IMMUNOPROPHYLAXIS OF COCCIDIOSIS – CONTRIBUTION TO REDUCING OF ENVIRONMENT BURDEN CAUSED BY INTENSE POULTRY PRODUCTION

Ružica Blaževic1, Neda Ergotic1, S. Cajavec1, Bara Vinkovic2, Tihomira Gojmerac2

1Veterina Ltd., Svetonedjeljska 2, Kalinovica, 10436 Rakov Potok, Croatia; 2Croatian Veterinary Institute, Savska 143, 10000 Zagreb, Croatia

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Introduction

Modern and successful production of poultry meat without residues of antimicrobial agents, without risk of occurrence of coccidiosis, danger for man in production and manipulation with food which contains coccidiostats and danger for environment are some of major requirements that recently have been increasingly and frequently posed to modern production of meat-type chickens. Coccidiosis is a severe, world wide health and welfare problem in poultry.

Coccidiosis remains one of the most economically important diseases of poultry. In addition to its economic effects it has significant welfare implications from both the adverse effects of the infection itself and the potential interaction with widely occurring bacteria, which can result in severe gut disease (11).

In this study application of coccidiostats in relationship with immunoprophylaxis (LIVACOX® T) was analysed. Application of coccidiostats resulted with residues in food as well as environment burden with coccidiostats and their metabolites, which doesn't occur in case of vaccination.

About coccidiosis

Coccidiosis is an infectious disease caused by a microscopic protozoan parasite which damages the intestinal tract of the bird (or other animal host), causing illness and sometimes death. The *Eimera* are highly host specific. However, disease is likely to occur only under conditions of high stocking density which favour the build-up of pathogenic populations of the parasite. Thus, coccidiosis is especially important in intensive poultry operations. Wherever large numbers of animals are crowded together in overstocked, warm, moist, unchanging conditions, outbreaks of coccidiosis start to occur. Apart from causing disease, subclinical infections cause impaired feed conversion and since feed costs comprise some 70% of the cost of producing broiler chickens, the economic impact of coccidiosis is considerable. The disease is characterised by an invasion of the intestinal wall by parasite.

The parasite then undergoes several stages of growth, during which there may be intense damage to the mucosal and submucosal tissues. Severe haemorrhage may result and mortality in an unprotected poultry flock may be extensive. For this reason it is essential in most poultry rearing situations to use an anticoccidial agent or vaccine during period to prevent illness and control infections (1, 5).

About drugs used for coccidiosis control

Coccidiostats have, in fact, contributed substantially to the remarkable success of modern poultry production. Included among the coccidiostats used in poultry are the ionophoric antibiotics and various chemotherapeutics substances. Coccidiostats are incorporated in the feed to commercially raised broiler chickens and during the growth period to many replacement pullets (future layers and breeders). Ideally, the drugs should show no adverse effects on growth, feed intake, feed conversion or health, leave no residues in meat and should not be dangerous for man and environment. The rapid development of new and more potent drugs against coccidian as well as the development of efficient vaccines against many avian viral diseases, together with confinement rearing and genetic selection for improved growth rate, made the success of the broiler industry possible (2, 3, 8, 9, 10, 11).

Coccidiostats are generally considered to be free from side effects and toxicity as long as they are used in their target species at the correct dose. However, the ionophoric antibiotics and some of the chemotherapeutic coccidiostats have a narrow range of safety and there are many reports in the literature of accidental intoxications of target and non-target species with various anticoccidial drugs (10).

Monensin is available as 20% premix for incorporation into animal feedstuffs for prevention of coccidiosis. Monensin should be mixed into feed at a rate not less than 500 g and not more than 600 g per tonne to provide 100-120 mg monensin activity per kg in finished feed. Feed containing monensin should be fed continuously. Treated poultry should not be slaughtered for human consumption until 3 days after the end of treatment.

Lasalocid is available as 15% premix for incorporation into animal feedstuffs. Quantity of 600 g of the premix should be thoroughly mixed into each 1,000 kg of broiler feed to provide 90 mg per kg. Chickens must not be slaughtered for human consumption during treatment or for human consumption during treatment or for a period of five days thereafter.

Salinomycin is available as 12% product. Product should be added to feed at a rate of 0.5 kg per tonne of complete feed, to provide 60 mg salinomycin sodium per kg (60 ppm).

Chickens must not be slaughtered for human consumption during treatment or for a period of five days thereafter.

It is structurally similar to salinomycin, differing only in the presence of a methyl group in *narasin* that is not present in salinomycin. Narasin is available as a 10% additive. Additive should be mixed thoroughly into broiler feeds at a level of 700 g per metric tonne. This will provide narasin at a level equivalent to 70 g of narasin activity per metric tonne. Poultry must not be slaughtered for human consumption during treatment or for at least 5 days after the last treatment (6, 7, 15).

A ”**withdrawal period**” for these drugs. Five to nine days before slaughter, is intended to prevent residues entering the food chain – as this report describes, it is often failing to do so. When the drugs are withdrawn, the disease can take hold with drastic results. This is one reason why producers maybe tempted to ignore withdrawal periods, if they feel they can get away with it. (1, 4, 6, 7, 12, 15, 16).

Residues and toxicity

Anticoccidial drugs are so toxic that they could never be used in human medicine. They are also used in poultry feed at high concentrations, sometimes at between a third and half lethal dose.

However, most of these drugs were licensed a long time ago when regulatory process for new drugs was significantly less rigorous than today. There are serious gaps in scientific data and for some, Maximum Residue limits have never even been set (6, 7).

Lasalocid, maduramicin, monensin, narasin and salinomycin, have a narrow range of safety: their lethal dose is generally no higher than two to three times the recommended dose. There are many reports in the literature of accidental intoxications of target and non-target species, and ionophore poisoning is well known problem in poultry (6, 7).

Polyether ionophores are metabolized by animals through oxidative processes (hydroxylation, O-demetilation, decarboxylation). As most living organisms possess effective oxidative metabolic pathways, it can be assumed that similar metabolites to those produced by the chicken would arise from manure and soil microbial activity (6, 7).

Although recent studies suggest that veterinary medicines may enter the environment as aerosol and dusts. However, researchers consider emissions via these routes less relevant than emissions to soils and surface waters from aquaculture and intensive livestock treatments. Moreover, substances absorbed by an animal can be metabolized. The degree of

metabolisms will depend on the type of substance, the species treated, and the age and condition of treated animals (2, 9, 11).

Mortality in the broiler house due to poisoning by ionophoric anticoccidials may occur much more frequently than reports in the scientific literature suggest. Intoxication by these drugs is not easy to diagnose (6, 7, 16).

The major source of anticoccidial drugs entry into the environment would be from excreta of chickens fed diets containing anticoccidial drugs. Anticoccidial drugs are not likely to be dispersed to any significant extent in air. Dispersion in air is a potential hazard to humans during production or biomass and subsequent premix manufacture, and appropriate safety precautions are instituted during these phases.

Discussion and investigations that were carried out

In year 2004, in Croatia, in several controlled field experiments was confirmed efficiency of breeding of 4 287 000 broilers vaccinated against coccidiosis. Chickens were vaccinated at the age o 9 days with trivalent vaccine Livacox®T (Biopharm, Jílové-Prag, Representative for Croatia is Veterina Ltd., Kalinovica) in drinking water. One dose of the vaccine contains from 300 till 500 oocists from each species of coccidia (*E. tenella, E. acervulina i E. maxima*) (13, 14).

Monitored broilers were not treated with anticoccidial agents, but the achieved production results were nevertheless high. After 42 days of fattening in all cycles, the following results were recorded: mean production number 303; body weight 2.232 kg; feed conversion 1.70, mortality rate 1.17; culling 1.89 % with survival rate of 96.94%. Caecal coccidiosis as the cause was confirmed at necropsy.

In our discussion we have presumed the usage of coccidiostats – ionophoric antibiotics (monensin, lasalocid, salinomycin and narasin) in breeding of broilers, used in the experiment of the investigation of efficiency of the vaccination against coccidiosis with the vaccine Livacox® T. During the breeding period of 42 days each bird ate cca 4.00 kg of the feed. Withdrawal period for these coccidiostats is from 3 till 7 days. Calculating, we considered that birds ate last week feed without coccidiostats (cca 1 kg of feed). Broilers would during breeding eaten 12 861 tones of feed with coccidiostats, and that would be either 1458 kg of monensin or 1512 kg of lasalocid or 730 kg of salinomycin or 850 kg of narasin.

In this example, at the end of breeding, it would become a mass of 4 975 tones of litter with manure. If the chickens were, for coccidiosis control, feed with the coccidiostats, in feed mass would finish one of the described products in original form, as well as their metabolites.

Possibility of environment pollution with coccidiostats originates by bringing manure on plough-fields. Problem becomes bigger when there is too much broilers manure on one side and a lack of arable land on the other side.

There is also potential danger for people and environment in production of coccidiostats, production of feed for broilers with coccidiostats, as well as for personnel working in the poultry production.

Conclusion

From mentioned, we can see that in modern poultry farming coccidiosis is serious health problem, especially in big agglomerations and inadequate microclimate conditions. Control of coccidiosis and possible damages because of it, could be carried out by better breeding conditions, adding of coccidiostats in feed as well as vaccination. With time it was shown that usage of feed with coccidiostats resulted with occurrence of residues in organs and tissues. Beside that, by secretion via faeces, coccidiostats ends in litter and further on in environment.

Application of vaccines in the control of coccidiosis in poultry has a perspective because of fact that these are biological products which induce satisfactory level of protection in poultry against coccidia, as well as for the fact that there is no possibility of residues in meat and faeces.

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