Jesus López Inzunza, Ruben Barajas
Universidad Autónoma de Sinaloa

ABSTRACT

In the tropical countries, the inclusion of trees in grazing areas is promote due to its improvement of ruminant nutrition with the leaves and buds with a higher crude protein content than tropical grasses. In addition, trees provide shade enhancing the animal welfare. Most researches are focused in species from raining tropic, and is poor the information relative to trees in dry tropic, where raining oscillates between 800 and 500 mm. This study was conduct to compare the in situ (rumen) dry matter degradation of five native trees from Northwest of Mexico dry tropic. The treatments were tree species as follows: 1) Mauto (*Lysiloma divaricata*); 2) Palo Amarillo (*Esenbeckia hatmannii*); 3) Palo de Asta (*Cordia sonora*); 4) Papachio (*Randia mitis*); and 5) Vinolo (*Acacia cochliaconyha*). The leaves collected from five trees, was dried (60 °C 48 h), ground (2 mm), and placed in nylon bags. During 0, 3, 6, 12, 18, 24, 36, 48 and 72 h bags were incubated in the rumen of three steers fitted with T-cannulas. The data was subject to ANOVA for a complete randomized block design, where steers constituted the block and a pair of bags the experimental unit. The solubility (time 0 h) of DM from Palo de Asta was 7% higher than remainder species ($P < 0.01$). The higher degradable fraction was in Palo Amarillo and the lower in Vinolo ($P < 0.05$). The major proportion of effectively degraded dry matter was appreciate in treatments 1, 2, and 3, respectively. Treatment 2 was at less 6% lower ($P < 0.05$), and treatment 5 showed the lowest value compared with remainder treatments ($P < 0.05$). Results suggest that Palo Amarillo, Mauto, and Papachio trees are an option to promote the sustainable grassing practice in the dry tropic area of Northwest of Mexico.

FEED HYGIENIC QUALITY CHANGES FROM FEED MATERIALS TO ANIMAL

Jurgita Jovaisiene¹, Violeta Baliukoniene², Bronius Bakutis¹, Gediminas Gerulis², Gintarė Kasperavičiūtė¹, Rimvydas Falkauskas²

¹Lithuanian University of Health Sciences Veterinary Academy

²LUSH Veterinary Academy

ABSTRACT

The hygienic quality of feed is very broad concept involving many indicators and factors that influence them. Bacteria, fungi and other microorganism and their different metabolites as mycotoxins, endotoxins, biogenic amines are as hygienic quality indicators of feed.

The aim of the present work is to review the hygienic quality of different feed materials, and feed, depending on the length of storage and technological processes.

Samples of feed materials and feed were collected from three different Lithuanian farmer granaries: small private farm (MU); large pig complex (KK); grain processing enterprise (GPI). In order to assess how the pollution vary during storage, samples were taken from the same granaries and farms were collected every month during a year between October to May. A total 100 samples including pigs feed (37 samples of different types of feed:) and feed materials (63 samples: wheat, barely, oat, triticale, oats, pease, soy pellets, sunflower cake). Total count fungi were isolated using the method described in ISO 21527-1:2008. Concentration of mycotoxins (aflatoxin, zearalenone, deoksinivalenole, T-2, ochratoxin) were analyzed by thin layer chromatography method according to approved Romer Labs. Inc (Austria) methodology.

In some samples fungal levels exceed 4 log CFU/g. The means, during all months storage in all granaries, fungal total counts of feed materials and feed ranged respectively from 3.48 to 5.03 and 3.72 to 4.81 log CFU/g. The highest fungal total count were observed in barley samples on May from MU granarie. Seventy percent of feed materials and 67 % of feed samples were contaminated with more than one mycotoxin. No one feed materials samples did not exceed (EU) 2016/1319 guidance value. In one feed samples DON and in three feed samples ZEA were detect above the guidance level.

Changes in feed hygiene quality depending on feed materials, feed technological processes, storage time.

EVALUATION OF THE EFFECT OF FEED ADDITIVES IN THE GROWN OF LAMBS

Karla Paola Figueroa Girón, Jorge Alberto Saltijeral Oaxaca, Gustavo Ruiz Lang

Universidad Autónoma Metropolitana -Xochimilco, Calzada del Hueso No. 1100, Col. Villa Quietud, Coyoacán, C.P. 04960, Mexico city.

ABSTRACT

The infectious intestinal diseases are one of the most important problems by sheep production in worldwide causing diarrhea inducing a delay growth of animals and economic losses. Health and hygiene are important elements for animal production; decreasing the population of sick animals is an important factor for a better production.

For this research was used the feed additive SANGROVIT® a premix of benzo [c] phenanthridine and alkaloids protopine (QBA + PA), which is an appetite and digestion stimulant made from plants of the Papaveracea family. The ingredients stimulate the absorption of essential nutrients and amino acids for health and yield, preserving intestinal health and reduce the use of antibiotics. The work was carried out with 20 lambs (females and males) of East Friesian and Awassi breeds, which were randomly distributed in two groups: group 1-Control and group 2-treatment that consisted in the daily administration of two intakes, in each intake were administrated 2g of (QBA + PA) in 200 ml of water at 30°C, for this it was ensured that all the lambs had taken colostrum. It was made a weekly registry of the weight and health state of each animal from the birth day until the 21st day that the treatment ended. For the analysis

of the data was used a linear statistical method. The (QBA + PA) had a positive effect on weight gain and helped to improve the growth rate in the lambs.

INTRODUCTION

The infection intestinal diseases are considerate one of the main problems faced by sheep around the world being that the digestive system is an area very susceptible to the proliferation of infectious pathogens causing diarrhea inducing a delay growth of animals and economic losses.

The increase in the efficiency of the feeding system is an factor for the profitability of the farms [7]. Health and hygiene are important elements for animal production; decreasing the population of sick animals is an important factor for a better production.

Genetic and environmental aspects have influence in the growth. The growth of animals on farms is one of the most important aspects to verify productivity; this is expressed in weight and size.

The indiscriminate use of antibiotics in production has caused the appearance of pathogens that are capable of resisting a wide variety of existing antimicrobials. This is an important problem that is increasing in humans and animals. In recent years has been observed the proliferation of agents that cause multiple diseases and have genes that determine resistance to these drugs [3]. Resistant microorganisms not only become the predominant species in an animal population, buy they can also genetically transfer the material to other susceptible pathogens that acquire resistance [8]. These are associated with a higher mortality and cost of treatments. The interest in the health and safety of people is, finally, a reason to reduce the use of antibiotics in animal production. Nowadays are being sought alternatives for synthetic chemicals and the use of plant mixtures has been used.

It is known that benzo [c] phenanthridine and protopine alkaloids (QBA / PA) extracted from plants of the Papaveracea family have antimicrobial, anti-inflammatory, and immunomodulatory effects [9, 11]. The additive used is an organic plant-based material that contains both substances which increase the food intake in animals and can stimulate the secretion of digestive enzymes that improve the digestibility, nutrient availability and food conversion. It is believed that their benefit on growth and production parameters is due to the regulation of the inflammatory response, rather than its antibiotic effect [6]. The quaternary alkaloids of benzo [c] phenanthridine irreversibly inhibit the enzyme amino acid decarboxylase, which increases the availability of aromatic amino acids to be absorbed and used in the synthesis of protein [4]. Alkaloids decrease the number of coliform and aerobic bacteria in the intestine, reducing like this the production of toxic compounds and the consequent damage to the mucosa [12].

Nutritional studies on animal growth have often focused on the understanding of macronutrients (proteins, fats, carbohydrates, however, it is evident that the bioactive of plants affect not only animal growth but also body composition. Plants are essential for the nutrition of ruminants, but offer benefits beyond basic nutrition. The judicious use of specific bioactive plants has the potential to impact almost all aspects of ruminant production [10]. Recently, phytogetic compounds have shown potential use as food additives for ruminant diets.

The objective of this work is to evaluate the growth by the weight and improvements that may occur when implementing the additive QBA + PA in the diet of the lambs.

MATERIAL AND METHODS

The experiment was conducted in a small ruminant farm with a semi-extensive production system located in the municipality of Totolapan, Morelos, Mexico located at coordinates 18°59'13 "N 98°55'11" W, the climate is humid subtropical and a temperature is recorded annual average of 17.4°C.

For this study were used a total of 20 lambs (females and males) of East Friesian and Awassi breeds, which were randomly distributed in two groups: group 1-Control and group 2-Treatment, for this it was ensured that all the lambs have taken colostrum.

The lambs were subjected to an experimental phase of 3 weeks, in group 1 no additive was used, while in group 2 two doses of the treatment were administered daily, in each one were added 2 gr of (QBA + PA) in 200 ml of water at 30 °C.

The lambs were weighed individually each week to determine the evolution of the body weight according to the treatment; it was made a registry of the weight and of their health condition from the birth day until the 21st day when the treatment was concluded. For the analysis of the data was used a linear statistical method.

RESULTS AND DISCUSSION

The lambs fed with the SANGROVIT® additive increased significantly in weight compared to the lambs in group 1. The average weekly weight gain was 1.21 kg in group 1 and 1.38 kg in group 2.

As can be seen in Table 2, the lambs of group 2 (Treatment) had higher body weights in the 21 days of the experiment.

Field studies realized worldwide consistently show a positive effect of alkaloids, especially in the parameters of meat production. Abasto, et al in 2000 verified that were found significant differences between the weight of the lambs with and without supplementation. Plascencia in 2015 proved that the animals of his research that consumed (QBA/PA) showed a numerically higher gain compared to the control group. Likewise, Estrada et al in that same year demonstrated that supplementation with this additive resulted in a greater efficiency of weight gain.

In a study carried out by Abdullah, et al in 2000, they mention that the sex of the lambs has important effects in the weight gain since birth. In this study there were 4 females, 6 males in the control group and 6 females, 4 males in the treatment group, however all the lambs subjected to the treatment had greater weight than those of the control group without import the sex.

No.	Sex	Birth weight	1° week	2° week	3° week
Group 1 - Control					
1	M	4.500	5.500	7.000	8.600
2	M	3.000	3.500	5.600	7.000
3	M	3.500	4.600	5.500	6.100
4	F	3.700	4.500	5.500	6.200
5	M	4.000	7.700	8.500	9.700
6	F	4.000	7.600	9.000	10.200
7	F	3.000	4.000	5.500	6.000
8	F	3.500	4.500	5.200	6.000
9	M	4.500	5.000	6.000	7.000
10	M	3.300	4.500	5.100	6.500
Group 2 - Treatment					
1	M	4.000	5.300	5.500	6.500
2	F	5.000	6.200	8.000	9.600
3	F	4.000	6.500	7.500	8.600
4	F	4.600	6.100	7.500	9.200
5	M	5.000	7.400	9.000	10.600
6	F	4.000	6.000	7.200	8.500
7	M	3.500	5.000	6.000	6.500
8	M	2.500	3.700	5.000	5.500
9	F	6.000	8.000	10.000	12.000
10	F	2.000	3.000	3.600	4.000

The data suggest that the administration of this additive from birth can contribute to an improvement in growth and yield (Fig. 1).

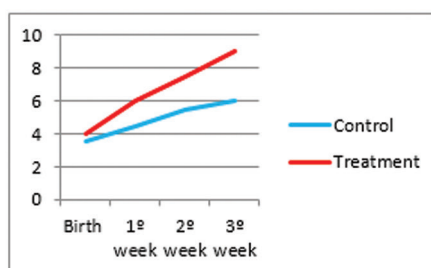


Fig. 1. Weekly weight gain of the lambs [kg per week]

Group	Initial weight	Final weight	Gain
Control	3.500 kg	6.00 kg	2.500 Kg
Treatment	4.000 kg	9.00 kg	5.00 kg

CONCLUSION

The findings of the present study indicated that the use of this additive (QBA + PA) gave a favorable result in the increase of the weight of the growing lambs between their birth and the final weight. The above can be considered to improve the rate of growth in production.

The implementation of (QBA + PA) in the feeding of the lambs is presented as an alternative to improve their intestinal health. So it can be used as a cost-effective option to the prophylactic use of antibiotics.

In terms of costs, the price of antibiotics and the additive are equivalent. The cost of antibiotics varies between \$13 to \$28.50 USD depending on the type of antibiotic used; in the case of SANGROVIT is \$34. It is worth mentioning that \$11.74 USD was invested for each supplemented lamb. The costs were considered according to the grams administered to each lamb in the 21 days of the treatment.

At first sight the use of the latter would imply an additional cost, but is evident the efficient effect in the productivity and health. Also it should be considered that antibiotics demand a greater consumption and dose increase that would result in a higher expenditure.

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PALATABILITY TESTS OF 5 LEAVES OF PLANTS IN DAIRY GOATS

Jorge Saltijeral¹, Juan Eulogio Guerra Liera², Luciano Abelino Lopez Juarez²

¹Universidad Autónoma Metropolitana

²Universidad Autónoma de Sinaloa

ABSTRACT

The goats distinguish the flavors bitter, sweet, salty and acid and show greater preference for the bitter. They like the variation in their diet.

The senses are important for the selection of feed. The goats have the horizontal pupil to get a better view of the vertical objects. The sense of smell is the best developed of the goats a sit occupies a vital role in the identification and recognition of feed, individuals, offspring, and predators.

The habit of consumption by means of the search-test, refers to the relationship that exists between the taste and the response that it receives that can be positive or negative. If it is positive it determines changes in the taste of the animals thus incorporating new foods into their diet. Goats can consume about 500 varieties of plants.

14 goats females of French Alpine and Saanen breeds with a weight between 40 to 55 kg, were grouped at the time of feeding in two groups, Experimental design Five additional feeders were implemented, in which leaves of the five plants with the same weight were placed at the same time for three consecutive days, once a day before they were given the concentrate. The time of consumption and the preference in both groups was measured. The procedure will be repeated the following week.

The feeds evaluated were: Alfalfa (*Medicago sativa*), Mulberry shrub (*Morus alba*), leaves of the Ficus tree (*Ficus carica*), banana leaves (*Musa × paradisiaca*), leaves of the cocoa plant (*Theobroma cacao*) and corn silage (*Zea mays*).

Bromatological analysis of feed provided especially its value in: protein, fiber and total digestible nutrients.

There was a greater preference for alfalfa, mulberry in second place, Banana leaf in third ; Cocoa leaves in fourth and Ficus as well as the rejection of corn silage was observed.

PRECISION LIVESTOCK FARMING: TECHNIQUES, RISKS AND BENEFITS

INTERACTIONS BETWEEN ENVIRONMENT AND ANIMAL PRODUCTION

KEYNOTE LECTURE

COMPARISON OF MEASURED GROWTH RATES ON AUSTRALIAN PIG FARMS AND CONSEQUENCES OF THE MEASURED DIFFERENCES

Thomas Banhazi¹, Mark Dunn², Annamaria Banhazi³

¹PLF Agritech Pty. Ltd. Toowoomba, Queensland, Australia,

²Leading Edge Research Pty. Ltd. Brisbane, Queensland,

email: Thomas.banhazi@plfag.com

ABSTRACT

Growth rates were measured over time in a number of pens on a commercial farm in Australia. In addition, a number of production related parameters, such as air temperature, relative humidity, the concentration of carbon dioxide, ammonia and ventilation rates were also measured in the same buildings. Selected results from these long-term monitoring events will be used in this article to highlight the beneficial effects of routine monitoring of these important production related parameters in commercial livestock buildings. The information collected has been used to identify the significant differences observed in the growth performance of pigs over time and also on the same farm but housed in different pens. The authors will argue that there is often a multi-factorial relationship between these parameters and under-performance. Dissecting specific reasons for under-performance remotely is difficult for most farm environments. The differences observed in production efficiency however, could be used to alert managers for periods of inefficiencies that might go undetected under normal management conditions. In this way, they can action appropriate management interventions to rectify issues related to under performance.

The growth rate and environmental variables associated with 'fast' and 'slow' growing groups were compared during the trials being reported. Improved thermal control, provision of optimal air quality, and maintenance of health status of animals are all important factors that can improve productivity. Thus, it was concluded that real time monitoring and better controlling production conditions in piggery buildings could result in improved profitability of commercial livestock farms.

INTRODUCTION

Managers of livestock farms are constantly searching for new ways improving profitability via the utilisation of new technologies and management procedures (Wathes et al., 2008). The implementation of Precision Livestock Farming (PLF) technologies on farms is such a production enhancing method. The so-called PLF technologies are essentially enabling livestock managers to (1) collect information about key aspects of livestock production, (2) automatically analyse the collected information and (3) implement automated or semi-automated management responses based on the analysis of the collected information. In essence, the PLF approach can turn livestock production facilities into virtual research facilities (Banhazi and Black, 2011; Banhazi et al., 2012). PLF Agritech Pty Ltd., an Australian start-up company has developed a number of technologies over the years that could potentially decrease the production related costs of pig farms by up to 30% (Black and Banhazi, 2013). Two such production enhancing technologies developed by PLF Agritech, namely the Weight-DetectTM and the Enviro-DetectTM devices were tested on two Australian farms over an 18-month period. In this article the performance of pigs monitored by these two technologies will be discussed with special attention to the benefits they offered in relation to providing decision support tools to farm managers on a daily basis.

MATERIAL AND METHODS

Long-term weight and environment monitoring were carried out in five different grower/finisher buildings on two farms in Queensland, Australia. The pens monitored were located in traditional grower-finisher building with natural ventilation systems installed. All experimental pigs were fed mash or pelleted feed and were kept on partially slatted floors. On each farm a number of pens were selected and in each pen a Weight-DetectTM (PLF Agritech, Toowoomba, Australia) equipment was installed approximately in the middle of the pen at 2 m height. In the same pens Enviro-DetectTM (PLF Agritech, Toowoomba, Australia) devices were also installed. The functionality of the Weight-DetectTM instruments has been described previously, so only a brief description will be given here (Banhazi et al., 2011). Weight-DetectTM incorporates an off-the-self depth sensor (Microsoft Kinect, Microsoft, USA) with a 6-meter maximum and 0.5m minimum depth. A second process running on the embedded computer (FitPC 2, CompuLab Ltd. Yokneam Illit, Israel) processed the images as they are captured. Weight prediction in real time was achieved by acquiring, analysing and extracting features and measurements from images captured by Weight-DetectTM and producing the corresponding weight estimate to the image. Enviro-DetectTM was installed inside one of the pens on the wall of the piggery building (Clements et al., 2011). The positioning of the equipment was selected high enough to be out of reach of an adult animal. Enviro-DetectTM acquired continuous measurements of air temperature, relative humidity, ventilation rates, carbon dioxide (CO₂), ammonia (NH₃) and airborne particle concentrations. Automated reports were emailed to the producers in a PDF format reporting on growth rate and environmental conditions of individual pens. In these reports, descriptive statistics have been used to convey the average, maximum, minimum values to producers and other important parameters, such as average daily gain (ADG). Additional analysis using various techniques were also implemented.

RESULTS AND DISCUSSION

Growth rate data (Figure 1) was collected continuously on an Australian piggery (Farm Z) during two distinct periods, namely between 12/07/18 and 6/8/18 as well as between 22/9/18 and 10/10/18 in the same pen. The starting and finishing weights were the same during both periods, approximately 41 and 62 kg, respectively. However, pigs reached this final weight within 25 days during the first growth period, resulting in an ADG of 0.84 kg/day. During the second growth period, it took 18 days for the pigs to reach 62 kg, resulting in an ADG of 1.17 kg/day. The difference was 0.33 kg/day between the two periods monitored.

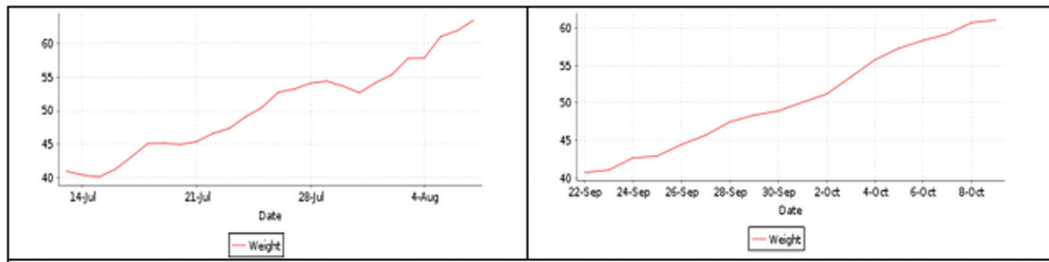


Figure 1. Growth rates (kg) recorded on farm 'Z' in the same piggery building in the same pen, but during two distinct periods. Pigs during the first study period achieved an ADG of 0.84 kg over 25 days, while during the second period, pigs grew at a much higher rate achieving an ADG of 1.17 kg over an 18-day period.

In Figure 2 growth rate data is presented that was collected continuously during the same time period, between 15/6/18 and 9/8/18 on Farm X in the same building but in two different pens. The starting average weight of the pigs in pen A was 17.5 kg on the first day and a gradual weight gain is observable reaching the maximum weight of 61.2 kg on the last day. Pigs monitored during this specific time period in pen A gained 43.7 kg, resulting in an ADG of 0.79 kg/day. In pen B, the starting average weight of the pigs was 18.4 kg and reached the maximum weight of 71.4 kg on the last day. Pigs monitored during this period in pen B gained 53.0 kg during the growth period, resulting in an ADG of 0.96 kg/day. The difference in ADG was 0.17 kg/day between the groups of pigs housed in pen A and B.

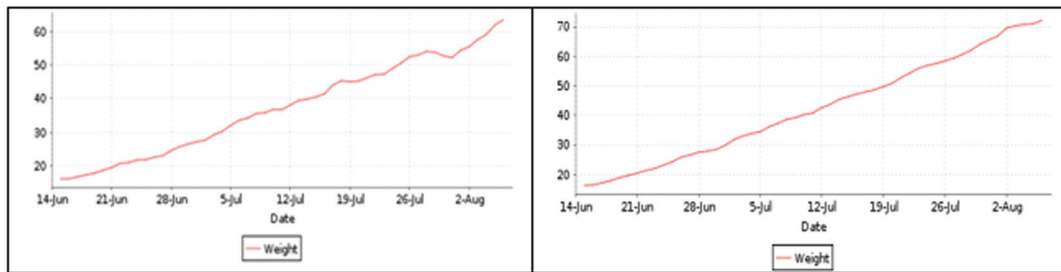


Figure 2. Growth rates (kg) recorded on farm 'X' in the same piggery building during the same time period but in two different pens. Animals in pen A achieved an ADG of 0.79 kg over 56 days, while in pen B animals grew at a much higher rate achieving an ADG of 0.96 kg over the same 56-day period.

The long-term monitoring of pigs and the environmental conditions in the buildings housing these animals provided valuable insight of the general health/welfare conditions of animals and their varied production efficiency. This monitoring provided the farm managers with information about the widely fluctuating ADGs that can be observed on farms under commercial conditions (Stygar et al., 2017). It was important to document the differences observed in the growth efficiency between seemingly identical pens within in the same building and/or in growth efficiency achieved in the same pen during different time periods. This enforced the observations of piggery managers and piggery staff involved in the daily management of pigs on farms that problems associated with slower than expected growth rates often go undetected, resulting in unexpected underperformance of batches of pigs at the end of growth periods (Hartung et al., 2017). Anecdotal evidence provided by farm veterinarians in the past and case studies indicated that growth rates on farms can fluctuate significantly without being noticed promptly (Pluske et al., 2018). This long term monitoring study enabled piggery managers to put value on this fluctuating production performance (Willis et al., 2016). What also became evident that the shape of the growth curve observed was important. Better performance (either over time or in different pens in the same building) was clearly associated with 'smooth' growth curve that can be characterised by relatively straight growth line. On the other hand, pigs that underperformed had typically a crooked or irregular growth curve. This wavy growth pattern indicates that pigs were not kept under ideal conditions and their growth patterns were characterised by periodic stagnations peppered with periods of compensatory growth. Under such circumstances, pigs cannot perform to their maximum growth capacity. Thus, the shape of growth line can give famers an indication if their animals are performing close to their genetic potential or if there are conditions holding them back. Therefore, this study provided farm managers with new information that was previously unavailable to them as they as they did not have the capacity to collect such information without the introduced new technologies.

CONCLUSIONS

The new technologies, Weight-DetectTM and Enviro-DetectTM, provided practical information to livestock producers that empowered them to make management changes based on objective data to enhance the profitability of their operation. The weight monitoring tool pinpointed problem areas and assessed the effectiveness of management procedures of the participating livestock producers.

ACKNOWLEDGMENT

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ORAL PRESENTATIONS

IMPROVED HEALTH AND PRODUCTIVITY OF SWINE WITH TREATMENT OF AMMONIA FROM MANURE

Matias B. Vanotti¹, Ariel A. Szogi¹, Pat D. Millner², John H. Loughrin³

¹United States Department of Agriculture (USDA), Agricultural Research Service, Coastal Plains Soil, Water and Plant Research Center, Florence, South Carolina, USA

²USDA-ARS, Sustainable Agricultural Systems Laboratory and Food Safety Laboratory, Beltsville, Maryland, USA

³USDA-ARS, Food Animal Environmental Systems Research Unit, Bowling Green, Kentucky, USA

ABSTRACT

Substantial animal production advantages can be realized by improvements in manure management. In this study, the direct linkage between improved manure management and animal productivity and health was documented in a full-scale on-farm demonstration of an innovative swine manure treatment system operating at full-scale during five pig production cycles. Indicators of better productivity and health were healthier pigs, reduced mortality, increased daily gain, improved feed conversion, and substantial economic benefits to the producer. In North Carolina, USA, construction of new swine farms or expansion of existing swine farms requires new waste management systems that meet multiple environmental standards of reduced ammonia, odor emissions, and pathogens release, and the substantial elimination of soil and groundwater contamination by nutrients and heavy metals. A treatment system that met these multiple standards was implemented at full-scale in a swine farm. It combined high-rate solid-liquid separation with nitrogen and phosphorus removal/disinfection processes that replaced the existing anaerobic lagoon treatment for the waste. Ammonia concentration in the manure effluent was reduced by 96% and pathogens 99.99%. The reuse of cleaner, sanitized water to refill barn pits reduced ammonia concentration in the air and improved the growing environment. Ambient ammonia levels in the barns dropped an average of 75%, from 11.3 to 2.8 ppm. As a result, animal health and productivity were enhanced. Daily weight gain increased 6.1%, and feed conversion improved by 5.1%. Animal mortality decreased 47%, and cull weight was reduced by 80%. The farmer sold an average of 5,265 pigs per growing cycle, which resulted in a 516,300-kg net gain per cycle. During five production cycles, the farmer sold 28,100 kg more hogs (a 5.8% increase) per growing cycle compared to the previous lagoon management at the same farm.

INTRODUCTION

Typically, waste from confined swine production operations in the south-eastern U.S. is stored and treated in large, open anaerobic lagoons prior to application on cropland. Environmental and human health concerns associated with the anaerobic lagoon system included emissions of ammonia, odor, pathogens, and water quality deterioration. Therefore, there was a major interest in developing new swine manure treatment systems in the region to address these issues. Consequently, demonstrations of new treatment systems were conducted on-farm to demonstrate feasibility of environmental superior waste management technologies (EST) that could address five environmental standards: 1. Eliminate the discharge of animal waste to surface waters and groundwater through direct discharge, seepage or runoff; 2. Substantially eliminate atmospheric emissions of ammonia; 3. Substantially eliminate the emission of odor that is detectable beyond the boundaries of the parcel or tract of land on which the swine farm is located; 4. Substantially eliminates the release of disease-transmitting vectors and airborne pathogens; and 5. Substantially eliminates nutrient and heavy metal contamination of soil and groundwater [4]. The swine waste management system described in this work is a manure treatment system [3] developed to meet the environmental standards referenced above. As a result of this process, new legislation in North Carolina was enacted enforcing the environmental performance standards of EST for the construction of new swine farms or expansion of existing swine farms [2]. 2013).

The aim of this study was to evaluate the effects of improved manure management on water quality and air quality and the beneficial effect of a cleaner environment on animal productivity and health. The study was done at full-scale on a 5,600-swine finishing farm where the manure management system was converted from anaerobic lagoon to a new EST wastewater treatment system.

MATERIAL AND METHODS

The on-farm system uses solid-liquid separation, biological nitrogen removal, and disinfection and phosphorus removal unit processes linked together into a practical system for livestock operations [3]. The system greatly increases the efficiency of solid-liquid separation with flocculation of the suspended solids using polymer. Nitrogen management to eliminate ammonia emissions is accomplished by passing the liquid through a biological module containing nitrification and denitrification bacteria adapted to high-ammonia wastewater. Subsequent alkaline treatment of the liquid in a phosphorus removal module precipitates phosphate and kills pathogens. The phosphorus precipitate is simultaneously separated with the manure. The system recycles clean water to flush the barns (this replaces the use of lagoon water with high ammonia used to flush the barns in previous system). The treated water is stored in the former lagoon and used for crop irrigation. The solids are removed from the farm and used for the manufacture of value-added products and energy production. An aerial picture of the system and swine barns is shown in Fig. 1.

RESULTS AND DISCUSSION

System Performance – Water Quality Improvement.

The wastewater treatment performance data obtained during full-scale operation are summarized in Table 1 showing the values of various water quality indicators as the liquid passed through each treatment module in the system and the overall efficiency of concentration reduction for these parameters. In cleaning up manure wastewater, the system removed 99.99 percent of pathogens, 99 percent of odor-causing components, and 95 percent of total phosphorus,

97 percent of ammonia, and more than 99 percent of heavy metals copper and zinc. These high removal efficiencies significantly reduced the environmental footprint of the operation. For this reason, the farmer was permitted by State authorities to expand its operation from 5,145 to 11,025 pigs.



Figure 1. Aerial picture of waste treatment system and barns. It treated all the manure flushed from seven barns with 735 pigs each.

Table 1. Manure treatment plant performance by treatment step and overall efficiency. Data are means of 122 samples during five pig growth cycles (Vanotti et al., 2018).

Water Quality Parameter	Raw Flushed Manure	After Solids Separation Treatment	After Biological N Treatment	After Phosphorus Treatment	System Efficiency (%)
TSS (mg/L)	11,754 ± 6417	1254 ± 1015	227 ± 199	325 ± 215	97.2
BOD (mg/L)	7364 ± 6313	3185 ± 2692	62 ± 88	41 ± 61	99.4
TKN (mg/L)	2054 ± 778	1466 ± 600	138 ± 166	87 ± 130	95.7
NH ₄ -N (mg/L)	1290 ± 615	1213 ± 451	124 ± 171	45 ± 92	96.5
TP (mg/L)	492 ± 272	151 ± 79	83 ± 30	33 ± 23	93.3
Cu (mg/L)	16.8 ± 11.1	2.0 ± 2.4	0.2 ± 0.1	0.2 ± 0.1	98.8
Zn (mg/L)	25.4 ± 12.6	2.9 ± 2.8	0.4 ± 0.4	0.3 ± 0.3	98.8
Odor Compounds (ppb) ^{a)}	71,269 ± 14,733	63,642 ± 12,366	40 ± 17	44 ± 11	99.9
Fecal Coliforms (log cfu/mL)	4.11 ± 0.19	3.47 ± 0.16	0.84 ± 0.23	0.17 ± 0.18	99.99
Salmonella (log cfu/mL)	1.79 ± 0.11	1.14 ± 0.30	0.00 ± 0.00	0.00 ± 0.00	100.00

^{a)} Odor compounds = sum of phenol, p-cresol, p-ethylphenol, indole, and skatole concentrations in the liquid.

Animal productivity and health improvement

The reuse of cleaner, sanitized water to refill barn pits reduced ammonia concentration in the air and improved the growing environment. The treated water with low ammonia and pathogens was reused on the farm to flush the pits under the barns. It replaced the dirtier lagoon liquid charged with ammonia (532 ± 189 mg/L) used for the same task under the traditional lagoon management. Since the recycled wastewater was mostly ammonia free, ambient ammonia levels in the air in the barns dropped an average of 75 percent, from 11.3 to 2.8 ppm. As a result, animal health and productivity were enhanced (Table 2). Daily weight gain increased 6.1 percent, and feed conversion improved 5.1 percent. Animal mortality decreased 47 percent, and cull weight was reduced by 80% (Table 2). The farmer sold an average of 5,265 pigs per growing cycle, which resulted in a 1,138,247-pound net gain per cycle. Using the new manure management instead of the lagoon system, the farmer sold 61,996 pounds more hogs—a 5.8 percent increase—per growing cycle (Table 2). Results obtained in this demonstration project are consistent with previous observations [1] on the substantial animal production advantages that can be realized by improvements in manure management in swine production buildings.

Table 2. Improvement of animal productivity and health indicators obtained with the new waste treatment system compared with the previous lagoon system on the same farm. Data are means of production records obtained in seven barns during five production cycles before conversion and five production cycles after conversion.

	Five pig growing cycles using the old lagoon system (before new system)	Five pig growing cycles with the new manure treatment system	% Change ^[a]
Mortality (%)	5.23	2.77	-47%
Daily Gain (lb/pig/day)	1.48	1.57	+6.1%
Feed Conversion (lb feed/lb meat produced)	2.56	2.43	-5.1%
Cull/cycle (lb) ^[d]	23,575	4,777	-80%
Gain/cycle (lb)	1,076,251	1,138,247	5.8%

[a] % Change compares the performance obtained with the new system with performance obtained using the preceding lagoon system.

[d] Entire hogs that did not pass inspection.

CONCLUSIONS

This full-scale study evaluated the effects of improved manure management on air and water quality in a swine farm, and the effect of the improved environment on animal productivity and health. The treatment system substantially removed N, P, copper, zinc, odor, and pathogens. Ammonia concentration in air of the barns was reduced. Animal health and productivity were enhanced: mortality decreased 47%, daily weight gain increased by 6.1%, and feed conversion improved 5.1% compared to the traditional lagoon management. These results overall showed that cleaner alternative technologies for manure management can have significant positive impacts on livestock production and the environment.

ACKNOWLEDGMENT

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APPLICATION OF FIELD OLFACTOMETRY AND QUESTIONNAIRE SURVEYS TO ASSESS ODOR NUISANCE FROM REARING OF POULTRY

Agnieszka Grzelka, Anna Pielichowska, Marcin Pawnuik, Yaroslav Bezyk, Izabela Sówka
Wroclaw University of Science and Technology

ABSTRACT

Intensive breeding of poultry is associated with the formation of odorants. The effect of this is the appearance of the problem of odour nuisance around livestock buildings, often manifested in numerous complaints of local residents about the odorous air quality. In the assessment of the odour nuisance, various emission methods are applied - among others analytical methods or dynamic olfactometry. In addition to them, immission methods are often used - e.g. field olfactometry, field measurements and questionnaire surveys. The choice of the method depends on such factors as: type and location of facility and the number, diversity and character of odor emission sources, proximity of other installations with odor potential, number of complaints about odor nuisance from residents, or type and physicochemical parameters of the gases emitted.

Field olfactometry is an immission method, used when odour emission is periodic and variable over time, to determine small and fast-changing values of the odour concentration in the ground-level air layer performed in situ using a field olfactometer. Questionnaire surveys are carried out to determine the type/nature of the emitted odour, the territorial range of its impact and the assessment of its impact on the quality of life of local residents.

The work evaluates the odour nuisance of a poultry farm. For this purpose, questionnaire surveys were carried out among residents living in areas adjacent to the facility, and measurements of odour concentration by field olfactometry were carried out at points located on the measuring grid around the plant boundaries. The analysis of the results of the questionnaire surveys indicates mainly the odour of the poultry manure character. Measurements carried out by field olfactometry carried out during autumn-winter season (November 2018) showed odour concentrations of about 4 ou/m³, 78 ou/m³, 7-43 ou/m³ in the north-west, north and north-east directions from the plant's boundaries, respectively. The second series of measurements carried out in the spring-summer season (May 2019) showed odour concentrations of about 78 ou/m³, 11-43 ou/m³, in the north and north-east directions from the plant boundaries, respectively.

QUANTIFICATION OF PATHOGENIC BACTERIA IN MANURES AND RAW DIGESTATES OF BIOGAS PLANTS

Christine Ziebal¹, Martine Denis², Céline Druilhe¹, Lorine DERONGS¹, Sophie Michel-Leroux¹, Elisabeth Repérant², Lorette Heurtevent¹, Evelyne Boscher², Bérengère Nagard², Laure Martin², Anne-Marie Pourcher¹

¹IRSTEA, France

²ANSES, France

ABSTRACT

On-farm anaerobic digestion (AD) which has expanded in Europe, produces biogas and a by-product (digestate) used as fertilizer. However, very few studies have been devoted to the effect of AD on the level of pathogenic bacteria. The study aims to evaluate the impact of mesophilic AD on the concentrations of zoonotic pathogenic bacteria (*Listeria monocytogenes*, *Salmonella* spp., thermotolerant campylobacters) and on indicator bacteria (*E. coli* and enterococci) in manures and in raw digestates sampled in three biogas plants (BGP).

Samples were collected in storage tank (manures) and at the outlet valve of the digester (raw digestates) from three BGP during a one-year period (8 sampling dates per BGP, 3 replicates per sampling date). Two digesters were fed with pig manure. The third digester was essentially fed with cattle manure. Indicator bacteria were enumerated on specific agar media. Pathogenic bacteria were quantified after an enrichment step by MPN. A total of 144 samples (72 inputs, 72 digestates) were analyzed.

The pathogens have been detected in manure at a frequency ranged between 92 and 96%. They were also present in raw digestate at a frequency of 38% (thermotolerant campylobacters), 83% (*L. monocytogenes*) and 88 % (*Salmonella* spp.). The concentrations were lower in raw digestates than in manures. The average concentrations of thermotolerant campylobacters, *L. monocytogenes* and *Salmonella* spp. in raw digestates were 2, 23 and 5 MPN/g, respectively. The average levels of *E. coli* and enterococci (10⁴-10⁵ cfu/g in manure) decreased by 1 to 2 Log₁₀ during AD.

Although mesophilic AD did not eliminate the pathogenic bacteria, it reduced their concentration. Raw digestates are not directly spread on agricultural land. It is thus likely that their post-treatment (eg. storage or post-digestion) also contribute to limit the spread of pathogens together with the digestate onto agricultural land.

ASSESSMENT ROOSTERS-PRODUCERS BY THE ADAPTIVE ABILITIES OF THE OFFSPRING

Ivan Kochish¹, Vladimir Smolensky¹, Olga Myasnikova¹, Vladimir Galkin², Maxim Korenyuga¹

¹Moscow State Academy of Veterinary Medicine and Biotechnology – MVA by K.I. Skryabin

²Nizhny Novgorod State Agricultural Academy

ABSTRACT

The authors evaluated some parameters of specific and innate immunity in highly productive offspring of pedigree broiler roosters grown in both optimal and difficult conditions (increased stocking density, high temperature and humidity, reduced nutritional density of the starting diet).

It was established that only about 10% of roosters transmit to offspring at the same time good meat qualities and

high level of resistance at any conditions of the growing. This allows the use of a comprehensive evaluation of roosters to improve productivity and, most importantly, viability in subsequent generations.

INTRODUCTION

More than a hundred years ago, people began to use birds on an industrial scale not only for the production of eggs, but also for the production of meat. In the 40s of the last century the first hybridization of birds was started, selection of young birds by live weight, amount of pectoral and femoral muscles was started [6,11]. High results at the production of poultry meat are provided primarily by four-line hybrids, where in the paternal parent form the breeds of Cornish birds are used, and as the female parent - white Plymouth rock. The choice of these breeds for growing broiler chickens is associated with early body weight of Cornish and good reproductive qualities of Plymouth rock. [1, 2].

However, the successful operation of modern poultry farms in a highly competitive market requires a constant increase of efficiency of production [4, 8]. Getting good results only in terms of productivity is not enough to achieve a successful financial result. Therefore, the efforts of modern breeders are aimed not only at increasing meat productivity and reducing the feed conversion ratio, but also to increase the viability and reproductive qualities of poultry [5,7].

Studies a number of scientists from a countries with hot climates are devoted to the creation of hybrids which more adapted to cultivation in insufficiently physiological or even extreme conditions. For this purpose, various combinations of lines and parent forms of industrial crosses and local breeds of chickens are used [9,10,12].

However, more relevant is the creation of new methods of breeding, which will objectively evaluate each bird on genetically determined indicators of natural resistance and select the best birds for further reproduction and creation of flocks, the most resistant to adverse environmental factors. With this hypothesis in mind, the current study addressed to development and testing of method of family assessment of poultry for resistance to adverse conditions, to predict the viability and resistance of offspring.

MATERIAL AND METHODS

Studies were carried out in one of the breeding farms of the Nizhny Novgorod Region of the Russian Federation, where for the reproduction of livestock, artificial insemination of chickens of the parent flock is practiced.

20 families of broiler breeder hens were formed, selected by the level of egg production for the period of 24-34 weeks. Each family has 12-14 hens and one rooster-producer. Every hen received insemination with mono sperm 3 times with a 4-day interval. Five days after first insemination, and then for the next eight days, from each family were collected eggs, than them were set at the farm hatchery. Day old chickens were marked with wing band. The offspring of each family (semi sibs) were divided into two groups A and B. Group A chickens were kept in a poultry house with optimal conditions of keeping and feeding. Chickens of group B – were placed in the next room of the poultry house and fed with reduced nutrition density of feed, stocking density was increased, low light intensity, increased temperature and humidity. Vaccination schedule of chickens for group A and B were similar and had vaccines against Newcastle disease (NDV), infectious bronchitis of chickens (IBV) and infectious bursal disease (IBD) fit of their application, adopted on the farm.

Growing chickens was carried out for 38 days. Mortality was recorded for each family. At the end of the experiment, each chicken was weighed, and serum samples were taken to assess the level of post-vaccination antibodies and some innate (adaptive) immunity factors.

Antibody titers were determined by enzyme immunoassay using appropriate diagnostic test systems from IDEXX. Evaluation of bactericidal activity of blood serum (BBA) was carried out by nephelometric method, according to the degree of delay in the growth of biomass of the test microbe (%). The amount of lysozyme ($\mu\text{g/ml}$) was determined by its ability to lyse agar-suspended acetone powder obtained from the membranes of *Micrococcus lysodeikticus* cells [3].

RESULTS AND DISCUSSION

Research on the growing of semi sibs in different conditions allowed to differentiate roosters according to the degree of inheritance of their offspring not only production traits but also adaptability and factors of resistance.

The results of growing chickens are presented in table 1.

Tab 1. Body weight and liveability of chickens.

Family	Group A				Group B			
	No of birds	Liveab, %	Body weight, g	Cv, %	No of birds	Liveab, %	Body weight, g	Cv, %
1	26	100,00	1 985±47,1	12,1	27	92,31	1 806±49,7	14,3
2	29	92,86	1 993±67,0	18,1	28	75,86	1 748±58,6	17,7
3	20	90,48	1 997±59,8	13,4	21	85,00	1 867±43,7	10,7
4	24	97,65	1 937±49,1	12,4	23	95,83	1 830±60,8	16,8
5	28	96,30	1 880±61,7	17,4	27	92,86	1 672±68,7	21,3
6	23	95,83	2 001±60,4	14,5	24	86,96	1 931±47,0	11,9
7	33	87,50	1 944±44,4	13,1	32	93,94	1 757±43,4	14,0
8	32	96,88	1 985±45,1	12,9	32	96,00	1 849±51,4	15,7
9	34	95,94	2 196±38,9	10,3	33	94,12	1 877±45,3	13,9
10	28	89,29	2 081±71,5	18,2	28	82,14	1 833±59,0	17,0
11	29	100,00	2 030±52,6	14,0	29	86,21	1 958±42,5	11,7

12	30	96,67	2 031±41,1	11,1	30	93,33	1 988±40,9	11,3
13	39	94,87	1 994±47,6	14,9	39	97,44	1 755±38,7	13,8
14	30	90,65	1 996±47,0	12,3	31	88,89	1 903±47,3	13,8
15	25	92,00	2 078±65,9	15,8	25	92,00	1 848±71,7	19,4
16	33	97,06	2 167±46,7	12,4	34	90,91	1 902±40,5	12,4
17	24	83,33	2 095±43,6	10,2	24	87,50	1 621±60,0	18,1
18	21	86,36	2 176±67,9	14,3	22	91,00	1 907±52,0	12,8
19	24	86,96	2 055±70,2	16,7	23	91,67	1 853±77,4	20,0
20	39	91,89	2 045±43,1	13,2	37	97,44	1 995±56,3	17,2
\bar{X}	28,4	93,1	2033	13,9	28,5	90,6	1845	15,2
Min	20,0	83,3	1880	10,2	21,0	75,9	1621	10,7
Max	39,0	100,0	2196	18,2	39,0	97,4	1995	21,3

As follows from the data in table 1, birds grown in poor conditions (group B), the average indicators of liveability were less by 2.5%, the body weight was less by 188 g. with its greater variability in families (Cv from 10.7 to 21.3 % in group B, against Cv from 10.2 to 18.2% in group A). At the same time, convincing differences in economic indicators were obtained in 16 of the 20 experimental families and only four of them (from roosters №4, 8, 9 and 12) showed high liveability and weight gain even in adverse conditions and feeding. The results showed the principal possibility of selection of males into the breeding, which transmit these important features to the offspring.

To assess the degree of formation of innate and acquired resistance factors at chicks, serum samples from representatives of some families that showed the best final results of growing under normal and extreme conditions (families from roosters № 1, 4, 5, 6, 8, 9, 12, 13, 15, 20).

The results are shown in Figure 1, as well as in Tables 2 and 3.

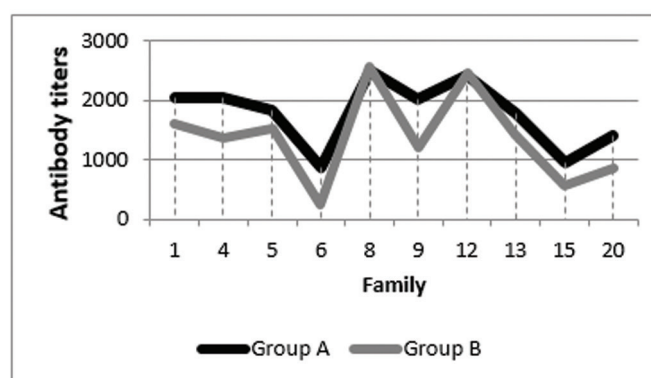


Fig 1. The level of antibodies in chickens from families with high results of growing.

As shown in Figure 1, adverse housing conditions adversely affected the production of post-vaccination antibodies in the chickens of most experimental families. Only two families (from roosters No. 8 and No. 12) showed the antibody response turn out to be comparable, regardless of the conditions of their growing.

The content of lysozyme and blood bactericidal activity from these chickens are presented in Tab. 2 and 3.

Tab 2. The content of lysozyme in the blood serum of chickens from trial families.

Family	The average amount of lysozyme ($\mu\text{g} / \text{ml}$)		Δ
	A	B	
1	157	122	-35
4	129	109,4	-19,6
5	123	110	-13
6	119	79,4	-39,6
8	172,5	188	15,5
9	111	100	-11
12	122	132	10
13	110	91	-19
15	99,5	80	-19,5
20	54	22	-33
\bar{X}	119,7	103,3	- 16,4

As can be seen from Tab. 2, the average amount of lysozyme in the serum of chickens kept in favorable conditions slightly exceeded the indices of group B (16.4 $\mu\text{g} / \text{ml}$). However, this pattern was not confirmed in the families of roosters №8 and №12. Moreover, the amount of lysozyme in these families slightly exceeded the results of semi sibs from the group with optimal growing conditions. The average values of the bactericidal activity of serum samples are shown in Tab 3.

Tab 3. Bactericidal activity of the blood serum of chickens from trial families.

Family	Group A	Group B	Δ
1	35,02	32,0	-3,02
4	65,2	44,0	-21,2
5	55,0	46,0	-9
6	45,0	39,0	-6
8	67,0	73,0	6
9	63,0	49,0	-14
12	91,3	95,4	4,1
13	28,3	21,0	-7,3
15	66,0	55,0	-11
20	45,0	32,0	-13

As shown at table 3 there was a significant variation in the indicators of blood bactericidal activity in the offspring from different roosters. (from 3.02 to 21.2%). But at the same time, the best results of BBA were also established in the offspring of the cocks No. 8 and No. 12.

Thus, the long-established idea of the full dependence of the natural resistance of the organism of the bird on the level of feeding, and the conditions of housing is not absolute. Our research has shown that there are also individual characteristics of roosters with the ability to transfer these qualities to offspring. The use of technologies of intensive cultivation, leading to a significant increase the pressure on the body, is naturally accompanied by an increase in the sensitivity of birds to adverse environmental conditions. Ignoring in the selection of the principles of selecting parents for the body's resistance leads to frequent occurrence of diseases and an increased mortality of flock even with minor violations in feeding and maintenance [8].

CONCLUSION

Used in the trials, a comprehensive assessment of roosters according to the adaptive abilities of the offspring and indicators of their resistance indicates the possibility of selecting producers that provide reliable superiority of their peers in these parameters.

When a bird is selected to increase its liveability, roosters are preferable for selection, which offspring shows fairly high resistance rates not only in optimal, but mainly in compromise growing conditions.

The number of roosters of interest for breeding work is extremely limited. According to the obtained results, no more than 20% of producers are able to transmit to offspring a sufficiently high level of resistance, which keep even under insufficient growing conditions.

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EMISSIONS OF CAMPYLOBACTER SPP. FROM BROILER FARMS AND PERSISTENCE IN THEIR ENVIRONMENT

Benjamin Reichelt, Vanessa Szott, Katrin, Anika Friese, Uwe Roesler

Freie Universitaet Berlin, Institute for Animal Hygiene and Environmental Health

ABSTRACT

Occurrence of Campylobacter spp. in broiler farms and their environment is considered a major public health and economical concern.

Persistence and survivability in the environment as well as the viable but non-culturable (VBNC) state of Campylobacter spp. are not completely researched yet. Therefore, we carry out a largescale investigation aiming towards the detection of possible emission pathways and reservoirs of persistent Campylobacter spp. in the environment.

Campylobacter-positive tested broiler farms and their environment are sampled intensively by taking pooled faeces, boot swabs, air, water and swab samples from various surfaces and insects. Two consecutive fattening periods are investigated at the end of the fattening period, each. In addition, we also assess the efficacy of the cleaning and disinfection procedure in between the two fattening periods. To differentiate between environmental conditions all farms are sampled in summer and winter. Samples are processed according to DIN ISO 10272 for Campylobacter spp.. Afterwards positive isolates are species typed with MALDI-ToF analyses and multiplex PCR assay. Flagellin genes (flaA) of Campylobacter spp. are determined to select isolates for whole-genome sequencing.

We observed high prevalence of Campylobacter spp. in the investigated barn samples (67%) in this ongoing project. After cleaning and disinfection there was no Campylobacter spp. detectable. In the environment one sample was tested positive. This showed first evidence of cultivable Campylobacter spp. in a water-associated matrix. All analysed samples were identified as *C. jejuni* and FlaA- typing revealed two predominant flaA types (36, 57). Further results of the ongoing project will be presented.

Our first summer investigation results showed almost no emissions of cultivable Campylobacter spp. from the broiler farms. Further investigations will include the winter term investigations and the detection of the VBNC state using propidium monoazide quantitative PCR (PMAqPCR).

MEASURING ODOURS

Michael A. McGinley¹, Grzegorz Piętowski²

¹St. Croix Sensory, Inc., USA

²TIGRET Sp. z o.o., Polska

ABSTRACT

The aim of the presentation was to inform about use of field tool, the Nasal Ranger® system, to measure odors. Case studies are presented to show how the odors' measurement influence on the plant operation, on a different management level, like:

- Truck route reconfiguration,
- Multi-year Field Olfactometer Study to provide a comprehensive picture of the ambient odor environment over time and can be used to verify odor complaints as well as clarify when the source of an odor is misattributed
- Protocol for Reliable Field Olfactometry - Field olfactometry can be a valuable management tool in decisions impacting the odor potential of production units and practices, and in evaluating odor reduction strategies.

POSTER PRESENTATIONS

HOW LIKELY IS AN ENVIRONMENTAL SPREAD OF ESBL-PRODUCING E. COLI OUT OF MANURE?

Paul Siller, Katrin Daehre, Uwe Roesler

Freie Universitaet Berlin, Institute for Animal Hygiene and Environmental Health

ABSTRACT

Resistant bacteria in the environment are a "One Health" problem. Broiler and pig manure, which is often tested positive for ESBL-producing Enterobacteriaceae is used to fertilize arable land. We aim to assess the risk of an airborne spread of resistant bacteria to the environment by wind channel trials. We also evaluated an on-farm mitigation strategy, therefore we performed short-term manure storage trials in summer and winter.

In the wind channel trials, ESBL-positive manure was mixed with soil and exposed to different wind speeds to simulate wind-driven erosion. Air samples were taken via impingement and automated impingement. For the manure storage trials superficial and deep manure samples were taken over five consecutive days from a stockpiled manure heap, to investigate decline rates of ESBL-producing E. coli in winter and in summer. All samples were qualitatively and quantitatively analyzed by cultivation. Species-identification was performed with MALDI-TOF and resistance genes were analyzed via real-time PCR and subsequent sequencing.

In the wind channel experiments a detection of ESBL-producing E. coli in the air samples was impossible despite high concentrations in the used manure (up to 4.2×10^5 CFU/g of manure). Non-resistant E. coli were detected in 11/60 air samples. In the manure storage trials the number of ESBL-producing E. coli decreased continuously. A qualitative detection was impossible for 3/6 deep manure samples taken after 72h and 96h respectively in the winter trial and 6/6 samples in the summer.

Our results indicate, that an airborne environmental spread of ESBL-producing E. coli cannot be excluded, but has to be considered unlikely, at least for large quantities of these resistant microorganisms. We have also shown, that an extended storage period before usage as organic fertilizer is effective for reducing the number of ESBL-producing E. coli in manure.

EFFECT OF CLIMATIC VARIABILITY ON THE REPRODUCTION PERFORMANCES OF MURRAH BUFFALO IN NORTHERN INDIA

Subhasish Sahu¹, Sandeep Dhillon², Yogesh Bangar², Anil Kumar³, Suresh K Chhikara², Devender S Bidhan², Vishal Sharma², Dipin C. Yadav²

¹LUVAS, HISAR, HARYANA

²Lala Lajpat Rai University of Veterinary and Animal Sciences

³CCS Haryana Agricultural University

ABSTRACT

To study the effect of climatic variability viz. THI and season on Service period and Calving interval, a total of 439 calving over last 17 years (2001-2016) and on conception rate, a total of 2351 animals inseminated over last 9 years (2009-2017) were analyzed from the data of Buffalo farm, LUVAS and Department Agriculture meteorology of CCSHAU, Hisar. THI group is categorized into 4 sub groups as THI-1 (≤ 70), THI-2 (70-75), THI-3 (75-80) and THI-4 (≥ 80) and Seasons as Season-1 (Hot Dry): Mar-Apr-May, Season-2 (Hot-Humid): Jun-July-Aug-Sept, Season-3 (Autumn): Oct-Nov and Season-4 (Winter): Dec-Jan-Feb. Animals under study for conception rate and pregnancy status, data were analyzed as per χ^2 test and logistic regression. Further, general linear model was used to study the effects of climate on service period and calving interval. It was observed that THI-1 showed significantly ($\chi^2=12.54$; $p<0.01$) higher CR% than other THI groups. Likelihood of getting pregnant in THI-1 was significantly ($p<0.01$) higher and 1.35 times more as compared to THI-4. The study revealed that season had significant effect ($\chi^2=12.79$; $p<0.01$) on CR%. Likelihood of getting pregnant in season-1 is significantly ($p<0.01$) lower (0.69 times) compared to season-4. Females calved during season-3 had significantly ($p<0.01$) lower service period (119.79 days) and calving interval (424.07 days) as compared to the animal calved in season -1 [Service period:181.31 days and Calving Interval: 486.61 days]. Females calved in THI-4 showed significantly ($p<0.05$) higher service period (166.56 days) and calving interval (471.6 days) as compared to other THI groups. From the study, it can be concluded that Animals calved at THI more than 80 were found to have longer service period and calving interval and Autumn season were proved to be optimum for getting best conception rate, better service period and calving interval in Murrah buffaloes in Northern India.

NMR-BASED METABOLOMICS APPROACH TO UNVEIL POTENTIAL BIOMARKERS OF HEALTHY PREGNANCY IN MURRAH BUFFALOES

Archana Sarangi¹, Mayukh Ghosh¹, Subhasish Sahu², Subhash Chand Gahalot², Ashok K Mohanty³, Sushil K. Phulia¹, Rakesh K. Sharma¹, Ashok K. Balhara¹

¹ICAR-Central Institute for research on Buffaloes

²LUVAS, HISAR, HARYANA

³ICAR-NATIONAL DAIRY RESEARCH INSTITUTE

ABSTRACT

The white revolution was a huge success consequently India ranked by first in milk production on the basis of mass livestock population, particularly buffalo. As production profile is flipside of reproduction and buffaloes inherit several reproductive inefficiencies alike improper or delayed pregnancy. The current study focused on the analysis regarding the changes in maternal urinary metabolite profile corresponding to the events of pregnancy and precisely growth of conceptus, taking a step towards the development of ideal diagnostic biomarker(s). Six blood and urine

samples from each pregnant (1st trimester, 2nd trimester and 3rd trimester) and non-pregnant buffalo heifers were collected followed by separation of plasma for NMR analysis. Both plasma and urine samples were prepared in phosphate buffer/D₂O,99%D (pH 7.4) and 3-(trimethylsilyl) propionic-2,2,3,3-d₄ acid sodium salt, 98%D used as chemical reference followed by scanning with Bruker Avance III, 400 Hz spectrometer at 300 K. Standard ¹H spectra were acquired, using a noesy 1D pulse sequence. Multivariate analysis was applied to the full resolution ¹H NMR plasma and urine spectra with exclusion of the water (4.60-5.05 ppm) and urea (5.50-6.20 ppm) regions in case of urinary metabolite analysis. Metabolites were assigned based on comparison of chemical shifts in plasma and urine spectra and identified libraries reported in publicly accessible metabolomics reference databases such as the Human Metabolome Database and Kyoto Encyclopedia of Genes and Genomes. Twenty-five and forty-six metabolites in plasma and urine samples respectively were assigned based on ¹H NMR data. Current metabolomics analyses may aid in elucidation of signature metabolites associated with progression of healthy pregnancies to avoid premature pregnancy termination and associated production loss.

COOLING HOLSTEIN COWS AND HEIFERS BEFORE CALVING DURIN SUMMER: COLOSTRUM AND MILK QUALITY

Leonel Avendaño-Reyes¹, Antonio de Jesús Mejía Lastra², Arnulfo Vicente Pérez³, Ulises Macías Cruz¹, Abelardo Correa Calderón¹, Saul Rojas-Hernandez²

¹Instituto de Ciencias Agrícolas, Universidad Autónoma de Baja California, México;

²Unidad Académica de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Guerrero, México;

³Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Sinaloa, México;

ABSTRACT

This study was conducted to evaluate the effect of cooling during 30 d before projected calving date on colostrum and milk quality postpartum of cows and heifers under hot and dry conditions. Eleven first-calf heifers and 11 multiparous cows were housed in separate pens with shade and a cooling system based on spray and fans. After calving, all animals were moved to a common pen for fresh cows. Colostrum was sampled three times: at calving, and 12 and 24 h after calving, while milk was sampled at days 7, 14, 21 and 28 postpartum. Colostrum and milk components were determined using a portable automatic ultrasound equipment. Data were analyzed under a completely randomized design with repeated measurements. Climatological variables during the trial showed an average THI of 82.2 units. In colostrum, cows showed lower fat ($P<0.05$) than heifers (3.10 vs 5.89%); however, solids-not-fat (17.4 vs 17.9%), protein (6.83 vs 6.67%) and density (64.96 vs 60.85%) were similar ($P>0.05$) between cows and heifers, respectively. In milk, fat (4.90 vs 4.27%), solids-not-fat (8.70 vs 9.06%), protein (3.44 vs 3.53%), and density (28.96 vs 30.51%) of cows and heifers respectively, did not change ($P>0.05$). Small differences in colostrum and milk components were detected between mature cows and first-calf heifers when both type cattle are cooled before calving. Cooling Holstein cows and first calf-heifers for one month before parturition is a positive management practice that helps to maintain normal ranges of components in colostrum and milk

INTRODUCTION

Arid and semi-arid regions of the world are considered vulnerable because of their extreme climatic conditions along with very low rainfall availability. Dairy herds located in these zones are exposed to very hot ambient temperatures during approximately 6 months every year [1]. This scenario could be exacerbated because of Global Warming, which projects an annual increase in the ambient temperature of 3.7 to 4.8 °C by the year 2100 [2]. Holstein cows in hot environments can be at risk of heat stress, which affects their productivity and well-being. Feed intake is negatively affected by heat stress, leading to a reduction in milk production and quality, as well as depressed reproductive efficiency of Holstein cows and heifers [3]. Common management practice is to apply artificial cooling to cows when they are lactating, that is, during the postpartum period. However, the prepartum period is a stage that involves several important physiological mechanisms that will definitely impact on productive and reproductive efficiency postpartum [4]. So, when heat stress is present in the dry period can lead to an alteration in concentrations of several hormones related to essential metabolic processes which are associated to postpartum Holstein cow colostrum and milk quality and productivity [5]. Therefore, cooling from the dry period of the cow must be identified as part of the total cooling period of a lactating cow. The aim of this research was to evaluate the effect of cooling cows and heifers for one month before parturition on milk quality of colostrum and milk production under hot and dry conditions.

MATERIAL AND METHODS

The care and management of cows were according to procedures approved by Mexican Official Norms (NOM-051-ZOO-1995: humanitarian care of animals during mobilization). The study was conducted in a commercial dairy herd located in the Mexicali Valley (Establo Nevárez, Ejido Chihuahua), Baja California, México (32° 49' N and 115° 21' W). This is an arid region with temperatures in summer that reach 50°C and during winter falls to -5°C, 85 mm of annual precipitation and is at 10 m above sea level [6]. Eleven first-calf heifers and eleven multiparous cows were housed in separate pens with shade and a cooling system based on spray and fans during 30 d before programmed calving date. After calving, all cows were moved to a common pen for fresh cows. Colostrum was sampled three times: at calving time, 12 and 24 h after calving. Milk was sampled at days 7, 14, 21 and 28 postpartum. Colostrum and milk components were determined using a portable automatic ultrasound equipment (LactiCheck® LC-01 Milk Analyzer). Temperature-Humidity Index (THI) was obtained using the following formula: $THI = (0.81 \times DBT) + RH (DBT - 14.4) + 46.4$, where DBT is the dry bulb temperature and RH is the relative humidity [4]. Data were subjected to an analysis of variance under a completely randomized design with repeated measurements over time using SAS [7].

RESULTS AND DISCUSSION

Minimum and maximum temperatures registered during the study were 23 and 49 °C, and average relative humidity and ITH of 39% and 82.2 units respectively during the pre-partum period. Table 1 shows the results of colostrum quality. In colostrum, cows showed lower fat ($P<0.05$) than heifers (3.10 vs 5.89%); however, solids-not-fat (17.4 vs 17.9%), protein (6.83 vs 6.67%) and density (64.96 vs 60.85%) were similar ($P>0.05$) between cows and heifers,

respectively. Table 2 shows the results of milk quality. Milk fat (4.90 vs 4.27%), solids-not-fat (8.70 vs 9.06%), protein (3.44 vs 3.53%), and density (28.96 vs 30.51%) of cows and heifers respectively, did not change ($P>0.05$). Average of THI falls in the category of danger for Holstein dairy cows because they start to show signs of heat stress when THI is about 68 – to units. So animals were subjected to severe heat stress during most of the days during summer in the experimental site [1, 3]. Colostrum is a fluid secreted by the mammary gland that is rich in several nutrients and is the first secretion of the cow after giving birth until approximately 48 h after birth, so it plays an important role in the nutrition, protection, and development to the baby calf, contributing to the immunological defense of the neonate by stimulating their immune system [8]. As expected, fat, protein, SNF, and density decline from calving until 24 h postpartum. Meanwhile, the fact that multiparous cows produce more fat than first-calf heifers is a normal result since fat content in milk increased with the age of the cow [9]. High environmental temperatures during late prepartum and early postpartum periods of Holstein heifers and cows noticeably affect the quality of colostrum. Since the majority of colostrum is produced several weeks before calving, is essential to cool cows and heifers during conditions of heat stress prepartum [10]. In order to obtain adequate results on postpartum performance under heat stress conditions, a cooling system should be used for cow comfort during the complete dry period of 60 d [11, 12]. We applied a short period of cooling since it lasts for only 30 d. So, small differences in colostrum and milk components were detected between mature cows and first-calf heifers when both type cattle are cooled before calving.

CONCLUSIONS

It was found that cooling Holstein cows and first-calf heifers for one month before parturition is a positive management practice that helps to maintain normal ranges of components in colostrum and milk. However, a recommendation is to increase the time of cooling to improve post-partum performance of cows and heifers.

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DIRECT BIOCHAR ADDITION TO LAYING HENS MANURE: EFFECT ON NH₃ EMISSIONS

Kajetan Kalus¹, Sebastian Opaliński¹, Marek Kułczyński²

¹Wrocław University of Environmental and Life Sciences

²Wrocław University of Science and Technology

ABSTRACT

Poland is 7th biggest egg producer in European Union, with the second biggest number of laying hens - over 48.5 million of the birds and 624 thousand of eggs produced in 2018. Such intensive production has a very strong environmental impact associated with gaseous emissions, especially during manure handling operations, where vast amounts of ammonia (NH₃) are being emitted in the poultry houses and further to the atmosphere. Mitigation methods of those emissions are in demand, with the use of sorbents being one of them. Biochar with its high porosity and large surface area appears to be a very promising manure additive that could reduce NH₃ emission to the atmosphere. In this screening experiment, two ways (topical and by mixing) of beech wood biochar application to laying hens manure have been tested. 50 and 100 g of the biochar has been added to the manure and NH₃ concentration in the manure headspace has been measured every 2 days, for 6 days. Topical application resulted in up to 60% reduction of NH₃ emission, while biochar-manure mixture showed up to 80% increase in NH₃ emission.

IMPACT OF FEEDING-TIME SCHEDULE ON FEEDLOT PERFORMANCE OF CATTLE IN HOT ENVIRONMENT

Ruben Barajas¹, Alejandro Ramos-Suarez¹, Juan Eulogio Guerra Liera¹, Billy Josue Cervantes-Pacheco²

¹Universidad Autónoma de Sinaloa

²Ganadera Los Migueles, S.A. de C.V.

ABSTRACT

During the hottest hours of day, cattle experienced major difficulties to dissipate excessive heat load to environment. The main source of heat production of cattle is rumen fermentation process. Changing common feeding schedule from day to night hours could help cattle to dissipate easily the heat from digestive process to surrounding and impact on its performance. With the objective of determine the impact of feeding-time schedule on feedlot performance of cattle in hot environment, 80 bull-calves (244.9 kg BW) were involved in a 56 feedlot experiment, performed during summer of 2018 in Culiacan, Mexico. In a complete block design experiment in groups of five were placed in 16 ground pens (6 x 12 m), and inner each block pens were randomly assigned to two treatments: 1) Feeding twice a day at 0900 and 1530 hours (Control); and 2) Feeding once a day at 2000 hours (Night treatment). In animals fed ad libitum with a growing diet, body weight, dry matter intake, average daily gain, and feed efficiency were measure. Pen (five animals) was consider as the experimental unit (8 by treatment). Results was subject to ANOVA and $P < 0.05$ fitted to accept statistical difference. Across experiment, maximum and minimum temperature were 44.7 and 23.6 °C, respectively; and maximum and minimum THI were 95.99 and 73.07, respectively. Night feeding schedule increased ($P < 0.01$) in 5% final weight, 25% daily gain, 7% dry matter intake, and 17% feed efficiency (gain: feed ratio). Results suggest that feeding time have strong influence on feedlot performance of cattle under hot weather. It is conclude that delivering feed during the night hours becomes as a viable feeding strategy to improve feedlot performance of cattle in hot environment.

AFFECT OF PROLONGED WEAKENING OF GEOMAGNETIC FIELD ON THE MORPHOLOGICAL ABNORMALITIES IN LABORATORY RATS

Barbara Tombarkiewicz, Krzysztof Pawlak, Marcin Lis, Bartosz Bojarski, Jerzy Niedziółka

Department of Zoology and Animal Welfare, Faculty of Animal Breeding and Biology, Agricultural University in Kraków

ABSTRACT

The aim of the present study was to verify if the prolonged (multigenerational) weakening of the GMF may result in morphological abnormalities in laboratory rats. Geomagnetic field (GMF) is one of important, but so far not enough appreciated elements of natural environment, The living beings exposed to the constant presence of the geomagnetic field often respond to GMF disturbances in a visible way. Among others, shielding of geomagnetic field may result in anatomical and functional abnormalities during the early stages of growth in amphibians, birds, and mammals [Asashima et al 2003., Wang et al. 1991, Kopanev et al., 1979]. Three generations of Wistar laboratory rats (F1, F2 i F3) were used in the experiment. The animals from experimental groups were placed in hypogeomagnetic conditions (GMF weakened to the level of about 12 μ T and component vertical value of GMF was below 20 nT), whereas control groups were kept in conditions free from GMF disturbances – the value of vertical component of GMF c.a. 38 μ T [Geo-Scanner BPT 3010]. After 6 months of exposure in each generation the rats were sacrificed by decapitation. Kidneys, livers, lungs, ovaries and intestines were collected for histological analysis. The experiment was conducted in conformity with the NIH Animal Care Guide and was approved by the Local Éthical Committee on Animal Testing in Kraków. In our study some rats kept under hypogeomagnetic conditions were affected with blindness (absence of the eyeballs). These cases occurred in 4.8% (F1 generation), 7.9% (F2 generation), and 9.2 (F3 generation) of all rats that have reached 14 days of age (opening of the eyelids). This phenomenon was not recorded in any control rat. Histological examination showed that the kidneys of rats of experimental groups, contained some hyaline material in the glomeruli. These changes occurred both in the cortical as well as in the medullar areas of the kidney. In the generation P these changes occurred in several animals exposed to hypogeomagnetic conditions, but in the F1 and F2 generations they were found in all animals from experimental groups. The obtained results indicate that disturbances of the geomagnetic field can cause morphological abnormalities in animal organisms.

This research was financially supported by the statutory activity 215/DZ06

EFFECT OF A RADIOFREQUENCY ELECTROMAGNETIC FIELD EMITTED DURING EMBRYOGENESIS ON THE BLOOD PICTURE OF ONE-DAY-OLD DOMESTIC HEN CHICKS (GALLUS GALLUS DOMESTICUS)

K. Pawlak¹, Z. Nieckarz², B. Bojarski¹, B. Tombarkiewicz¹, M. Swadźba-Karbowy¹, M. Lis¹

¹Department of Zoology and Animal Welfare, Faculty of Animal Breeding and Biology, Agricultural University in Kraków, Poland, ²Experimental Computer Physics Department, Institute of Physics, Jagiellonian University in Kraków,

ABSTRACT

Exposure to artificial electromagnetic fields (EMFs) emitted mainly by mobile telephony has been steadily increasing with the development of human civilization. Haematological parameters are among the most common indicators of the body's physiological status. The aim of the study was to determine the effect of an 1800 MHz electromagnetic field emission on the blood picture of one-day-old domestic hen chicks. During the experiment, chick embryos were exposed to EMF throughout incubation for 13 x 2 min/day, 4 x 10 min/day and 1 x 40 min/day. After hatching, blood was collected from 10 one-day-old chicks from each group to determine: red blood cell (RBC) count, haemoglobin (Hb) concentration, hematocrit (Hct), MCV (mean corpuscular volume), MCH (mean corpuscular haemoglobin), MCHC (mean corpuscular haemoglobin concentration), white blood cell (WBC) count and leukocyte differential count. In addition, the heterophil/lymphocyte ratio (H:L) was calculated. The study showed that increases in RBC,

Hb concentration, Hct, WBC, segmented heterophils and the H:L ratio were paralleled by a decrease in lymphocyte percentage, which may be indicative of the stress-inducing effect of EMF on living organisms. This research was financially supported by the statutory activity 215/DZ06

EFFECT OF GEOMAGNETIC FIELD DEPRIVATION ON EMBRYONIC DEVELOPMENT OF FRESHWATER FISH

Bartosz Bojarski, Krzysztof Pawlak, Marcin Lis, Jerzy Niedziółka, Barbara Tombarkiewicz

Department of Zoology and Animal Welfare, Faculty of Animal Breeding and Biology, Agricultural University in Kraków, Poland

ABSTRACT

The aim of this study was to assess the influence of hypogeomagnetic conditions on embryogenesis, hatching dynamics, malformation severity and mortality rate of larvae of Prussian carp (*Carassius gibelio*). The geomagnetic field (GMF) is a natural field that constitutes an integral part of the geosphere which surrounds the Earth. The GMF present in the seas and oceans is an important navigation marker for water animals. Fish can detect electric charges generated as a result of intersecting geomagnetic field lines. Organisms are particularly sensitive to environmental factors, including the geomagnetic field, during early developmental stages. Fish eggs were divided into two groups: control and experimental. The control group was maintained in a natural GMF, while the experimental group was incubated in a weakened GMF. Hypogeomagnetic conditions were created by placing the eggs in shielding cages. The obtained results indicate that GMF deprivation has an impact on embryonic development and hatching dynamics of Prussian carp. Hypogeomagnetic conditions caused an increase of embryo mortality rate and affected hatching dynamics of Prussian carp. Geomagnetic field shielding accelerated hatching into larvae by 6 hours. The results of this experiment showed that there is a need of examining the materials used for manufacturing apparatuses for fish egg incubation in terms of causing GMF disorders.

This research was financially supported by the statutory activity 215/DZ06

This research was financially supported by the statutory activity DS 3263

THE EFFICIENCY OF BIOFILTRATION AIR POLLUTANTS EMITTED FROM RENDERING PLANT

Tymczyna Leszek, Bożena Nowakowicz-Dębek, Łukasz Wlazło, Anna Chmielowiec-Korzeniowska

University of Life Sciences in Lublin

ABSTRACT

The normal functioning of the agricultural sector is not possible without suitable treatment of the waste material emerging there. Unfortunately, the processing of animal waste in treatment plants can be a source of emissions of significant amounts of microbiological and chemical contaminants, including volatile compounds with strong odorigenic properties. In order to meet the requirements concerning the maximum reduction of pollutant emissions to the environment, this paper assesses the efficiency of biofiltration of air pollutants emitted in the rendering plant. Obtained results of research indicate the legitimacy of installing biofiltration devices in this type of facilities. High efficiency of the tested beds (especially after the first year of operation), low investment and operating costs, non-waste technology and the ability to remove from the gases also compounds that are poorly or practically insoluble in water, give hope for the spread of biofiltration methods wherever it is necessary to reduce the emission of gaseous air pollutants.

COMPARISON OF THE PREDICTIVE ASSESSMENT OF POLISH LANDRACE (PBZ) NATIONAL PIGS WITH RESULTS OF WIELKOPOLSKA

Damian Knecht, Anna Jankowska-Mąkosa, Anna Bartosik

Department of Pig Breeding, Institute of Animal Breeding, Wrocław University of Environmental and Life Sciences

ABSTRACT

The study aimed to compare intravital and BLUP ZWH evaluation results of gilts from Polish Landrace (PBZ) pedigree breeding with the results of this breed evaluation performed in 2015 by POLSUS (Polish Pig Breeders and Producers Association) in Wielkopolska. The farms from the examined region were divided into three groups: all farms evaluated by POLSUS, sows number from 25 to 50, and 33% of the best herds.

The experimental population consisted of PBZ 278 gilts. The significance of differences between mean values was determined using Tukey's post-hoc test and the following significance levels were determined: highly significant $p \leq 0.01$ and $p \leq .05$.

The highest meat content in carcass was observed in individuals from 33% of the best herds in terms of average meat content in carcass (60.7%), slightly lower mean value was observed in 33% of the best herds in terms of average BLUP ZWH (60.1%). The worst results were noted in the herds evaluated in Wielkopolska (59.5%), their mean differed significantly from other herds ($p \leq 0.01$). Average meat content in PBZ gilts evaluated throughout the country was 59.3% [Blicharski et al. 2016].

The highest average standardized gains were obtained in the examined herd (651.2 g/day). Significantly lower gains ($p \leq 0.01$) were noted in gilts from 33% of the best herds (617.7 g/day).

The loin eye height was the highest on the examined farm (61.4 mm), this value differed significantly from the others ($p \leq 0.01$). The worst results were obtained in the herds of 25 to 50 sows (55.9 mm). The average height of loin muscle of PBZ gilts in Poland was 57 mm [Knecht et al. 2018].

The highest index of intravital evaluation was obtained by gilts from the examined farm (118.7).

Gilts from the farm achieved much higher daily gains, the height of the loin eye and the index of intravital evaluation.

THE IMPORTANCE OF BROILER CHICKEN UNIFORMITY

Ewa Lukaszewicz¹, Tomasz Bobusia²

¹Wroclaw University of Environmental and Life Sciences, Institute of Animal Breeding, Division of Poultry Breeding

²Poultry farm, Nowa Odra

ABSTRACT

The performance of chicken broiler depends on many issues related both with broiler parent stock and their progeny management and environmental conditions. Proper flock statement and chick uniformity at the day of hatch are one of the key factors affecting the effectiveness of broiler production.

Four hundred hatching eggs collected from 39 weeks-old Ross 308 broiler breeders were divided into four groups, according to weight (100 eggs each): I group – egg weight 50 – 55 g, II – weight 58 – 63 g, III – 67 – 75 g, and group IV – eggs of weight varying from 50 to 75 g. All hatched chicks were reared for 42 days in the unified environmental conditions, at the same weight groups and in four subgroups each. Following parameters were controlled and evaluated: growth rate (GR), daily feed intake (DFI), feed conversion ratio (FCR), Production Efficiency Factor (PEF), slaughter yield and carcass composition.

The egg weight and resulted weight of day-old broiler chicks affected the final live body weight. As it could be expected the heaviest (2433.75 g on average) were chicken from group III (hatched from the biggest eggs), while the lowest live body weight (2292.5 g), less effective FCR (2.08) and PEF value (250.49), which includes four key performance indicators (liveability, final live body weight, length of the rearing period and FCR) were noted in group IV characterised by the lowest birds uniformity. It is interesting that PEF value of broilers of the smallest group (I) was the same as for the heaviest birds (group IV; 268.26 and 268.91, respectively).

The obtained results indicate that broiler breeder eggs of lower or higher weights than the normative ones can be successfully used for hatching, provided that the hatched chicks will be reared separately.

ENVIRONMENTAL CONSEQUENCES OF RUMINANTS WITHDRAWAL IN POLISH MOUNTAIN AREAS

Kamila Musiał, Wojciech Krawczyk

National Research Institute of Animal Production, Department of Production Systems and Environment

ABSTRACT

In mountain areas in which grasslands dominate or should dominate, it is very important to maintain an adequate livestock population, especially ruminants. The aim of the study was to show progress of the complex process of desagrarisation, including deanimalisation. The latter is the withdrawal of livestock farming or the dramatic decline in livestock population. The research concerned 4 mountainous voivodships: Lower Silesian, Silesian, Lesser Poland and Podkarpackie Voivodeship, which are located in the Carpathian Mountains and the Sudetes. There was carried out a dynamic (long-term) analysis of the condition and structure of the utilization of agricultural land and the population of ruminants: cattle and sheep. The tendencies for changes in the livestock status maintained in animal farms were determined, as well as the progressing decrease in the number of farms covered by the CAP (direct subsidies) and agriculture-developed land. Results show that the desagrarisation processes were observed to be highly advanced, which was especially visible through the decreasing number of ruminants, that we called deanimalisation process. Such withdrawal of livestock farming in recent years is more and more visible in both of the mountain ranges. It can be estimated by the percentage of pastures excluded from agricultural production, that over the last 10 years has increased. For the area of the Carpathians that increased by 26,8% and in the Sudetes by 49,8%. Quantitative analysis of the ruminant population (cattle and sheep) shows that the size of livestock population over the last 10 years has in turn decreased. For sheep, these indicators were 22% in Carpathians and 12% in Sudetes. For cattle similarly, these values have decreased by 30% in Carpathians and by 28% in Sudetes. Consequently, effects of ruminants withdrawal are expressed through a progressive secondary succession, which is unfavorable for the environment and the local biodiversity.

THE IMPACT OF BIOCIDAL PAINT AS A DISINFECTANT ON THE REDUCTION OF ALPHITOBIOUS DIAPERINUS IN POULTRY HOUSES AND IMPROVING CHICKEN WELFARE

Sara Dzik¹, Tomasz Mituniewicz¹, Bogumił Torlop²

¹University of Warmia and Mazury in Olsztyn

²Kleib Ltd. Company

ABSTRACT

First, it is necessary to reduce the number of insect pests in poultry houses which pose a serious threat to humans, broiler chickens and buildings (e.g by destroying of the insulating layer). In the light of the growing population of the lesser mealworm *Alphitobius diaperinus* Panzer (Coleoptera: Tenebrionidae) not only in Poland but also in the whole world, the issue of effective disinfection needs to be addressed.

The aim of the research was to assess two repellents (chemical -permethrin and optical – mixture of ultramarine and violet 23) whose carrier is paint, especially in terms of their impact on the incidence of pests and on chicken welfare, which in turn were assessed on the basis of zootechnical indicators and production results.

The research was conducted in production conditions. The material comprised two poultry houses with the maximum chicken stocking density. In the experimental building, the biocidal paint was applied as a disinfection method. However, in the control building the interior was painted with limewash. The experiment was repeated three times (3 individual 6-week production cycles). The cycles started 7 days, 6 months and 12 months after the application of the paint.

The results indicate that biocidal paint can be used as a disinfectant and is more effective than liming, since the number of *A. diaperinus* decreased (although a complete depopulation of lesser mealworm was not noted). More favourable zootechnical indicators were obtained in the experimental building. Therefore, greater production results were also reached, while maintaining a good level of chicken welfare. The data were statistically validated.

The research emphasises the importance of disinfection in poultry houses and tries to resolve the issue of the effectiveness of commercially available methods of disinfection.

ACTIVITY REPORT: ERASMUS PROGRAM - JEAN MONNET MODULE: "ANIMAL HYGIENE AND WELFARE: THE EUROPEAN VISION"

Gustavo Ruiz¹, Jorge Alberto Saltijeral Oaxaca¹, Karla Paola Figueroa Giron¹, Juan Eulogio Guerra², Hugo Castañeda Vazquez³, Jose Luis Bedolla⁴, Nazario Pescador⁵

¹Universidad Autónoma Metropolitana, México

²Universidad Autónoma de Sinaloa, México

³Universidad de Guadalajara, México

⁴Universidad Michoacana de San Nicolás Hidalgo, México

⁵Universidad Autónoma del Estado de México, México

ABSTRACT

The objective of the Jean Monnet program is to study and research in the field of EU integration and to understand the place of Europe in a globalized world. The actions of Jean Monnet are organized and applied through higher education services. In 2016 the UAM (Universidad Autónoma Metropolitana) contest with the European Union with this project, of 1011 projects that will be published, 194 will be approved and remembered in Mexico, this is one of them. The funds are to develop activities in the 2016-2019 period.

The work of this module is also part of the One World One Health global initiative, which seeks a closer relationship between veterinary medicine and human medicine. To promote a scientific approach to teaching and research in the field of animal health. The UAM was the headquarters of the program.

Three courses were held with the following results:

Hygiene and Animal Welfare: The European Vision, Prof. Dr. Joerg Hartung, Germany 28 students.

Application of the European protocol of welfare quality in cattle Dr. Frank J.C.M. Van Eerden burg, The Netherlands .22 students.

3) Factors of environmental risk in the facilities, their influence on the welfare and health of animals Dr. Andrés Aland, Estonia. 14 students

In addition, students from the Brazil. Colombia, Cuba, Haiti, Nicaragua and Uruguay participated as well.

In the UAM there are the commemorative plaques of the three courses of the module where the photographs of professors and participating students will appear.

INTRODUCTION

The objective of the Jean Monnet program is to study and research in the field of EU integration and to understand the place of Europe in a globalized world. The actions of Jean Monnet are organized and applied through higher education services.

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• Hygiene and Animal Welfare: The European Vision

Prof. Dr. Joerg Hartung

University of Medicine Veterinary of Hanover, Germany

September 11-21, 2017

Content:

- Teaching health and welfare. Background, historical aspects.

- Understanding animal welfare. Sentient beings. Stress, heat stress and behavior.

- Animal welfare legislation in EU and Germany. How to implement animal welfare in practice. The ban of battery cages.

- Assessing animal welfare. Resource based indicators. Animal based indicators. Checklists. Animal Welfare Quality Program.

- Animal housing. Cattle/ dairy/fattening pigs/sows/broilers/turkeys.

- Transport regulation and means of transport. Road/ship/air. Road accidents.

- Slaughter and stunning. Captive bolt. Gas stunning. Electric stunning. Stress and meat quality.

- Aspects of occupational health of workers.

- Aspects of meat hygiene along the production chain.

- Application of the European protocol of welfare quality in cattle

Dr. Frank J.C.M. Van Eerdenburg

Utrecht University, Faculty of Veterinary Medicine.

March 12-16, 2018

Content:

- Assessment of welfare in dairy herds with the Protocol of welfare quality and other systems.

- Implementation of the European Protocol of Welfare Quality.

- Stress - basic concepts of heat:

- What is heat stress and what are the consequences?

- How to prevent it?

- How to detect it?
- Design of the milking parlor (freestall) - size.
- Bed
- Number
- Types of floors
- Behaviour of cattle.
- Importance of grazing
- Social interactions
- Behavior and estrus, estrus detection
- Overcrowding
- Use of sensors to detect diseases and estrus.
- Use of sensors to improve the management of livestock.
- Impact of the disease on well-being (stress) and productivity.
- Mastitis
- Lameness
- Rearing of calves and heifers
- Factors of environmental risk in the facilities, their influence on the welfare and health of animals

Dr. Andrés Aland

Estonian University of Life Sciences. Estonia

October 15 -26, 2018

Content:

- Animal hygiene at the service of the facilities for the animals.
- Animal hygiene as key to reduce the use of antibiotics in animal production.
- The impacts of the microclimate in the animals.
- Bioaerosols and contamination of air in animal facilities.
- Emissions to the environment and its impact on the animals.
- Management routines. Supply of space. Technological equipment in the vicinity of the animals.
- Precision farming: techniques, risks and benefits.
- Reduction of health risks associated with the management of manure.
- It is better to prevent than cure: zoonoses and emerging diseases.
- The means and measures for Biosecurity and hygiene of the flock.

In the three courses visits to sheep and goat farms were done, where all the theoretical issues of the courses were applied to real situations. It can be said that the Jean Monnet module was a success in it's the three courses.

RESULTS AND DISCUSSION

Three courses were held with the following results:

In addition, students from the following countries participated with scholarship (funds from UAM): Brazil, Colombia, Cuba, Haiti, Nicaragua and Uruguay

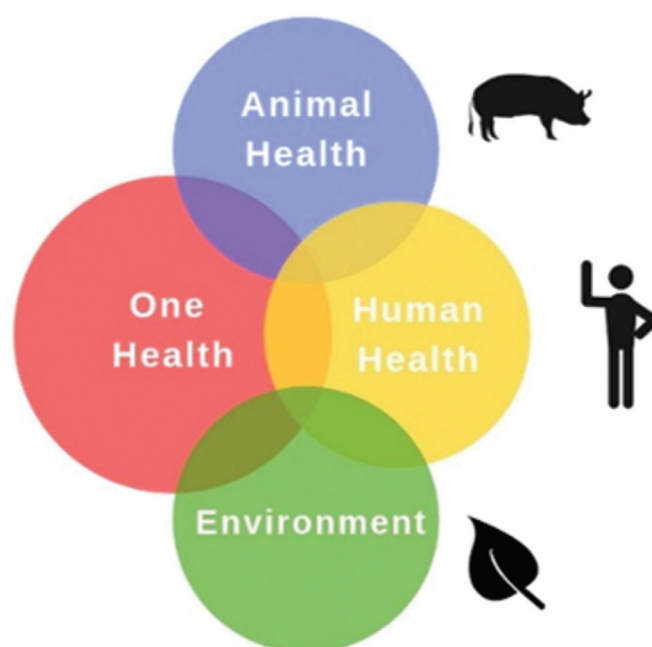
Date	Title	Responsible for the course	Participating teachers	No. of participating students
September 11- 21, 2017.	Hygiene and Animal Welfare: The European Vision	Prof. Dr. Joerg Hartung Germany	UAM, UNAM	28
March 12 -16, 2018	Application of the European protocol of welfare quality in cattle	Dr. Frank J.C.M. Van Eerden burg The Netherlands	Czech Republic UAM Universidad Autónoma de Baja California, Universidad de Guadalajara, Instituto Tecnológico de Monterrey	22
October 15 -26, 2018	Factors of environmental risk in the facilities, their influence on the welfare and health of animals	Dr. Andrés Aland Estonia	Diken UNAM UAM	14
	Total			64

Table 2. Lectures at other universities		
	Dates	Number of Attendees
Universidad Autónoma de Sinaloa	September 4 - 8, 2017	110
	October 8 al 11, 2018	70
Universidad Autónoma del Estado de México	September 25 and 26, 2017.	90
	October 1 and 2, 2018	45
Universidad Michoacana de San Nicolás de Hidalgo	September 27 and 28 2017	200
	October, 3 - 5, 2018	185
Universidad Autónoma de Guerrero	October 28, 2018	40
Universidad de Guadalajara	October 29 - 31, 2018	85
Total		825

The discussion and agreements were very rich and the European model can be applied in Latin America with some particular adjustments to each country conditions.

CONCLUSION

The efforts in this module are part of larger projects, enrolled in the One World One Health initiative that seeks to link veterinary medicine with human medicine. To promote a scientific approach to teaching and research in the field of animal health. International cooperation and solidarity in animal hygiene are pillars for a One health.



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SELF-DEVELOPING VARIETY-COMPLYING TECHNOLOGY OF MARKETABLE PORK PRODUCTION AS A RESULT OF SIMULATION OF BIOLOGICAL, INDUSTRIAL AND ECONOMIC PROCESSES IN THE BELARUSIAN PIG BREEDING

Sergey Solyanik¹, Valery V. Solyanik¹, Andrey A. Hochenkov¹, Alla N. Solyanik¹, Alexander V. Solyanik², Alexander A. Solyanik², Vitali A. Solyanik²

1RUE Research and Production Center of the National Academy of Sciences of Belarus for Livestock Breeding
2EI Belarusian State Agricultural Academy

ABSTRACT

Modern industrial pig breeding cannot provide proper welfare of animals and has increased environmental risks for administrative territories the pig breeding farms and complexes are located in. The aim of our work was to develop appropriate, environmentally balanced, and economically perfect production technology for commercial pork. Scientific knowledge and practical experience were used in pig breeding, engineering aspects and hygiene of growing pigs, and ecological aspects of manure drain at pig-breeding enterprises. An integrated vertical-and-horizontal simulation model of pig breeding enterprise was developed (Animals Hygiene Model Solyanik). Simulation model (MS Excel spreadsheet-based) includes six integrated technological indicators, each of which is optimized by the criterion of the lowest financial and material costs according to hygienic, ethological, and environmental standards and regulations. The final stage of the simulation model is to find the most balanced options between the initial six integrated technological indicators. Computer simulation of marketable pork production technology has been carried out. It has been determined that the critical control point was a sow in the production process with more than one farrowing during productive life. A self-developing variety-complying technology (SV-technology) was proposed including two-phase pork production in a closed cycle, management of all the sex-age groups of pigs, excluding suckling sows with piglets, by a large-group method on a periodically changed deep straw bedding and access to the walking area. The SV-technology allows to improve the pigs' welfare, increase soil fertility, reduce environmental pressure of a pig-breeding enterprise on the community, and increase financial efficiency of pig breeding.

Keywords: pigs, self-developing variety-complying technology (SV-technology), simulation

INTRODUCTION

Computer technology and robotics have had a significant impact on the development of livestock breeding in general and pig breeding in particular in the past quarter of the century. The exact livestock breeding as a scientific area attracting young researchers to solve interdisciplinary problems. For the majority of engineering scientists being neither veterinary medicine doctors, nor zoology (animal) engineers (Higher education Republic Belarus. I stage – specialty 1 74 03 01 Zootechnics (Animal Science; Agricultural), qualification Zoengineer); or animal hygienists (Higher education Republic Belarus. II stage – specialty 1-74 80 03 Zootechnics (Master of Agricultural Sciences); Ph.D. (D.Sc.) of Agricultural Sciences), researching biological objects, including farm and domestic animals of various species, is of a genuine interest. First of all, researchers are interested in the possibility of mathematical and computer descriptions of processes taking place both at the level of an animal, group of animals, or even livestock management facility.

At the same time, the application of the exact livestock breeding results in practice is foremost only increases the cost price of marketable products.

The main problem in our opinion is the fact that when developing innovative solutions in exact pig breeding, an excessive individualization of an animal takes place, its activity, behavior, incidence rate or other ailments are monitored. At the same time, for some reason, it is forgotten that the number of animals, for instance, at Belarusian pig breeding complexes amounts to thousands and tens of thousands. Therefore, there is no need to take into account the growth dynamics of each animal, or even a group of 20-30 animals. Variability of pigs' performance traits conforms to the law of normal distribution. So storing information about how exactly one or another performance indicator of a specific animal was obtained (average daily weight gain, multiple pregnancies, etc.) is of no great practical significance. It is important to know in general feed cost for obtaining pig body weight gain taken to slaughter from a specific stall area. It is mainly the aggregated data that helps to solve the issue of economic efficiency of an enterprise and the financial profitability level for its specific employees.

Climate control systems are widely used in the modern pig breeding facilities, and controlled microclimate, excluding biologically conditioned cold training process, leads to a susceptibility of animals body and immunity. Unpredictable shutdown of ventilation systems leads to stressful situations resulting in decrease of pigs performance, incidence level increase and even death of a significant part of the population.

Lean pork pigs breeding, the susceptibility of meat breed pigs probably led to the appearance of new previously not determined diseases. To obtain lean pork, animals shall be fed with more expensive feed, and the higher the costs of pigs management, the significantly higher the cost of pork production, and the lower the profitability of this type of business.

Pig breeding enterprises operation according to existing technologies has long been in contradiction with both the welfare of pigs and the ecology of a particular administrative territory.

Pig breeding in Denmark, the Netherlands and other European countries is mostly based on the operation of separate commercial reproduction farms and pig fattening farms. At the same time, the breeding stock of reproductive farms consists of hybrid sows obtained from breeding and genetic centers. The existence of a genetic selection pyramid had a catastrophic effect on the biodiversity of pig breeds, as a result – most of the indigenous breeds in the EU have disappeared.

Pig breeding is represented by industrial pig breeding complexes of the closed production cycle with a capacity of 1 to 15 thousand tons of marketable pigs' live weight in the countries of the former USSR. At the same time, the official financial cost for the design and construction of pig farms in Belarus come expensive for agricultural enterprises in a huge amount. So the cost of a pig space is 2440 USD. And this is despite the fact that 160-165 kg of body weight

pork averagely is produced at Belarusian pig breeding complexes per year per one pig space, and a little bit over 240 kg at the best enterprises. Considering the low purchase prices for marketable pork, as well as the low level of pork production per pig space, it is not realistic to expect recoument of new pig farms in the near future.

MATERIAL AND METHODS

Greater part of the tabular data obtained from research and production studies by domestic and foreign scientists, including pig performance, hematological, biochemical, immunological and other indicators, pork quality indicators, bioengineering, animal hygienic, technological, thermal engineering, thermal physical, environmental and other parameters were replaced by linear, curvilinear and nonlinear functions of one and/or two variables. The designed approximation curves adequately describe the tabular data, i.e. the deviation did not exceed the statistical error.

The obtained mathematical dependences were used in computer block programs for calculating dynamic models of one or another parameter, including herd turnover, livestock movement, pork quality, manure volume, soil fertility, etc. After, the block program output results served as input data for a comprehensive simulation model (Animals Hygiene Model Solyanik) of a pig enterprise.

MS Excel capabilities, in particular, the "Search for Solution" service was used to improve the pork production technology.

The following general restrictions and requirements were established for the development of a computer program for simulation of marketable pork production:

I. Animals: 1) Meat and lard type of pigs, meat yield 60% maximum. 2) Bodyweight of pigs sold for slaughter shall not exceed 150 kg. 3) Backfat thickness – 5 cm maximum. 4) Sows multiple pregnancies is 12 live piglets per farrow maximum. 5) Animals are fed with specialized industrial feed. All the cereal straw used for compound feed production is used as bedding. 6) Sick animals are culled and slaughtered. 7) Veterinary services are performed exclusively for mandatory vaccinations against five diseases maximum.

II. Production technology: 1) Closed production cycle (growing and fattening at one and the same enterprise). 2) Two-phase technology (piglets are kept in sows' stalls from birth till reaching 30 kg of body weight. Then they are taken to another facility for fattening). 3) Self-repair of the main stock. The peculiarity of selection and breeding work at the pig complex consists in fulfilling two requirements: the first is the selection of repair gilts from sows with multiple pregnancy rate of 11–12 live piglets, and from litter with over 80% of females born. The second requirement is to check all repair gilts during the suckling period regarding activity for seizing the feeder space when there are fewer feeders than animals. 4) Suckling period is 5 weeks maximum. 5) Production rhythm is 1 week. 6) Insemination shall be carried out with the use of purchased sperm products obtained at breeding and genetic stations for pig breeding in the regions of Belarus. 7) The pork production volume per pig space is 250 kg minimum.

III. Management conditions: 1) Cost of pig space for an average annual animal is 250 USD maximum. 2) Enclosures of facilities the pigs are kept in having the highest and economically perfect thermal characteristics, service life is 50 years minimum. 3) All the animals, except for suckling sows with piglets, are kept in a large group on deep periodically changed straw bedding, have free access to the walking area. 4) Urine is drained from the facility and pumped into an airtight storage facility. 5) All the facilities are equipped with free ventilation.

IV. Manure and farmlands: 1) Manure is stored near the facility, it overheats and taken out to the fields in spring (autumn). 2) Humus content and soil fertility are controlled. 3) Nitrates distribution in the groundwater of the areas of manure and urine disposal is monitored.

V. Slaughter and processing: 1) Slaughter and advanced processing of pigs is performed mainly at industrial meat processing plants with merchant network.

VI. Labor management and economics: 1) The number of employees is 10 people maximum per first thousand tons of pork sold in a year counted per body weight, and then 5 people maximum for each subsequent thousand tons. 2) Recoument of capital costs is 5 years maximum.

RESULTS AND DISCUSSION

Application of the basic laws of zoology engineering and zoology hygiene, the basic principles of HACCP and ISO 22000 and 14000, as well as multi-stage computer simulation (Animals Hygiene Model Solyanik) allowed to determine:

- the critical reference point in marketable pig breeding sows in a technological process having over one farrowing during the productive life, i.e. group of the main sows;
- to improve the welfare of pig stock, the group and large-group free management of all the sex and age groups of pigs is required, with the exception of sows in the farrowing area.

Sows with multiple pregnancies at marketable pig farms with a closed production cycle have become the main source of diseases at livestock facility. From the point of view of production arrangement and calculation of livestock movement in the production cycle, there is a dry period for the main sows, and it is also required to constantly control the size of the buffer group and its location. Sows are subjected to multiple immunizations and treatment of various diseases during the productive life. After piglets weaning, feeds are spent for the sows which may not be recouped at the new farrowing, as soon as the sow can become dry. It is impossible to obtain high-quality pork for consumption from sows having several farrows.

Exclusion of main sows from production technology, intensification of the reproduction process in order to obtain a more predictable result in the farrowing area, transfer of culled and dry gilts and sows after piglets weaning allows increasing production volume at a pig-breeding complex by 15-25%.

Simulation modeling of marketable pork production technology allowed to develop the self-developing variety-complying technology (SV-technology) (Fig.).

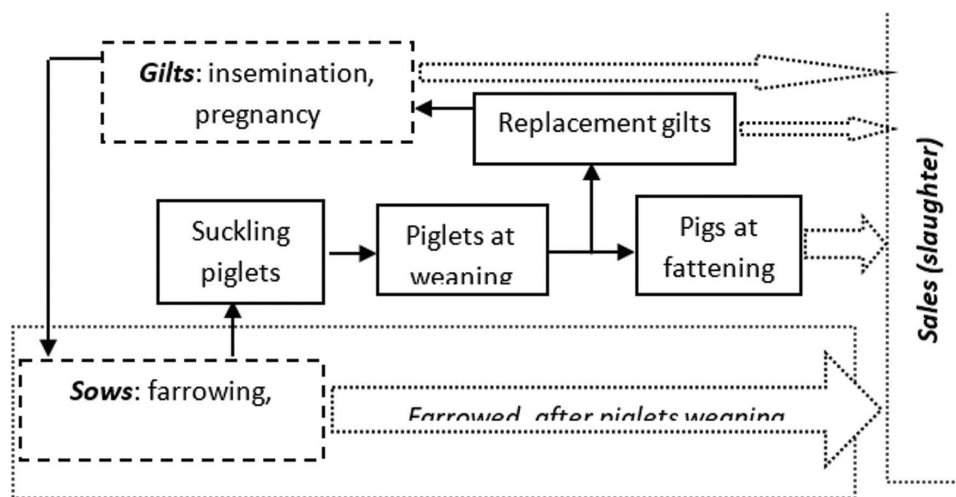


Fig. SV-technology layout

The main peculiarity of the SV-technology is the exclusion of sows from the herd with over one farrowing. Intensification of breeding process at a marketable pig breeding complex by selecting pigs from sows with higher multiple pregnancy and milk yield, as well as testing their the activity for occupying feeder space, allows obtaining 11-12 pigs from first litter gilts permanently. Variety-complying management of pigs in large groups on a periodically changed straw bedding with free access to the walking area allows increasing the animals' immunity and performance.

Refusing meat pigs in favor of meat and lard breeds reduces the requirements for diet energy and feed protein composition, which will affect the cost positively. Low financial costs for space per animal, the predominant use of free ventilation makes it possible to quickly recoup material costs and obtain higher net profit.

Bedding manure as an organic fertilizer will contribute to an increase in humus and soil fertility.

CONCLUSION

Thus, innovative technology has been proposed for the functioning marketable pig-breeding enterprises in Belarus, allowing to increase production volume, create variety-complying conditions for the management of all the sex and age groups of pigs, which positively affects their welfare, minimize environmental consequences of pig breeding in particular administrative area.

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ZOONOSES, VECTOR BORNE AND EMERGING DISEASES

KEYNOTE LECTURE

ROLE OF VETERINARIANS IN INTEGRATED CRISES MANAGEMENT (ICM) EXPERIENCED IN SYRIA

Darem Tabbaa

Department of Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Hama University, Hama, Syrian Arab Republic

ABSTRACT

The protracted and prolonged war in the Syrian Arab Republic, which caused mass exodus, has led to the deterioration of livestock production infrastructure and the decline of animal health services infrastructure that protected herds, the safety of food from animal origin and, consequently, environmental and public health.

Diseases of animal origin continue to pose an important health threat in most parts of the world, causing significant costs and losses to the health and agricultural sectors. Although the situation in the industrialized world is improving, the prevention and control of diseases of animal origin remains a major area of concern in most developing countries, especially those countries that have suffered the ravages of war and long-term crises such as the Syrian Arab Republic. Recent observations in these countries indicate that expenditures for the prevention of diseases of animal origin in humans are likely to increase significantly in the near future. There is an urgent need for programs to control and eliminate them in animal reservoirs. There is no doubt that veterinarians have provided the necessary technical knowledge to control diseases such as brucellosis, rabies, bovine tuberculosis, leishmaniasis and others, as trade in livestock products continues and the movement of population as a result of war and crises increases during the past eight years in a way that threatens public health. In this paper we describe the important role of Vets in carrying out all ICM responsibilities by organizing local, state and international responses to effectively integrate institutional plans, undertaking comprehensive strategies including prevention, mitigation, preparedness and designing measures for reconstruction of this critical sector until rehabilitation.

INTRODUCTION

The long and protracted war in the Syrian Arab Republic resulted in the mass exodus of large numbers of people from various areas, mostly from the urban belt and the Syrian countryside. This war contributed to high production costs, lack of good inputs and destruction of the infrastructure of many institutions, which severely hampered agricultural livelihoods, contributed to the decline in the herds of sheep and goats, and the disappearance of cattle herds. This has led to limited physical and financial access to food, high prices and inflation, with the decline of the purchasing power of the most vulnerable families.

Although the agriculture sector produces food for more than half of the population and contributes to 25-30 percent of GDP, levels of food insecurity remain high. FAO estimates that around 6.5 million people are insecure and 2.5 million others are at risk of food insecurity. To reduce the use of negative coping mechanisms to meet their daily needs, it was necessary for the Syrians to restore and protect agricultural livelihoods and value chains, increase self-reliance and strengthen their resilience.

Crisis management is a societal issue and needs to be effective in bringing together the efforts of all sectors at the local, national, regional and international levels to implement the responsibilities of integrated crisis management. Crisis response was organized at the local, governorate and state level to effectively integrate institutional plans. Integrated Crisis Management need a comprehensive strategy including prevention, mitigation, preparedness and provisions for the reconstruction and rehabilitation of the agriculture sector.

Awassi sheep comprised the majority of the livestock population before the crisis; cattle and goat populations were smaller. Commercial poultry was an important source of employment. Today, however, livestock numbers have decreased as herders lack animal feed. Veterinary services have been significantly damaged; as a result, many livestock were not vaccinated, and risk of spreading diseases into neighboring countries decrease. The loss of animals, either by diseases and death due to lack of care, poor living conditions, killed or stolen was particularly high in most rural areas of Syria.

MATERIAL AND METHODS

This paper was prepared based on data published by different national authorities and international organizations and self-observations collected during the 8 years of suffering within the work of veterinarians and veterinary institutions in Syria at the wartime (2011-2018).

Results and Discussion

The veterinary governmental and societal body in Syria focuses its attention during the war on comprehensive emergency management. They provides support in the form of personnel, finances, materials, and processes during four overlapping phases of military contingencies:

Mitigation – which reduce loss of life and property by lessening the impact of the crisis.

Preparedness – which developed resources to manage the impacts of hazardous events.

Response – which stop the emergency and its effects.

Recovery – which worked on both short and long-term restoration of the capabilities impacted by emergencies.

The Comprehensive Emergency Management Program supports the mission, vision, and strategic goals of the veterinary body to ensure the continuity of veterinary services, the safety of food, staff, and resources, and provides for the continuity of veterinary operations in the event of an emergency.

Livestock and its products are among the most important sources of national income in Syria, accounting for about 30% of it. As a result of the difficult conditions in the country, the number of livestock has decreased significantly, leading to lower input of the agricultural sector and increased the suffering of livestock farmers because of their inability to provide breeding requirements and improve production. During the war, veterinarians provided support to breeders to protect livestock and improve livestock production, thus contributing to increased income for breeders.

The number of veterinarians working in Syria and registered in the Association of Veterinarians in 2015 was about 4500. These veterinarians work in the public sector by 20% and in private sector by 80%.

During the war all the relevant authorities in the agricultural sector and animal resources, headed by the Ministry of Agriculture and Agrarian Reform with the participation of the General Union of Farmers, the Union of Chambers of Agriculture, the Veterinary Association, the Faculty of Veterinary Medicine at Hama University and Arab and international organizations, especially the Food and Agriculture Organization of the United Nations FAO, established emergency programs to address the effects of war on livestock.

These programs included a series of individual and collective actions aimed at achieving the emergency control plan and rehabilitation of the production sector.

Veterinarians working in private mobile clinics have continued to work in the places where livestock are located in the places they supervise under all difficult circumstances. Many of them have been subjected to abductions, theft and extortion, and a number of them have died in the performance of their humanitarian duty.

Veterinarians have intensified their involvement in supervising the markets for the sale of animal products to ensure that the situation of war is not exploited and that products that are unfit for human consumption or destroyed are used.

Many veterinarians rehabilitated a large number of animal breeding establishments that had been sabotaged during the war, to ensure that their production (poultry, sheep and cows) continued to be followed. They also rehabilitated drug and vaccine laboratories to ensure that their products were in the local market at reasonable prices.

Veterinarians cooperated with international organizations in organizing joint projects aimed at providing food safety and improving the general social situation of families affected by the war. These projects provided treatment and preventive services against external and internal parasitic diseases in sheep and goats in six governorates of Syria, which include Damascus, Homs, Hama including Al-Ghab, Al-Hasakah, Idlib and Daraa. The number of sheep and goats treated only in the year of 2015 was 252.15222 / animal. The number of beneficiaries benefiting from the project were about /12,122/ breeder at the same year. The number of veterinarians who benefited from the project were about /122/ veterinarian. (report of the veterinary Association 2015).

CONCLUSION

The risk factors recovered by veterinarians, in collaboration with relevant professionals during the wartime in Syria, were summarized in the followings: Animal transboundary diseases. Zoonoses. Human diseases connected with food of animal origin. Animal population control. Animal-connected occupational disease. Arthropods common to man and animals (disease vectors included pests and vector vertebrates). Environmental pathogenic agents. Environmental contamination. Animal emergencies. Planning of actions in epidemics or emergencies. Health education and public information of risks related to animals and food of animal origin in emergency situations, Training of veterinarians on ICM systems to rehabilitate the veterinary sector in particular and the livestock sector in general.

Nevertheless, the suffering of veterinarians working in Syria is still very high due to the deteriorating economic situation resulting from the war and the economic blockade, and the decline in the purchasing value of farmers, which makes it impossible for veterinarians to do their work perfectly.

Integrated Crisis Management of veterinary services in Syria during the 8 years of war was a concept that incorporates a wide variety of responses aimed at supporting the rehabilitation, recovery and reconstruction of the many facets of a society in urban and rural areas recovering from war.

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ORAL PRESENTATIONS

COMPARISON OF BIOSECURITY IN PIG FARMS AND STANDARD PRECAUTIONS IN HOSPITALS - CONTACT NETWORK ANALYSIS PERSPECTIVE FOR INFECTION CONTROL

Andrzej Jarynowski¹, Vitaly Belik²

¹Interdisciplinary Research Institute in Wrocław

²Institute for Veterinary Epidemiology and Biostatistics, FU Berlin

ABSTRACT

Recent geographical spread of *Klebsiella pneumoniae* – NDM in human hospitals and African Swine Fever in farms encourages us to prepare comparative computational risk assessment from ONE health perspective. Standard Precautions (SP) are strategies to decrease risks to healthcare workers and to patients and are core elements of infection prevention in hospitals. Biosecurity Practices (BP) are also very important in preventing the introduction and spread of infectious diseases, but among pig herds. We compare effective management models minimizing the risk of Hospital Acquired (HA) and Livestock Associated (LA) infection. We aim to understand how infections are transmitted in Polish hospitals and farms by epidemiological multiscale modelling.

- We have analyzed time-varying structure of contacts reconstructed from hospitals/farms and constructed referral dynamic networks of patients and pigs.

- We could map organizational structure of farm/hospital personnel by set of questioners, CAD maps integration, video recording, functional paths annotation and local vision.

- We present results of the analysis of perception and compliance with SP/BP among Polish farmers and healthcare workers in accordance with their organizational status and experience.

We conclude that rising awareness about the contact patterns reveal via network analysis is an important element of infection control, both in farms and hospitals and recommend the use of modeling approach for risk assessment.

DOES BIOSECURITY REALLY MATTER? BIOSECURITY IN ASF OUTBREAK HERDS VERSUS OTHERS

Arvo Viltrop, Kaari Reimus, Tarmo Niine, Kerli Mõtus

Estonian University of Life Sciences

ABSTRACT

African Swine Fever (ASF) outbreaks in domestic pigs occurred in Estonia in years 2015-2017 along with the spread of the virus in the wild boar population. The epidemiological investigations in outbreak herds (n=28) revealed that most probable mode of transmission of the infection into the herds was indirect transmission with contaminated vehicles, clothes or other fomites. Biosecurity breaches were identified in all outbreak herds. In farms only minor errors could be appointed that must have led to the incursion of the virus as high level biosecurity measures were in place.

In 2017 (from January to April) external biosecurity measures were evaluated in 29 randomly selected Estonian pig farms. The sample was stratified based on herd size to reflect the structure of the Estonian pig farms. One of these herds contracted ASF in summer 2017, thus the final sample size of negative herds for this study was 28. The evaluation in negative herds was performed on the same principles as it was conducted in outbreak herds and by the same expert team, which was performing ASF outbreak investigations (the authors of this paper). This allowed us to make a comparison of the biosecurity levels in outbreak and negative herds and to estimate if the herds with lower biosecurity had been in a higher risk of contracting ASF.

The results that will be presented and discussed are potentially valuable both to pig farmers and veterinary authorities indicating the role of different biosecurity measures and practices in controlling the spread of the ASF virus in wild boar-domestic pig interface.

CONTAMINATION AND DECONTAMINATION OF MEDICAL EQUIPMENT WITH AEROSOLIZED CLINICAL RELEVANT PATHOGENS

Britta Magsig, Kerstin Rosen, Uwe Roesler

Freie Universitaet Berlin, Institute for Animal Hygiene and Environmental Health

ABSTRACT

In recent years, rare and highly contagious diseases have occurred more often in Germany due to factors such as climate change and increased travel activity. For this reason, a joint project investigates to which extent hospitals can isolate, treat and cure patients with this kind of diseases. This also includes an efficient decontamination of used hospital rooms and medical equipment with the idea of reusing them.

To investigate the decontamination of medical equipment after pathogen exposure at a later point, the attachment of clinically relevant surrogate pathogens on medical equipment or materials was examined in an aerosol chamber. This occurred to find out, in what extent medical/ electric devices can be contaminated. This contamination was measured from outside as well as from inside the device by aerosolized pathogens.

As biological strains are used: *Staphylococcus* (S.) *aureus* as a surrogate strain for airborne gram-positive bacteria, *Geobacillus* (G.) *stearothermophilus* as a surrogate strain for spore forming bacteria and the bacteriophage MS2 as a surrogate strain for uncoated viruses. The experiments took place in a walk-in aerosol chamber with adjustable climate parameters, such as relative humidity and temperature. A computer with a build in active ventilation system was used as an electric device.

After examination of the strains in the aerosol chamber we found out, that more pathogens were attached on horizontal than on vertical surfaces of the device. The ventilation system of the device does not have a significant influence on the recovery rate of the strains. Even without air ventilation pathogens were found on several horizontal and vertical points inside the device.

In the next step these ongoing experiments will be repeated with different classes of medical devices. Furthermore the decontamination of these devices should be established with different decontamination methods and disinfectants.

ROLE OF THE N-TERMINAL DOMAIN OF THE BOVINE VIRAL DIARRHOEA VIRUS POLYMERASE

Andrey Kossarev¹, Jan Paeshuyse¹

¹Laboratory for Host-Pathogen Interactions in Livestock, Department of Biosystems, KU Leuven University, Belgium

ABSTRACT

Herein we describe our current progress in development of an efficient reverse genetics methodology for pestiviruses and demonstrate its direct, preliminary, application for bovine viral diarrhoea virus (BVDV).

INTRODUCTION

Bovine viral diarrhoea virus (BVDV) represents an ubiquitous RNA pestiviruses, a genera of the Flaviviridae family, which predominately affect livestock. On the level of genome organization Flaviviridae share a great deal of similarities. 5' and 3' ends of the genome represent an untranslated region flanking one single open reading frame coding for a series on structural and non-structural proteins. Some prominent members include bovine viral diarrhoea (BVD) and classical swine fever virus. On the level of pathogenicity, pestiviruses are characterized by high genetic variability and a gradation in virulence [4,5,8].

Affected farms are often faced with high morbidity and mortality rates which consequently decrease animal performance and meat quality, leading to detrimental economic losses with a global impact [9].

Due to the inherent nature of RNA viruses, their genetic instability presents a challenge as genetic engineering is cumbersome task to achieve. Contemporary methods in reverse genetics circumvent this problem through generation of complementary DNA (cDNA), which allows for direct manipulations and propagation as a bacterial cDNA plasmid clone. Furthermore, suitable RNA polymerase (RNAP) promoters permit generation of infectious genomic viral RNA by *in vitro* transcription. Modern strategies combine stable bacterial artificial chromosomes (BAC) with eukaryotic or viral promoters for *in vivo* / *in vitro* transcriptions and off-plasmid launching [1].

Current research project aims to clarify the role of the N-terminal domain of the RNA-dependent RNA polymerase (RdRp, encoded by the NS5B protein) in viral replication and pathogenesis. Our development proposes an improved reverse genetics system with simplified workflow and provide rigorous tools for molecular studies of pestiviruses.

MATERIAL AND METHODS

Cells, viruses, plasmids, and bacteria strains

Madin–Darby bovine kidney (MDBK) cells were maintained in supplemented Dulbecco's modified Eagle's medium (DMEM, 2% NaHCO₃, 1% non-essential amino acids) and conditioned to grow in presence of 2% horse serum. BVDV lab strain NADL is used as model for current developments. *E. coli* strains TOP10 (ThermoFisher) were employed for plasmid propagation and TransforMax™ EPI300 (Lucigen) were used for mass plasmid amplification. Yeast strain AH109 (Clontech) served as a host for homologous recombination cloning.

Construction of the BAC shuttle plasmid pBYS

pBYS shuttle plasmid was derived by digestion of BAC backbone plasmid, containing bacterial copy switch regulators, pNH040 (Addgene #42152) with Sall. Subsequent addition of adaptors, with KAPA HiFi DNA Polymerase (Kapa Biosystems) at limited cycle PCR, created cloning entry sites for yeast elements 2 μ and LEU2 marker, amplified from pRPR1_gRNA_handle_RPR1t (Addgene #49014). Final assembly was achieved by Circular Polymerase Extension Cloning. [3]

Construction of a full length cDNA clone and sequence analysis

Introduction of full length BVDV NADL genome (cytopathic strain) into pBYS shuttle vector was achieved through homologous recombination in yeast strain AH109 and denoted a pBYS-NADL [7]. Shortly: full length genome was split in 4 subunits of \pm equal length and co-transformed with Sall linearized pBYS vector. 3' UTR unit was fused to a mammalian optimized T7promotor sequence and 5' UTR to T7terminator and Hepatitis delta virus ribozyme (HDVr) sequence. The aforementioned elements ensure efficient transcription and eliminate potential run-off effects. Nucleotide sequencing of reconstructed BVDV NADL genome was performed at Eurofin Genomics.

In vitro transcription, transfection and virus recovery

Sfil linearized pBYS-NADL was *in vitro* transcribed by using HiScribe T7 RNA polymerase (NEB) kit following manufacturer's instructions in presence of 2 μ /uL RNasin (Promega) and subsequently directly transfected into MDBK cells with Biorad Gene Pulser as previously described [6]. Following a 72h incubation the culture supernatant was subjected to total viral RNA extraction with NucleoSpin® RNA Virus (M&N). Subsequently an RT-PCR was performed on total RNA extract with SuperScript™ IV One-Step RT-PCR (Invitrogen) using published primers [10].

Characterization of the rescued virus

Regenerated virus was titrated and a subsequent serum virus neutralization assay (SVN) was performed with serum from Bovela® (Boehringer Ingelheim) immunized cows according to an adaption of previously published procedure. [2].

RESULTS AND DISCUSSION

pBYS for efficient cloning and shuttling of BVDV

To explore the capability of pBYS as a suitable platform for integration of whole viral genomes, shuttling thereof between different organisms and execution of genetic manipulations, we have successfully cloned the complete BVDV NADL genome. Presence of the complete BVDV genome and its precise site of integration in pBYS shuttle vector was confirmed through Sanger sequencing of all recombination sites as well as the whole genome.

Plasmid isolation may be easily performed with most commercial miniprep kits, which yields sufficient material direct transformations with *E. coli* and *S. cerevisiae*. However, larger quantities requires an upregulation of the plasmid copy number. EPI300 cells contain a mutant *trfA* gene under regulated by an inducible promoter. Addition of arabinose solution induces expression of *trfA* gene, following utilization of plasmid's *oriV* origin of replication and consequently leading to a high copy plasmid amplification. Such copy number switch results in significant increase of plasmid copy number, yielding several micrograms DNA material from a 10mL culture.

Lastly, *in vitro* transcription with T7 RNA polymerase resulted in a clear band at the expected molecular weight of 12.5 kb, without any observable presence of non-specific products nor smears. In conclusion, we can assume that the regulatory transcription elements are correctly recognized by the T7 RNA polymerase generating a full sized BVDV genome.

Characterization of rescued viral strain

Transcribed viral genome is directly useable for mammalian cell transfections. Initial incubation time following the transfection spans up to 120h prior the viral cytopathic effect occur. Subsequent inoculation of fresh mammalian cell cultures with 120h transfection supernatant (150x dilution), shows normal viral replication as apparent by the cytopathic effects that occur within 72h after infection (Fig. 1).

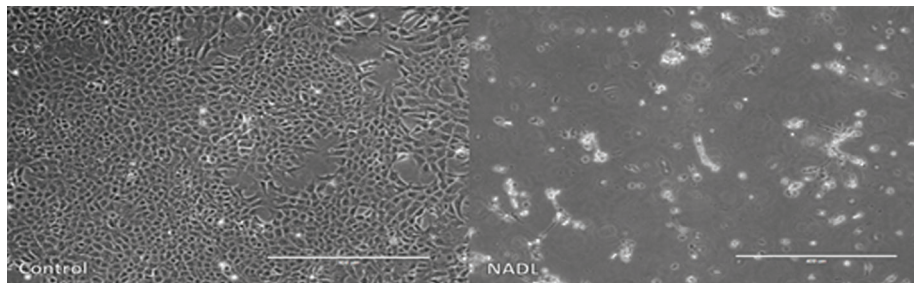


Figure 2: pBYS-NADL *in vitro* transcribed re-infection trial. 72h incubation after supernatant infection (150x dilution) Viral titration yielded a TCID₅₀/mL = 104.5, which corresponds to the TCID₅₀ of the wild type NADL lab strain. Lastly, the rescued NADL lab strain was successfully neutralized by all tested serum samples taken from immunized cows as soon as 21 days post immunization.

CONCLUSIONS

As demonstrated, our current development shows a promising potential in the field of reverse genetics. Ongoing efforts are aimed at further characterization of the rescued viral strain, which includes plaque and immunostaining assays, generation of NS5B mutant strains and optimization of shuttling protocols.

To conclude, the pBYS shuttle vector represents an interesting addition to the reverse genetics toolbox as it demonstrated its capability in the presented study.

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POSTER PRESENTATIONS

IDENTIFICATION AND DENOMBREMENT OF SOME SPECIES OF MIGRATORY BIRDS VECTORS OF AVIAN INFLUENZA VIRUSES

Nadir Alloui¹, Barberis Abdelheq¹, Naouel Hamoudi², Amine Boudaoud¹

¹Poultry Science Division, Veterinary Department, University of Batna1, LESPA

²LBVA, University of Oum El Bouaghi

ABSTRACT

Migratory birds, especially ducks (order Anseriformes), constitute a primary reservoir and the first source of introduction of the avian influenza virus (AIV). In 2016, following the first official detection of the circulation of the subtype H9N2 in broiler farming's in Eastern Algeria, a preliminary descriptive study is conducted to identify and enumerate in the humid areas of the Eastern Highlands of Algeria, the species migratory birds, particularly Anseriformes and Charadriiformes, known to carry AIV.

In the order Anseriformes, 9 species of the family Anatidae are identified, 6 are known infected: Mallard (*Anas platyrhynchos*, Mallard); Winter Teal (*Anas crecca crecca*, Common Teal); Pintail (*Anas acuta*, Northern pintail); Gadwall (*Anas strepera*); Eurasian Wigeon (*Anas penelope*); Common Shelduck (*Tadorna tadorna*). In order of Charadriiformes, 2 species of the family Laridae, are identified, of which only 1 species known is infected: Black-headed Gull (*Larus ridibundus*). In the order Pelecaniformes, only 1 species of the family Phalacrocoracidae, was detected: Great Cormorant (*Phalacrocorax carbo*), and is known infected.

Our observations increase the diversity of migratory bird species, especially Anatidae that are infected with the AIV, in the humid areas of Eastern Algeria. Molecular characterization of circulating avian influenza viruses in these wild birds will make it possible to assess the risk of a probable spread of these viruses to populations of intensive poultry farming's.

ASSESS THE IMPACT OF NON-BIOSECURITY BASED MEASURES ON CAMPYLOBACTER SPP. PREVALENCE

Vanessa Szott, Benjamin, Katrin Daehre, Uwe Roesler

Freie Universitaet Berlin, Institute for Animal Hygiene and Environmental Health

ABSTRACT

Campylobacter infections in broiler farms currently are an issue of major importance worldwide. Previous approaches to reduce infections did not prove sufficient. Thus, in this study, we aim to examine the effect of non-biosecurity based measures on Campylobacter prevalence in animal trials.

To establish a Campylobacter (*C.*) jejuni colonisation model broilers of breed ROSS 308 are fed with standard diet and retained on ground floor with litter and a stocking density of 39 kg/m². First, we started with the dose finding experiments. In each group we orally inoculated 20 broilers on day ten of life - the first group with 10³ and the second with 10⁴ colony forming units of a *C. jejuni* reference strain. In the second part, the seeder-bird model, 18 (seeders) out of 90 broilers are orally challenged with the previously determined *C. jejuni* inoculation dose. Randomly selected broilers (seeders and untreated broilers (sentinels)) will be tested for Campylobacter colonisation and load by taking cloacal swabs at predetermined intervals. At the end of the trial after necropsy we quantitatively and semiquantitatively analyse the intestinal content (ceacum and colon) for *C. jejuni*.

Dose finding experiments showed that the ceaca of the broilers got highly and evenly colonized regardless of the used inoculation dose. Due to an earlier ascertainable Campylobacter colonisation the higher inoculation dose (10⁴) will be used for the subsequent groups. Further results of the ongoing project will be presented.

After establishing the colonisation model we will investigate the effect of different non-biosecurity based measures like the usage of Carvacrol or of different organic acids on the Campylobacter spp. prevalence at the end of fattening.

VIRUSES RESPONSIBLE OF FIRST OUTBREAKS OF AVIAN INFLUENZA IN THE EAST OF ALGERIA ARE GENETICALLY RELATED TO H9N2 G1-LIKE LINEAGE

Barberis Abdelheq¹, Angelina Gorrill², Jousianne Loupias³, Abdeljelil, A.³, Jihen Lachhebe³, Amine Boudaoud¹, Nadir Alloui¹, Mariette Ducatez².

¹ LESPA, Département vétérinaire, ISVSA, Université de Batna, Algérie ;

² IHAP, Université de Toulouse and INRA, ENVT, Toulouse, France ;

³ Laboratoire d'Epidémiologie et de Microbiologie Vétérinaire, Institut Pasteur de Tunis, Tunisie ;

ABSTRACT

Different organ pools collected in 2017 from 12 broiler farms showing high mortality (60%), were tested by the real time RTPCR. Ten positive samples were first typed using a pair of primers specific to the conserved avian influenza matrix (M) gene and then genetically characterized, targeting the hemagglutinin gen (HA) after amplification on 9-day-old specific pathogen free chicken embryos. Except isolate n°6, the others were monophyletic. All the Algerian isolates belong to the Middle East group, H9N2 G1-like. They are very close to the Moroccan isolates (isolated in 2016), but distant from the Tunisian and Libyan isolates. We established for the first time, the H9N2 subtype circulation in broiler farming in Algeria and his possible Moroccan origin. The study of the factors favoring the introduction and the spread of AIV in poultry farming from wild birds is essential to implement effective biosecurity measures.

Key words: Algeria, H9N2, HA, phylogenetic analysis.

INTRODUCTION

Influenza A viruses are classified in the family Orthomyxoviridae, which includes four genera: Influenza A, Influenza B, Influenza C and Thogotovirus [12], based on antigenic differences in nucleoprotein (NP) and matrix protein (M)

[9]. Avian influenza virus (AIV) comprises various subtypes, classified according to the antigenic properties and the diversity of external transmembrane proteins: hemagglutinin (HA) and neuraminidase (NA) [5]. Sixteen subtypes of HA (H1-H16) and nine subtypes of NA (N1-N9) are identified [4]. AIV H9N2 are the most common, with a widespread [1]. Different continents are subsequently affected: Asia, Europe, the Middle East and Africa [10]. H9N2 influenza viruses is a major problem in poultry farming, causing large economic losses, with a high mortality rate up to 60% in field conditions [11]. AIV H9N2 was detected in various countries of North Africa, such as Tunisia [13] and Morocco [2]. The objective of this study was to detect and to compare the Algerian isolates to reference strains, as well as with other strains, in particular those of the border countries.

MATERIALS AND METHODS

Virus isolation: The detection of AIV was performed by qRT-PCR using primers specific to the universal M gene, described by Fouchier et al. (2000) [3]. Isolates from positive samples were amplified on 9-day-old specific pathogen free chicken embryos and the allantoic fluid was subjected to total RNA extraction. After being tested once more to AIV by real time RT-PCR, the RNA was stored at -80°C.

Gene Segment Amplification: The amplification of hemagglutinin gene was performed by primers described by Hoffman et al (2001) [7]. The conventional one step RT-PCR program was: 50 °C for 30 min, 95 °C for 15 min, 40 cycles of 95 °C for 30s, 57 °C for 30s and 72 °C for 1-2.5 min (1min/kb). The amplicons were excised from the gel and purified by the QIAquick® Gel Extraction kit (QIAGEN®).

Sequencing and phylogenetic analysis: purified PCR products were sequenced by the Big Dye Terminator Kit v.3.1 cycle sequencing kit (Applied Bio-systems). Phylogenetic tree was generated using Mega 7 software and neighbor-joining method with 1000 replicates.

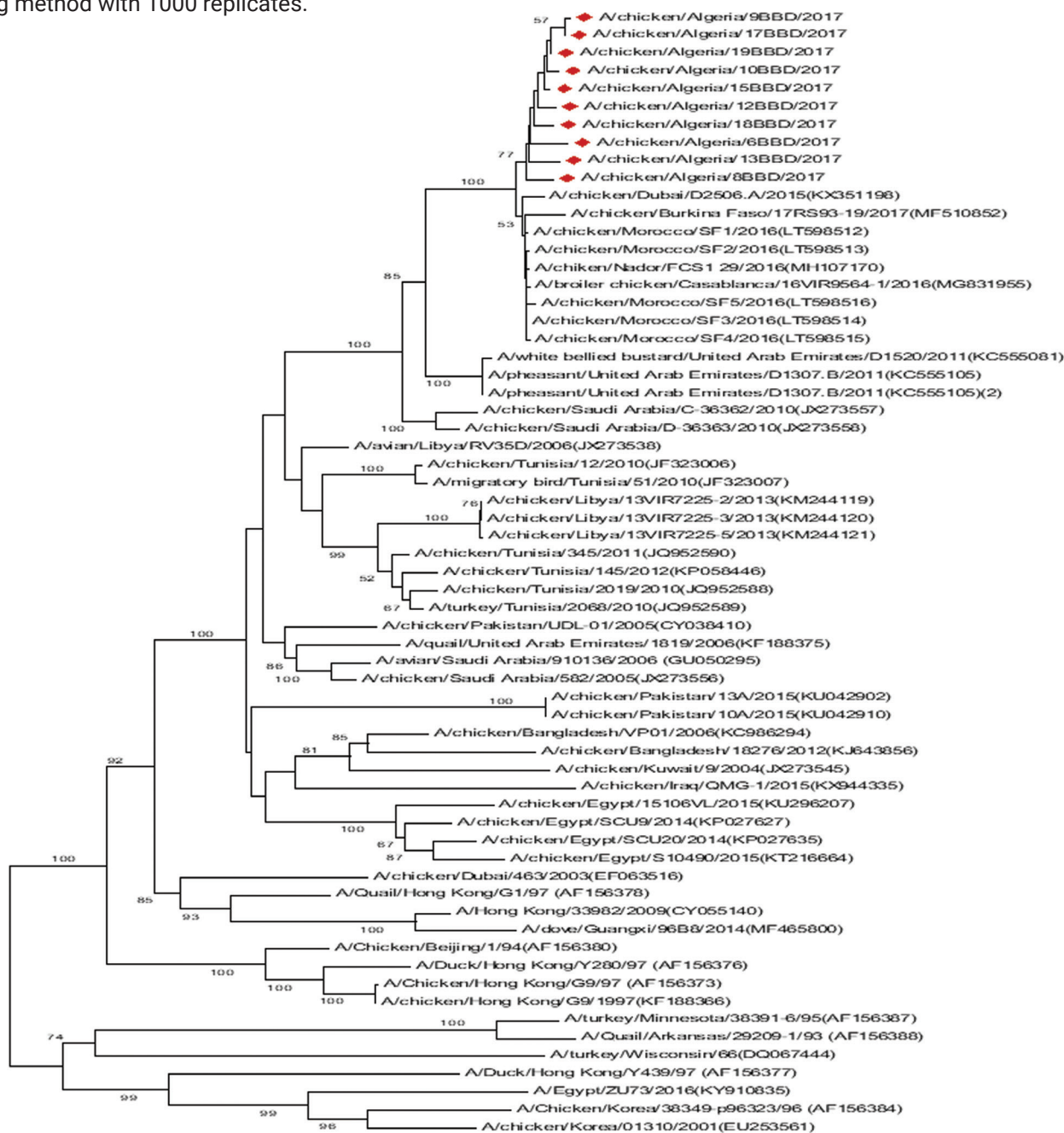


Figure 1. Neighbor-joining consensus tree based on Influenza A virus hemagglutinin nucleotide sequences showing evolutionary relationship between Algerian isolates (red diamond) and representative AIV from GenBank. Numbers at the nodes indicate the bootstrap confidence values (1000 replicates)

RESULTS AND DISCUSSION

LPAIV are divided into two phylogenetic lineages: the North American lineage and the Eurasian lineage (Europe and Asia) [6; 14]. The HA gene of ten AI strains isolated in 2017 in a fatal clinical episode (mortality: 60%), was completely sequenced and phylogenetically analyzed. The analysis showed that all the Algerian isolates belong to the Middle East group, line A, H9N2 G-1 like. The 10 isolates were very close to each other and grouped on the consensus tree (bootstrap value: 100) with a small distinction of strain n° 6. This result can be attributed to the short sampling period and the promiscuity of the studied geographic regions. All the Algerian strains have a low phylogenetic distances (Bootstrap value: 100) with all the Moroccan strains isolated in 2016 (eg A / chicken / Morocco / SF1 / 2016, A / chicken / Nador / FCS1_29 / 2016). Similarity between the Algerian and Moroccan isolates is not surprising, considering the sharing of borders between the two countries, facilitating the transmission of AIV. Current Algerian H9N2 strains were also closely related (Bootstrap: 100) to Burkina Faso viruses (A / chicken / Burkina_Faso/ 17RS9319/2017) and some Middle East strains such as those from Dubai (A /chicken/ Dubai/ D2506.A /2015). These observations suggest that all the viruses originating from these countries share one common ancestor [8]. In contrast, our strains are distant from the Tunisian and Libyan H9N2 viruses isolated in 2010, and 2006 respectively, most likely because of the temporal distance (2017 vs 2010 and 2017 vs 2006).

CONCLUSION

This study confirms the circulation of H9N2 AIV in Algerian poultry farms. It is well documented that wild waterfowl are the natural reservoir and the primary source of introduction of IA into poultry farming. Therefore, the study of the risk factors contributing to the introduction and spread of influenza viruses from waterfowl to domestic poultry and between different poultry farms, may promote the establishment of effective biosecurity measures to reduce economic losses and the risk of humans infection.

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KEYNOTE LECTURE

SOLVING LIVESTOCK ODOR PROBLEM AND IMPROVING INDOOR AIR QUALITY – AN AMERICAN PERSPECTIVE

Jacek Koziel

Iowa State University, Ames, USA

ABSTRACT

A review of recent air quality engineering research including the (1) development and assessment of mitigation technologies for odor, gas, dust emissions and concentrations at and around livestock operations and (2) development of novel analytical methods for environmental assessment of odor will be presented. Dr. Koziel and his team have introduced the use of simultaneous chemical & olfactometry analyses for solving the livestock odor problem. Since 2000, he has directed and collaborated on major emission measurement and mitigation of emissions projects including serving as a site director for the Iowa swine gestation and farrowing farm in the benchmark National Air Emissions Monitoring Study (NAEMS) and leading the scientific literature review of technologies to mitigate emissions of odor, gases and particulates from livestock operations.

ORAL PRESENTATIONS

PRE-TESTING OF A NEW HOUSING SYSTEM FOR BREEDING BIRDS OF LAYER STRAINS IN SWEDEN

Stefan Gunnarsson

Swedish University of Agricultural Sciences (SLU), Department of Animal Environment and Health

ABSTRACT

Pre-testing of the animal welfare of a new housing system for farm animals is compulsory in Sweden. A pre-testing of furnished cages for breeding birds, with ~ 70 non-beak trimmed hens and males per cage (LSL and Lohman Brown, respectively). Data were recorded in three flocks with ~24,500 birds each and data included production results, as well as, clinical records of 50 birds at three ages during each flock.

The mortality rate varied between 9.6% and 11.0%. In all the flocks studied, mortality was significantly higher for LB birds (16.4-17.3%) than for LSL (7.5-9.2%; $p > 0.001$). Mortality was significantly increased in brown males (40.1-47.1%) compared to brown hens (13.2-14.3%; $p > 0.001$), whereas on the contrary was found for white males (3.7-7, 2%) compared to white hens (7.7-9.5%; $p > 0.001$). Bursitis of the keel bone skin was found in up to 16% of the birds in the flocks, and white birds had more bursitis than the brown birds ($P = 0.025$). In general, the plumage of all bird categories deteriorated with increasing age. The feather damages have been substantial, particularly in the hens. In addition, the daily supervision was found to be difficult to carry out safely in the system.

In comparison with the mortality of conventional furnished cages in Sweden, this study that the mortality was more than double in the flocks of this study; 9.6% -11.0% compared to 3.8% on average in Sweden 2015. The prevalence of bursitis, as well as, of feather pecking was found to be high compared to what has been reported from Swedish layer flocks in 2015.

In summary, in the evaluation of the Veranda Breeder system, it was found that the system had important issues concerning bird health and welfare, and that an approval can be questioned.

SEX STEROID EXPOSURE EFFECTS ON DECHORIONATED COMMON CARP (CYPRINUS CARPIO) EMBRYOS

Konrad Wojnarowski

Wroclaw University of Environmental and Life Sciences

ABSTRACT

There is distinctive group of hormones frequently called sex steroids also known as gonadal steroids. Sex steroids are contained within three groups: androgens, estrogens and progestogens. Main role of sex steroids is regulation of sexual characteristics and reproduction behaviours of vertebrates. It must be taken into consideration that both males and females produce those compounds in their bodies although in different concentrations. Hormones concentration in water can affect biological development and gender of many animals, for instance fish, this phenomenon is being widely used in aquaculture. Because of their widespread presence sex-hormones in natural environment can pose a real threat to all living organisms. There are some evidence in literature that are linking exposure to sex-hormones with emergence of auto-immune diseases or even cancerogenesis.

In the present studies the effects of Progesterone, Testosterone and Estrone (all sex-hormones obtained from Sigma-Aldrich) on 195 fish eggs & embryos were assessed. Solutions of sex-hormones at following concentrations were used: 1, 10, 100, 500 ng*dm⁻³. Eggs were stored in system of aerated jars built specifically for the purpose of the experiment. Development levels of embryos were monitored during 72 hours through microscopic observations additionally photographs and videos were taken. For purpose of pigmentation analysis snaps were transformed into grey scale. Used concentrations have influenced pigmentation, hatching time of fish fries and survivability. Additionally achievement times of certain milestones in embryos development were compared between research groups used in the studies.

THE USE OF TECHNOLOGY TO DRIVE IMPROVEMENTS TO HUMANE HANDLING AND ANIMAL WELFARE

Susan Christine Shifflette

Technical Manager of Quality for OSI Europe Foodworks, OSI Europe Foodworks GmbH, a division of OSI Group

ABSTRACT

The aim of the presentation is to give an overview of the use of video monitoring as a driver to initiate improvements to humane handling and animal welfare during the slaughter process. Our monitoring extends from delivery to slaughter at each of our slaughter facilities. Due to gaps in our own process, we discovered in early 2018, we have committed to building and improving upon a HACCP-like Robust Animal Welfare Program, we call "The Right Thing!" which operates on the same system of risk analysis, monitoring, documentation and reassessment that food safety systems use. Within the "monitoring" step we introduced video monitoring to our European based facilities as one of the components to a multi-step approach that combines observation from within and from outside of our organization. This particular step provides us insight and accountability. It gives us another method to compare findings and objectively address behavior and not people. Root cause analysis of issues can be made without interjecting personality and can provide a systematic approach to finding the right issues to improve upon. Challenges included working within the data protection regulations and rebuilding an humane handling culture among all employees of OSI Europe facilities and divisions. This shift to work within an environment of continuous improvement has created momentum that now is affecting more aspects of our humane handling and animal welfare program.

ENHANCING THE GENETIC PROGRESS OF DAIRY FARMS BY A COMPLEX ASSISTED REPRODUCTIVE TECHNOLOGIES (ART) STRATEGY

Gerda Kiss, Eszter Losoncz, Laszlo Konyves, Csaba Pribenszky

University of Veterinary Medicine, Budapest, Department of Animal Hygiene, Herdhealth and Veterinary Ethology

ABSTRACT

One of the focuses of dairy cattle farms to produce safe food is to decrease the use of antibiotics, as it is also highlighted in European Union's directives. Mastitis and reproduction have the highest costs in the dairy sector by the common application of antibiotics and hormones. These two factors basically may also determine a farm's profitability as cows in adequate number and genetic value can produce more milk and breed better offsprings.

Assisted reproductive technologies (ART) may provide the tools to speed up genetic progress and contribute, intrinsically, to a higher resistance to such diseases. Our research program focuses to create a complex protocol for embryo production and cryopreservation by introducing a preconditioning treatment of gametes and embryos into the critical points of the in vitro procedures. We have specified a preconditioning protocol for bovine germinal vesicle oocytes in order to improve nuclear and cytoplasmic maturation and achieve a higher blastocyst quality after in vitro fertilisation and culture. A further protocol was specified for the treatment of blastocysts to increase cell number during blastulation and expansion and also to build a higher tolerance for the detrimental effects of cryopreservation. In a commercial embryo transfer program a significantly higher proportion of treated blastocysts remained of transferable quality after cryopreservation. Gene expression studies of the treated/control blastocysts revealed that the preconditioning treatment, promoted embryo competence through modest transcriptional changes: down-regulation of genes in cell death and apoptosis, and up-regulation of genes in RNA processing, cellular growth and proliferation.

We show related in vitro and field results and the use of this improved, complex in vitro embryo production/ cryopreservation program to create a population with higher resistance against diseases such as mastitis.

INTRODUCTION

Nowadays besides the economical profit high health and well-being status is getting more and more important in farm animal husbandry. The fight against infectious diseases and the basics of well being are determined by law however we have many other new developments in favor of reducing the necessity of medications (especially antibiotics) to produce healthy food.

As we have smart herd management systems and precision livestock farming facilities huge amount of data arise in every second in addition to the developing genetic examinations so we can make reliable decisions in selection by many traits and reach fast advance by assisted reproductive techniques. The biggest challenge for us is to work in huge teams with many researchers from different disciplines and create a complex model that could suit in different herds.

MATERIAL AND METHODS

Health data from diary cows have been collected for decades in the Northern European countries. Later in 2007 Canada also started a national project for data collection on health and disease prevalence to provide information for farmers and veterinarians and develop their genetic evaluation system [7]. In Hungary we also have our data bases but data mining and analysis are not advanced. The operators of several softwares offer some demonstrations but most of the farms work with two or three programmes which communicate blocky to each other. In our study the basic software is Riska which is a commonly use herd management system in Hungary and contains data recorded on the farm (health and disease records), milk data (yield, fat, protein, lactose and somatic cell count) from monthly taken individual samples by the national dairy performance monitoring company (Livestock Performance Testing

Ltd) and phenotype scores from the Hungarian Association of Holstein-friesian Breeders. Expletively we can collect information from Smart Dairy programme about the milking parameters (milking time, milk conductivity). Based on these aspects we try to find that families which less susceptible to mastitis and use their youngest heifer members for embryo production.

The genetical background of mastitis resistance is under research for a long time. Murphy and his colleagues compared two cow families first in 1942 by their udder health [8]. Later in 1952 Legates and Grinnells estimated the heritability of mastitis resistance [5]. From the appearance of DNA sequencing there is a big jump in genetic research. In the last two decades genetic tests have improved much and got cheaper. Hereby if we want examine only single nucleotide polymorphisms (SNP's) there are commercial tests on the market. Unfortunately mastitis resistance has polygenic background so several genes on several loci have impact on it [3]. In the literature we can find many markers in connection with mastitis resistance: TLR 4 (toll-like receptor 4) [2, 4], NLR (nod-like receptor) [9], Lactoferrin [10], Lysozyme [1], chemokines e.g.: IL-17 and IL-8 [6], BoLA-DRB3 [13] etc. After the selection by farm data we take the DNA sequencing on donor heifers and use „udder health specialist” bulls for fertilization which transmit good udder health and conformation.

Nowdays embryo production works well by refined protocols in cattle. We want to make our blastocysts with ovum pick up and in vitro fertilization for following their development with time-lapse video from the early stages in special WOW dishes (Well-Of-The-Well dish, Cryo-Innovation, Budapest) and predict their viability [11]. We assure that embryos are female and take DNA sequencing to find mastitis resistance markers. During the preparation for cryopreservation we treat the embryos with high hydrostatic pressure in sublethal dose to increase viability [12] and then freeze them.

RESULTS AND DISCUSSION

At the end of our project we will have many frozen female Holstein-friesian embryos with prospectively good viability, udder health and a complex protocol for selection and embryo production which could use on any farm.

With the transfer of these embryos we can collect data on our heifers' production and evaluate our hypothesis in the future.

CONCLUSION

The protocol that we process gives opportunity to find the best individuals in dairy herds and produce excellent offsprings from them in short term and huge amount. The goal of these animals is the economical and in some ways antibiotic free milk production for the food industry.

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APPLICATION OF ELECTRICAL PROPERTIES TESTING IN THE DETECTION OF DIFFERENCES BETWEEN ALPACA WOOL AND POLYACRYLONITRILE (PAN)

Marta Michalak, Paulina Cholewińska, Katarzyna Czyż, Piotr Nowakowski, Deta Łuczycza
Wrocław University of Environmental and Life Sciences

ABSTRACT

In the textile industry, in order to reduce costs, synthetic materials such as polyacrylonitrile are used. As petroleum products, they require much more water than the processing of natural fibers, which adversely affects the environment, and their utilization requires large financial outlays. In order to detect the quality differences between materials in recent times, the method of determining them by means of electrical properties and the related resistance phenomenon is becoming more and more popular. Analyses of electrical properties, in this case resistance, allow to detect differences at the molecular level. The research material was wool from 5 alpaca kept in the Zoological Garden in Wrocław and polyacrylonitrile fibers obtained from yarn. In order to determine the differences between materials, the study of electrical properties (resistance and impedance) was used, which detects changes at the molecular level. However, due to the fact that this is the initial application of this method in determining the differences between materials, a thickness, breaking stress and heat protection test was also performed. The study of electrical features showed higher resistance of wool than polyacrylonitrile fibers, which indicates that wool is a better dielectric as compared to PAN fiber, which proves that wool is a better dielectric in comparison to PAN fibers. The breaking stress test showed that the PAN fiber is a weaker material than the alpaca wool. The PAN fiber diameter was smaller than the wool fibers. The heat-protection test showed no differences between the tested materials ($P \geq 0.05$). In addition, the study showed that the more sensitive parameter of the electrical properties was impedance, probably due to the fact that it is a complex value, which measures the total resultant resistance of the tested material. The study of electrical properties on fibers is in the preliminary phase, but their results are already promising.

PCR-BASED LATERAL FLOW ASSAY TO RAPIDLY IDENTIFY KOI HERPESVIRUS IN THE FIELD

Stephanie Speck¹, Finn Niklas Loose¹, André Breitbach², Ivo Bertalan³, Uwe Truyen¹

¹Universität Leipzig/Institute of Animal Hygiene and Veterinary Public Health

²Martin-Luther Universität Halle-Wittenberg/Institut für Pflanzenphysiologie

³Milenia Biotec GmbH

ABSTRACT

Koi herpesvirus (KHV) disease (KHVD) threatens common carp and koi carp worldwide. It is associated with a high level of morbidity and mortality leading to severe economic losses. Vaccine-based preventive measures do not exist and virus dissemination via water, carrier fish, predators and other factors hinder eradication programs. To prevent disease spread, an early detection of KHV in affected or dead carp is crucial. The aim of this study was to develop a test assay that enables a fast KHV-identification at pond-site. A PCR-based lateral flow dipstick assay for the detection of KHV-DNA was designed using the HybriDetect 2T development platform (Milenia Biotec GmbH). An internal amplification control (IAC) and a hybridization control were included. DNA originated from KHV-cell culture, a plasmidic DNA-standard, and carp tissues with confirmed KHVD. Confirmed negative tissues were also included. Analytical sensitivity and specificity, repeatability and reproducibility were validated. The specificity panel included several viral and bacterial fish pathogens. Gill swabs from healthy carp and carp with KHVD rinsed in phosphate-buffered saline were further tested. Finally, a total of 100 clinical samples were investigated. A quantitative real-time PCR (qPCR) served as a reference.

The dipstick assay proved to be KHV-specific. The preliminary detection limit was 60 copies/ μ l template compared to a definite limit of detection of 7.5 copies/ μ l of the qPCR. Inhibition of the IAC was occasionally seen in samples with high KHV copy numbers but not by gill swabs tested directly. All negative samples were accurately identified. Two of 57 positive samples were tested false negative.

A rapid (1.5 h) and specific assay for the detection of KHV was demonstrated. False negative results might be due to testing samples in singular which may be avoided by testing samples e.g. in triplicates. Optimization of sensitivity is currently in progress.

SUSTAINABLE ANIMAL PRODUCTION AND AGRO-BIODIVERSITY CONSERVATION: EFFICIENT AND ALTERNATIVE FARMING

POSTER PRESENTATIONS

SOCIO-ECONOMIC AND HUSBANDRY PRACTICES OF SOLIGA TRIBE IN BILIGIRIRANGANA HILLS OF INDIA

Arun Somagond, Manjunatha Patel, Gyanendra Gaur, Mukesh Singh, Triveni Dutt, Prachurya Biswal, Seema Yadav
Indian Veterinary Research Institute (IVRI), India

ABSTRACT

The study was carried out to study socioeconomic status and animal husbandry practices in core and buffer zone of soliga tribe in Biligiri Ranga Hills (Tiger Reserve) of Karnataka state. Randomly 105 respondents from 11 villages/podus of core zone and 149 respondents from 16 villages of buffer zone were selected for the study. Only those Podus (settlements) was chosen who maintained different species of livestock by random sampling design. Results indicated that male respondents are predominant both zones. Most of respondents (35-60%) had 2 members, nuclear families and low literacy rate (15-22%) in both zones. Majority soligas had marginal land. It was concluded that Non Timber Forest Products (NTFP) was the common and top source of income followed by agriculture, labour and least was animal husbandry. Predominant species in both zones was goat, cattle and poultry. However, poultry was relatively highest in core zone compared to buffer zone. All farmers followed semi extensive system of rearing. The housing materials mainly used was wooden and bamboo. The location of cattle shed was adjacent to dwelling. Floor space was not adequate in both zones. Ventilation was good due to perforated side wall. Majority (95-98%) people not provided any facility for feeding inside the shed. All Soligas provided green fodder during night time. Less people provided the grains as supplements in core zone. Supplementation of kitchen waste was followed only in buffer zone. Most (96%) of the people followed natural breeding practices. There was no concept of colostrums feeding in both zones. There was no special care was taken either for pregnant or lactating animals in both the zones. It can be concluded that soligas in buffer zone are better settled than core zone. The study would be helpful in formulating policies for promotion of scientific animal husbandry operations among the tribes.

QUALITY OF ORGANIC HATCHING EGGS FROM R-11 HENS FED WITH HERB SUPPLEMENTED DIET

Ewa Sosnowka-Czajka, Iwona Skomorucha
National Research Institute of Animal Production

ABSTRACT

The objective of the study was to determine the effect of adding a herb mixture to the diet of organically raised hens on quality of hatching eggs. The experiment used 756 Rhode Island Red hens (R-11) kept in accordance with the rules of organic farming. Hens were fed semi-intensively with a certified organic feed mixture. Birds were assigned to two groups. Group II received a diet supplemented with a mixture of herbs from purple coneflower (*Echinacea purpurea*) and thyme (*Thymus vulgaris*). At 35 wks of rearing, 30 eggs were collected from each group to determine egg weight, albumen height, Haugh units, yolk colour and weight, egg length, egg width, egg shape index, and shell quality. Furthermore, the content of vitamins A and E, cholesterol and the profile of higher fatty acids in egg yolks were studied. Hens from group II were characterized by higher egg production and lower feed consumption per egg compared to the control birds. Darker shell colour and more intensive yolk colour of eggs from the experimental group ($p \leq 0.01$) were observed. Egg weight and shell weight were higher for eggs laid by hens from group II ($p \leq 0.05$). There was a difference in the cholesterol level ($p \leq 0.01$) between the yolks of eggs from both groups. In the yolks of eggs from the experimental group, SFA level was higher and UFA level lower ($p \leq 0.01$), and this was also associated with a lower level of PUFA (including n-6 and n-3) and a lower level of neutral and hypocholesterolemic acids. In conclusion, the herbal mixture supplementation had a positive effect on the weight of hatching eggs and the weight of their shell, but negatively affected the profile of higher fatty acids when compared to the control group. The herbal mixture supplementation was also associated with a lower egg yolk cholesterol level.

FEED CONVERSION EFFICIENCY IN TURKEYS AND DUCKS AND LOSS OF NITROGEN TO THE AIR

Vytautas Ribikauskas, Jūratė Kučinskienė
Lithuanian University of Health Sciences Veterinary Academy

ABSTRACT

The objective of the present study was to follow the flow of nutrients in duck and turkey reared for meat and eventually detect and evaluate loss of nitrogen from manure to air of the poultry houses. Turkeys were birds until 5 months (21 weeks) old, ducklings were until 8 weeks old. Birds of different species were kept in separate houses on litter and analyzed separately. Deposition and conversion of nutrients were calculated from differences between amount of nutrients in feeds and in poultry meat and manure. Until 5 months of age on average turkeys used 11.28% of feed nitrogen, 15.59% of phosphorus, 6.11% of potassium for their weight gain. The same average indices for ducks (during 8-week period) were respectively 19.08% N, 23.26% P and 17.51% K. Average nitrogen emission from turkey manure was 0.0956 kg per bird, that was 24.6% of fresh manure nitrogen losses due to emissions during housing. For the ducks N emission results were respectively 0.316 kg per bird and 14.9% loss during housing.

SPECIAL SESSION

EPIZOOTIC THREATS IN THE WORLD AND PRINCIPLES OF BIOSECURITY AND ANIMAL WELFARE WHILE ERADICATING OUTBREAKS OF CONTAGIOUS DISEASES

ONE HEALTH APPROACH IN COMBATting EMERGING INFECTIONS

Albert Osterhaus

TiHo-RIZ, Hannover, Germany. albert.osterhaus@tiho-hannover.de

ABSTRACT

Complex relationships between animal and human species have resulted in animal-animal and human-animal interfaces that have promoted cross-species transmission, and eventual adaptation of a plethora of pathogens to new hosts. Remarkably, most of these interfaces have been established long before the end of species pre-historical development, to be relentlessly shaped throughout the history of our own and animal species. More recently, changes affecting the modern human population worldwide and their dramatic impact on the global environment have taken domestication, agriculture, urbanization, industrialization, and colonization to unprecedented levels. This has created new global multi-faceted human-animal interfaces, associated with major epidemiological transitions, accompanied by an unexpected rise of emerging infectious diseases in humans, most having their origin in animal reservoirs. Until the start of the last century, infectious diseases caused about fifty percent of fatal human diseases in the western world. In the following decades, this decreased to less than a few percent, largely due to the implementation of public health measures, and the development of vaccines and antimicrobials. Major successes were the eradication of smallpox and rinderpest through well-orchestrated vaccination campaigns in humans and cattle, respectively. Such successes prompted policymakers and scientists to speculate that infectious diseases of humankind and of their domestic animals would eventually be brought under control, at least in the industrialized world. Paradoxically the following decades confronted the world with an ever-increasing number of emerging infectious diseases, some causing true human or animal pandemics. Pathogens spilling over from wildlife reservoirs, either directly or via intermediate hosts, caused most of these disease outbreaks in humans. AIDS from chimpanzees, avian influenza from migratory birds, SARS, MERS, and Ebola from bat reservoirs, and arbo-virus infections like Zika transmitted by mosquitos or ticks are striking examples. A complex mix of predisposing factors linked to major changes in our societal environment and global ecology, collectively created opportunities for viruses to infect and adapt to new animal and/or human hosts. This paved the way for the unprecedented spread of infections in humans and animals with dramatic consequences for public and animal health, animal welfare, food supply, economies, and biodiversity. Due to the complex and interactive nature of these predisposing factors, it is virtually impossible to predict which pathogen will strike when and which species in the future. However, a better understanding of the underlying processes may help to develop measures to improve our preparedness for disease outbreaks in animals and humans alike.

The increasing emergence of viral infections in animals and humans is largely paralleled by an unprecedented progress in medical, veterinary, societal and basic sciences. Investment in the better understanding of the human-animal and animal-animal interfaces, in combination with the implementation of state-of-the-art intervention strategies, will offer a head start in the never-ending battle against infectious diseases.

INFECTIOUS DISEASES IN CATTLE IN EUROPEAN COUNTRIES- CURRENT STATUS AND THREATS

Nadav Galon

Hachaklait Veterinary Services, international consultant, Israel;

ABSTRACT

Infectious diseases of cattle are numerous and vary greatly in their prevalence and their impact. They can be divided into "classical" endemic production diseases as mastitis, metritis, respiratory etc and to less common, emerging or re-emerging diseases also known as Transboundary Animal Diseases (TADs) like Foot and Mouth Disease (FMD), Lumpy Skin Disease (LSD) and others. Europe is mostly free of cattle TADs, yet these diseases are prevalent in neighbouring countries and periodically invade European countries at the circumference or deeper into the continent. With global warming and continuously increased global movements of people, animals and products the threat of introduction of TAD's from other countries and continents is real and should be analysed. Further, the risk of TAD's introduction and spread must and periodically reassessed and contingency plans must be refreshed and updated according to changes and the limited resources of our time. Stamping out of TADs incursions may be replaced by responsive or preventative vaccination. Trade and economic impact, public concern and political intervention, media and social reactions affect both the scope of technical response and the options of regulatory actions.

INTRODUCTION

Europe enjoys freedom of many cattle TAD's which are constantly present in the Middle East, the Near East and Africa like FMD, LSD, Bovine Ephemeral Fever (BEF), Blue Tongue (BT), Epizootic Haemorrhagic Disease (EHD) and others. Despite its high cattle density, freedom for intra and inter country cattle movement and trade, Europe has managed to keep the incidence of FMD to one in two or more decades without vaccination and so giving itself a great global trade advantage, supported by international (OIE) standards. However, the risk of TADs introduction remains high and managing the risk requires sophisticated and costly monitoring and surveillance measures. Europe and other developed countries built and support effective bodies like EUFMD, EFSA, GF-TADs, reference labs, training and research tools, enabling them to keep the threats away as possible from its borders. Yet the hazards are still out there, spreading further and faster. A lot can be learnt from the recent LSD outbreak in the Balkan countries to improve the future response of European veterinary authorities. I will use the framework of Risk-Analysis methodology to discuss these changes based on the LSD outbreak with reference to other TADs threatening Europe.

HAZZARD IDENTIFICATION

LSD was first diagnosed in 1929 in Southern Africa (Zambia) and in the first following decades was studied mostly at Onderstepoort South Africa, where the LSDV Neethling strain vaccine was developed and used vastly and successfully. After sixty years of slowly spreading north through the African continent LSD entered Asia. It was diagnosed for the first time in Israel in 1989 [1] and re-emerged from Egypt into the Southern part of Israel again in 2006 and in 2007. In 2012 LSD entered Israel unanticipated from the north (from Lebanon or Syria) and started to spread within the

Middle East and in Turkey. LSD eventually entered Europe (Greece) in the summer of 2015. It is important to evaluate retrospectively how predictable was the spread of the disease, if the risk was assessed and managed well enough and what can be done better to respond in face of a similar TAD introduction in the future.

RISK ASSESSMENT

Risk assessment is commonly divided into the risk of introduction, establishment in a susceptible population and the risk of spreading. When LSD was present only in Africa or occasionally emerged into the Middle east, Europe was not paying much attention to it, as it does today with BEF or EHD. LSD was considered as an exotic disease that if entered European territory; it will be isolated, infected herds would be stamped-out and freedom will be restored.

Much was known about the virus, clinical signs, pathology, vectors, epidemiology, prevention, vaccination and control measures. Yet all that did not prevent the disease from becoming endemic in most of Africa and emerging several times into the Middle East and later into Europe.

In February 2013 a one-day Middle East Regional meeting, dedicated to LSD was organized by the OIE in Cyprus, where European experts shared, with the countries' representatives, their knowledge and opinions about the effective measures to control LSD. Dr. E. Tuppurainen emphasized that vaccination with an effective vaccine with high coverage is the most effective way to control LSD and is preferred over stamping-out. The prevailing assessment was that the LSD outbreak will subside with time and will not reach Europe. Or if it does, Europe will detect it immediately, will stamp out infected herds and restore its freedom from the disease. The disease kept spreading north east and west, in 2015 reached the European part of Turkey and the risk of introduction into mainland Greece seemed close and real. At this stage The EU vet officers, animal health experts, with the assistance of OIE, FAO and the GF-TADs joined to "save the Balkan" and to prevent deeper spread of the disease into the continent.

EFSA was commissioned to assess LSD and on August 2016 published a comprehensive 27 pages statement; "Urgent advice on lumpy skin disease" [2], excellently analysing the epidemiology and control options. Much of EFSA conclusions were similar to field experience gathered in Israel, and to the conclusions of a vaccine efficacy comparison study done in Israel during the 2013 outbreak[3]; The Neethling based vaccine was effective in controlling the LSD outbreak without needing to stamp-out huge numbers of cattle. The Neethling vaccine was more effective than the sheep-pox based vaccine.

Searching PubMed for peer reviewed papers mentioning LSD shows that the first paper was published in 1947, the vaccine strain Neethling is first mentioned in 1966. Yet, out of a total of 288 papers mentioning LSD, 83% appeared after 1991 and 52% since 2013 until today, when LSD spread out of Africa.

The classical epidemiological triangle of infectious diseases has three components: the host; cattle is the same everywhere, the pathogen; in case of vector-borne diseases eventually spreads in the world using various ways, and the ever-changing environment; warming climate is in favour of the vectors, whether these are biologic like *Culicoides* for BEFV, BTV, or EHDV, or non-specific mechanical-vectors for LSDV. Most of the vectors are present already in Europe and are "waiting" for the viruses to arrive and spread the diseases.

RISK MANAGEMENT

The lessons of the past are useful tools to improve risk management in the future. Above all; research, accumulate knowledge and if needed change the paradigm; what was considered as "exotic" or "tropical" disease threats until recently, became a real risk, present at your doorstep that needs immediate attention.

Use of modern monitoring and surveillance tools supported by modern IT, allocate of budget for field and lab capabilities, aimed to reduce to minimum the "window period" from infection to detection of a TAD incursion. This is often easier said than done and requires efforts of preparedness and awareness among the various stakeholders; some may have limited interest or even conflicting interests to the authorities. A regional and collaborative surveillance as far away from your herds is advisable and is often cheaper on a long run cost-benefit analysis.

Laboratory capabilities; should be prepared in advance using the most accurate and rapid techniques. With eternal limited human and budget resources it is advisable to use fewer yet better equipped laboratories. The old approach that all labs must work on all diseases and labs should be located at every district and province as a management tool, is not feasible and often brings to a general weakness. Transporting samples over long distances (properly taken, preserved and bio-safe) is more beneficial than lots of partially capable laboratories.

With LSD, most of the Middle East and the Balkan cattle was protected with the old and reliable South African Neethling vaccines. Yet these vaccines are produced in non-GMP facilities and are not free of risks. Several non-EU countries insisted on using sheep pox or goat pox-based vaccine with doubtful efficiency. For some other vector-borne TADs vaccines either do not exist at all or are insufficiently safe or effective. Vaccine development is a long and expensive process.

Special attention and resources should be given to risk communication. With social media everywhere and faster than ever spread of information (real or fake), it is most important to increase awareness without creating panic, emphasizing risks to human health and food safety, using terminology understood by laypeople and keeping high transparency and real-time updates.

CONCLUSIONS

LSD serves as a good example for vector-borne diseases and to TADs threatening Europe. Europe is free of most of the important cattle TADs yet is threatened by several. It is most important to assess the risk of each hazard to be introduced, spread and have a severe impact on cattle, the industry and the economy. Each country has different size and distribution of cattle population, farm management types, importance of cattle to the livelihood of people in the periphery or to the national economy, yet the swift spread of some of the TADs and their potential devastating impact, calls for investment in means and resources for monitoring and surveillance, collaboration with neighbouring countries and continents and supporting them in their efforts to eradicate or at least contain TADs effectively, to the benefit of all sides.

The map of LSD infected countries in Europe could have been different, if the response was earlier and more effective at the initial spread. Changing the paradigm from stamping out to vast vaccination is not simple, especially when it involves legislation, regulation and large bureaucratic organs. The final result, containment and elimination of LSD is positive, but the lessons must be learnt to benefit future episodes of the same or other diseases.

Vaccines are the current, and probably near future, most effective mean of controlling vector-borne diseases. In the case of LSD Europe was "lucky" to have effective vaccines on the shelf. For BEF there is a less effective vaccine, but for EHD and most of BTV strains, there are no effective vaccines for cattle. Europe can allocate resources and expertise to assess their risk and support development of innovative, effective and safer vaccines. It is a complex and expensive, but currently it seems to be the best alternative. Entomology is an important research field in vector-borne diseases and must not be neglected, yet at the current state of knowledge there are very few effective practical means at farm and pasture real-life situations to control TADs by controlling the vectors. It can reduce morbidity, but vast spread of insecticides may harm other industries like honey and aqua, or the ecosystem at large.

Finally, animal welfare is a most important aspect today and leads to intensive public and even political interventions. Sick animals in large epidemics which could have been protected by vaccination or stamping-out of healthy or could-recover animals, may be a great obstacle for disease control strategies and tactics, and must be considered.

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EPIZOOTIC SITUATION OF SWINE DISEASES IN POLAND AS COMPARED TO EUROPE AND OTHER PARTS OF THE WORLD

Zygmunt Pejsak, Kazimierz Tarasiuk

University Centre of Veterinary Medicine JU-AU, Kraków, Poland

ABSTRACT

The paper describes epizootic situation concerning the most important swine diseases (included in the OIE list) in Poland and compares this situation to that in other European countries.

INTRODUCTION

Pig Production in Poland: Until 2007, the Polish sow population amounted to about 2 millions. Since that time, we have observed a visible decline in the pig population due to low profitability and later (since 2014) due to African swine fever (ASF). According to the Polish Central Statistical Office (2018), the sow population consisted of 730 000 animals and the pig population amounted to 11,000,000 animals.

The difficult market situation and lower supply of pigs also affected pig slaughters in Poland. Nevertheless, the pork prices have slightly improved in recent weeks, which is the first sign of a rebound of demand for pork in China. In 2019 the spread between the hog prices in Poland and Germany has remained at the historically high level (0.10 EUR/kg in March vs. ca. 0.03 EUR/kg in the period 2012-2018).

In 2019 the domestic piglet prices in Poland rose to 53.33 EUR/head in March vs. 49.56 EUR/head in February (+7.6% MoM). They followed a strong increase in the prices of Danish piglets associated with the improving prospects for the European pork market.

Pork imports: In 2018 the value of Polish imports of pork (livestock, meat and processed products) declined to EUR 1.9bn vs. EUR 2.1bn in 2017 (-7.8% YoY). The decrease in the value of Polish imports resulted from markedly lower pork prices while the higher volume had an opposite impact.

Piglet imports: In 2018 Poland imported over 7 million piglets for fattening (+5.1% YoY). Denmark was the major supplier of pigs to Poland (over 6 million heads), followed by Germany and the Netherlands.

Epizootic situation concerning notifiable OIE listed diseases of swine.

For long time OIE presented 2 lists of notifiable diseases of animals – List A and List B.

Since several years only one list of notifiable diseases is presented. The list is divided into 2 parts. The first list presents multiple species diseases. There are also lists for diseases of specific species, including the list of swine diseases.

The OIE list of notifiable diseases of multiple species includes the following diseases which may affect swine: anthrax, Aujeszky's disease (AD), Brucella suis, foot and mouth disease (FMD), Japanese encephalitis, leptospirosis, Q fever, rabies, trichinellosis, and swine vesicular disease (SVD).

The OIE list of swine diseases includes the following diseases: ASF, CSF, PRRS, infections with *Taenia solium*, infections with Nipah virus, TGE.

The data concerning epidemiological situation connected with OIE-listed diseases of swine in Poland and Europe are shown in Table 1.

Table 1. Epidemiological situation of Poland and Europe concerning diseases of swine on the OIE list.

DISEASES	POLAND	OTHER EUROPEAN COUNTRIES
Anthrax	+	+
Aujeszky disease	+	+
Brucella suis	-	+
FMD	-	-
SVD	-	+
Japanese encephalitis	-	-
Leptospirosis	+	+
Q fever	+	+
Rabies	-	-
ASF	+	+
CSF	-	+
PRRS	+	+
TGE	-	+
NIPAH	-	-
Trichinellosis	+	+
Taenia Solium	+	+

Analysis of the data indicates that in the period from 2014 until today (August, 2019) the Polish pig population is free from the following OIE-listed diseases: anthrax, FMD, SVD, TGE, rabies, Q fever, infections with NIPAH virus, Japanese encephalitis and classical swine fever (since 1994).

The following diseases continue to be detected in Poland: Aujeszky's disease, leptospirosis, PRRS, trichinellosis and porcine cysticercosis.

Aujeszky's disease occurred sporadically in one region of Poland only due to the national program for eradication of this disease, which has operated for 10 years. It is very likely that in 2020 Poland will be officially free from this disease.

Leptospirosis is present in Poland. It is detected mostly in relatively large herds. Data concerning spreading of this disease are not very precise.

PRRS affects a large percent of pig holdings, but precise data are not available.

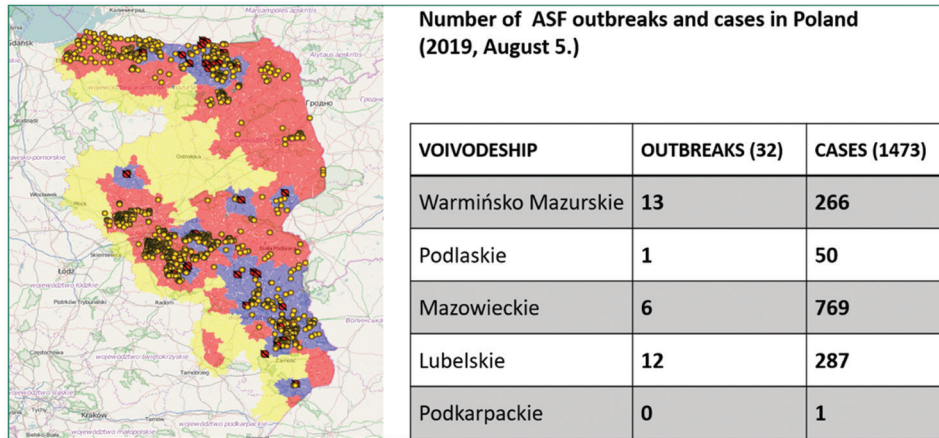
Trichinellosis. The number of outbreaks recorded in Poland was 4 in 2017, 2 in 2018, and 2 in 2019.

Porcine cysticercosis (*Taenia solium*). Every year several dozen cases are registered. It should be underlined that in Poland, like in Europe, the problem of porcine cysticercosis is gradually disappearing.

Since 2014 in Poland, Europe and globally, the most important and most dangerous disease devastating swine production is African swine fever (ASF).

African swine fever emerged Poland over 5 years ago on February 14, 2014. Until now over 5500 cases in wild boars and 232 outbreaks in pigs have been identified. The number of cases and outbreaks in Poland has significantly increased with each subsequent year. The number of reported ASF cases was 30 in 2014, 53 in 2015, 80 in 2016, 741 in 2017, 2443 in 2018, and 1473 in 2019 (until August 5). When it comes to ASF spread in the wild boar population an evident change and movement of infected clusters is observed. At the beginning of ASF epizootic the ASF cases in wild boars occurred in close vicinity (0.5-2.5 km) to the Eastern border, suggesting their introduction from Belarus area. For the first 28 months the virus (ASFV) was circulating exclusively in the wild boar population except 3 outbreaks in backyard pig holdings due to the poor biosecurity conditions. In 2017 the prevalence of ASFV in wild boars found dead reached 60%, while in hunted WB it was 1.88 percent, suggesting a considerable increase of positive animals. As regards the outbreaks, there were 2 outbreaks reported in 2014, 1 in 2015, 20 in 2016, 81 in 2017, 109 in 2018, and 32 in 2019 (until August 5). The number of outbreaks and cases in different voivodeships of Poland is presented in Fig. 1.

Figure.1. Number of ASF outbreaks and cases in Poland (August 5, 2019)

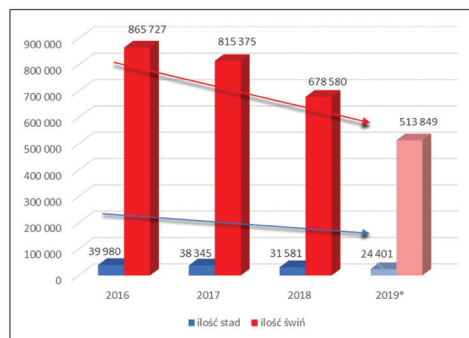


Importantly, the majority of ASF outbreaks occurred as waves during the summer time, mostly as an effect of direct or indirect human unawareness and lack of proper biosecurity.

Fifty-five months of Polish experiences with ASF in Poland showed that the process of country release from ASF can be a long-lasting procedure. Today, it can be stated that the primary objective of the multidirectional efforts of institutions involved in ASF eradication program should be focused on prevention of disease spread in the swine population as well as limitation of ASF spread among wild boars. So far, none of these goals have been achieved.

From the epizootic data collected by the veterinary service, it has been shown that the most common vector in ASF spread among pig holdings in Poland was green forage, hay and straw. The results of epizootic investigation, in this respect, differ fundamentally from the data presented by other countries. On the basis of data collected in Europe, it is generally accepted that the above-mentioned vectors are possible, but the real source of ASF spread in pig population remains unclear. Movement of infected pigs, use of ASFV-contaminated swill feed, and indirect or direct contact of swine with ASFV-contaminated carcasses of wild boars probably are the main reasons for ASF spreading. ASF has a significant influence on production of swine and number of pig holdings in regions affected by this disease. For example in the Lubelskie region, seriously affected by ASF, during the last 4 years the number of pig holdings dropped from about 40,000 to approx. 24,400 and the number of pigs produced from approx. 865,000 to 513,000 (Fig. 2).

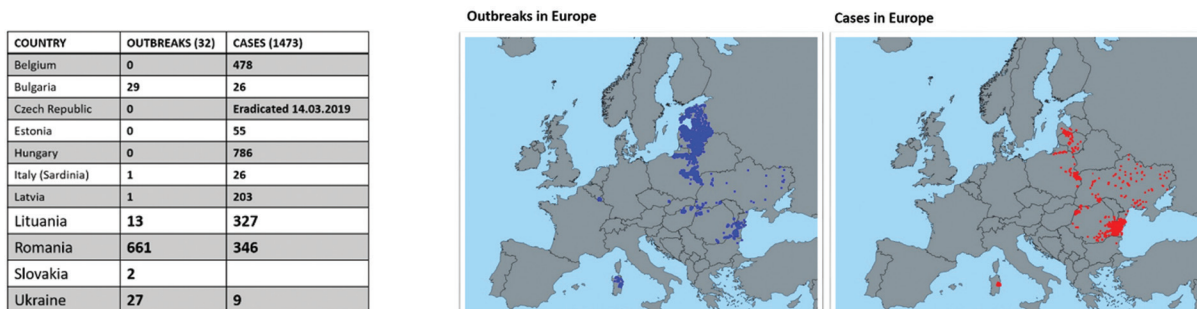
Figure 2. Number of ASF outbreaks and cases in the Lubelskie region from 2016 to 2019 (April).



In Europe, until now (August 2019), 10 EU countries (Lithuania, Latvia, Estonia, Romania, Bulgaria, Hungary, the Czech Republic, Slovakia, Italy and Belgium) have been affected by ASF.

Additionally, in Europe ASF is and was registered in Russia, Ukraine and Belarus (Fig. 3).

Figure 3. Number of ASF outbreaks and cases in Europe (August 5, 2019)



CONCLUSION

Several notifiable diseases still exist in Poland and in Europe. It is no doubt that except ASF the number of outbreaks of such diseases is decreasing.

The main epidemiological problem of Poland and Europe is connected with continuous spreading of ASF. Until today only one country – the Czech Republic – has successfully eradicated ASF.

In 2019 largest losses due to ASF were observed in Romania and Bulgaria.

For many reasons it would be extremely difficult to stop spreading of the ASF in Europe and globally, most of all in Asia.

Without any doubt over the next years ASF will have a great impact on Polish, European and global pig production and on prices of pork.

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ZOONOTIC DISEASES – STILL HAZARDOUS TO FOOD SAFETY

Uwe Roesler

Institute for Animal Hygiene and Environmental Health, Freie Universität Berlin, Germany

ABSTRACT

The consumption of contaminated or infected food is considered the main route of transmission of zoonotic infectious agents from animals to humans. The awareness of this issue and the technological advances in food production have significantly reduced the frequency of these transmissions and food is safer today than ever before. However, new developments have emerged globally in recent years. These trends and challenges are:

- Globalization of food production,
- Changes in food production (Free range, organic in industrialized nations),
- Migration/Travels and Transfer of known bacteria to other geographical regions,
- Change in human population composition (YOPI),
- So far underestimated pathogens,
- Microbial evolution.

The presentation is to illustrate and discuss the most important points of the current hazard in food safety due to zoonotic agents with examples.

METHODS FOR THE DISPOSAL OF ANIMALS KILLED FOR REASONS OF INFECTIOUS DISEASES CONTROL

Krzysztof Bednarczyk, Hanna Balcerak

General Veterinary Inspectorate, Poland

INTRODUCTION

In accordance with legislation, fallen stocks or animals killed as a result of the control of infectious diseases, including African swine fever (ASF), must be treated as animal by-products. In Poland, the management of animal by-products is regulated by the following legal acts:

- Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down sanitary provisions regarding animal by-products not intended for human consumption, and repealing Regulation (EC) No 1774/2002, and
- Commission Regulation (EU) No 142/2011 of 25 February 2011 on the implementation of Regulation (EC) No 1069/2009 of the European Parliament and of the Council laying down sanitary provisions for animal by-products not intended for human consumption, and on the implementation of Council Directive 97/78 / EC as regards certain samples and items exempted from veterinary checks at borders under this Directive.

Regulation (EC) No 1069/2009 defines the classification of animal by-products into three categories, according to the degree of risk involved. In accordance with art. 8 and 9 of the abovementioned Regulation, animals killed to eradicate infectious diseases and parts of these animals constitute material of category 1 or 2. Therefore, dead pigs or pigs killed in ASF outbreak are considered as category 2 material, whereas dead wild boars are classified as category 1 material.

RESULTS AND DISCUSSION

In order to ensure the safe disposal of dead pigs in ASF outbreak, the resulting material is loaded into leak proof containers, sealed, and transported to processing plants (rendering plants) category 1 or 2. In Poland, for practical

reasons, this material is in most cases delivered to category 1 processing plants or incineration plants. The transport of dead animals originating from the outbreak to the place of their disposal takes place via a previously designated route, assisted by the Police.

In the processing plants, animal by-products are processed by an approved method, by use of appropriate temperature, time and pressure parameters. Category 1 and 2 material is processed by pressure sterilization method (temperature 133 ° C, time 20 minutes under (absolute) pressure of at least 3 bar). The resulting meat and bone meal and category 1 fat are burned in approved incineration plants.

In addition, fallen stocks or animals killed as a result of ASF control, can be transported directly to the incineration plant, where they are subjected to disposal in accordance with the following conditions: $t \Rightarrow 850^{\circ}\text{C}$ for at least 2 s or $t \Rightarrow 1100^{\circ}\text{C}$ for 0.2 s.

Currently, there are 12 processing plants and incineration plants in Poland, which are ready to accept and dispose of dead animals from ASF outbreaks. Above mentioned enterprises are located in ten voivodships in Poland.

The means of transport used to transport the abovementioned materials are marked and dedicated exclusively to the transport of a specific category. They are subject to washing, cleaning and disinfection procedures after each use and must be clean and dry before loading. In addition, each batch of animal by-products transported is accompanied by commercial documents enabling product identification and tracking of its movement.

In addition, a number of principles have been developed and implemented to reduce the risk of ASF spreading via animal by-products, including fallen pigs and fallen boars. In the areas of ASF threat, an individual system of safe collection, transport and disposal of fallen farmed animals and wild boars has been established, guided by the principle of proximity to available rendering plants. This results in increased epizootic safety during transport of fallen animals and reduces the risk of spreading the virus in the environment. Considering the above, transport of fallen pigs and wild boars from ASF threat areas for disposal in rendering plants takes place in accordance with the following conditions:

- notification by the entity responsible for the transport of fallen pigs or wild boars to the district veterinarian (competent for the place of activity and appropriate for the final processing plant / incineration plant) means of transport for collecting fallen pigs / wild boars from ASF zones.
- maintaining all safety and biosecurity policies to minimize the risk of spreading a potential ASF virus.
- applying the highest possible standards for the tightness of transport equipment and applying washing, cleaning and disinfection procedures after each use.
- equipping the means of transport with a portable sprayer with a biocide solution to disinfect the wheels and other external elements of the vehicle that have come in contact with fallen animals. Disinfection is carried out before leaving the farm from which dead animals were collected.
- equipping means of transport, transporting dead pigs / wild boars from ASF danger areas, with a satellite navigation system, enabling the location of the vehicle during transport. Allowing the official veterinarian to control the movement of this car during transport and to keep records of this transport for at least 2 months.
- direct transport of dead pigs / wild boars collected in the threat area to a dedicated processing plant / incineration plant without the possibility of further collection in other areas.
- immediate processing / incineration in the processing plant / incineration plant of fallen pigs / wild boars supplied from the ASF areas.
- a ban on entry of means of transport used to collect dead pigs / boars to farms in the danger area where pigs are kept. Means of transport collect dead animals from outside the farm gates without entering their premises. Fallen animals are delivered to the gate by the owner and then loaded onto the car of the rendering company.
- each consignment of pigs' corpse is accompanied by a commercial document containing an additional statement of the owner of the animals about the notification of the pig's death to the competent district veterinary officer. The declaration is completed and signed by the breeder. The driver should not collect dead pigs without a signed declaration.

CONCLUSION

The above procedures apply to the collection and transport of all dead pigs from farms located in ASF threat areas and the collection of wild boars from ASF areas, that are sent for disposal. The competent authority in the field of supervision over the production, storage, transport, processing and disposal of animal by-products is the territorially competent district veterinarian. All plants in the rendering sector are subject to the approval or registration of a district veterinary inspection.

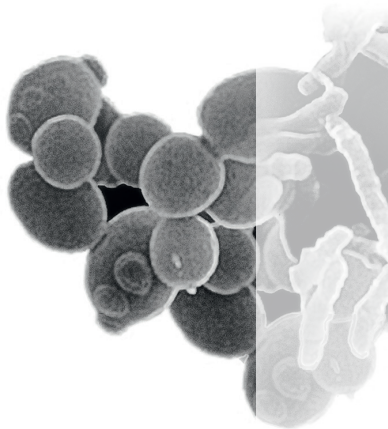
In order to ensure the safe management and disposal of fallen boars found in the environment, the corpses of these animals should be sent for disposal at authorized rendering plants (processing plants of category 1 or incineration plants). Nevertheless, the district veterinarian may decide to use the derogation provided for in art. 19 lit. e Regulation 1069/2009 (burying corpses or parts thereof). Such a decision may be taken in justified cases, e.g. inability to transport individual corpses of a boar or its part or in the case where the transport would increase the danger of spreading the threat (e.g. passage through rural areas with a large concentration of pigs).

If the decision to bury is taken, the carcass should be buried so that it cannot be unearthed by wild animals. The pit to which the boar's corpse will be deposited should be dug as close as possible to the boar found so that it can be directly folded into the prepared pit without having to move significantly. This is to limit the number of places that come into contact with the corpse of the wild boar. Nevertheless, the pit should be prepared off the beaten track, in a place not frequented by people.

The proper management and disposal of animal by-products has a significant impact on reducing the risk of ASF spreading in the environment. But to be effective, it must be carried out under official veterinarian supervision.



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