ANTIMICROBIAL RESISTANCE IN PATHOGENIC *ESCHERICHIA COLI* FROM SWINE RESAPATH NETWORK – RESULTS 2002

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Introduction

The emergence of antimicrobial resistance was observed for the first time in 1947 with *Staphylococcus* and penicillin. Nowadays, antimicrobial resistances exist for the main pathogenic bacteria that allows infections to progress in many people [2, 9, 10]. In veterinary medicine, the same phenomenon is observed with three risks associated: failures of animals treatments, selection of antimicrobial resistant zoonotic bacteria and creation of a reservoir of resistance genes [11, 13].

Because of the rapid development and spread of antimicrobial resistance, a lot of network exist in the world to follow this evolution in human and veterinary medicine [1, 8, 9, 10, 12, 14].

In France, the resistance monitoring of bovine pathogens, which has been existing since twenty years, was extended to poultry and pig production in 2001 to give a single network: RESAPATH. It is managed by the French Agency for Food Safety (AFSSA) in Lyon and Ploufragan [5, 7].

Materials and Methods

RESAPATH is a multicentric network. Antimicrobial susceptibility data are collected from voluntary public and private veterinary diagnostic laboratories.

The *in vitro* antimicrobial susceptibility test used by all laboratories involved in this network is the disk diffusion method [3, 6]. Antibiotic disks (6 mm diameter) are placed on Mueller-Hinton agar previously inoculated with bacterial suspension. Results of this method are inhibition zone diameters obtained after an incubation at 37°C for 18 to 24 hours. The size of inhibition zones is inversely correlated with the minimum inhibitory concentration (MIC) for a particular bacterium / antimicrobial combination.

Inhibition zone diameters are registered by RESAPATH then interpreted in susceptible, intermediate or resistant category. For antimicrobials used both in human and veterinary medicine, this classification is established with CA-SFM breakpoints [4]. For antimicrobials only used in animals, breakpoints are given by pharmaceutical laboratories.

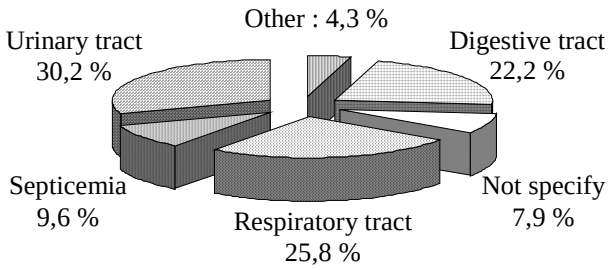
Quality control procedures are necessary to assure reproductibility and comparability of results. A regular internal quality control has to be realized by each laboratory with reference strains recommended by CA-SFM [4]. External quality control was also organized by RESAPATH managers.

Bacteria followed by RESAPATH are isolated from diseased animals : *Escherichia coli*, *Salmonella*, *Streptococcus*, *Staphylococcus* and *Pasteurellaceae*. For each isolate, epidemiological data are also recorded : species and localisation of diseased animal, type of production, pathology and type of sample.

Results

In 2002, 2664 antimicrobial susceptibility data were collected from 17 laboratories. The majority of these results concerned fattening pigs (40.7 %) followed by piglets (30.8 %) and sows (28.5 %). Seventy eight percent of antimicrobial susceptibility tests were performed for bacteria isolated in urinary, respiratory and digestive tracts (figure 1).

Figure 1 : Repartition of samples associated with antimicrobial susceptibility results recorded by RESAPATH in 2002



E. coli was the main swine pathogenic bacteria associated with antimicrobial susceptibility results (58.5 %, table 1).

Table 1 : Repartition of bacteria associated with antimicrobial susceptibility results recorded by RESAPATH in 2002

Bacteria	Number of strains	Percentages
*E. coli**	1300	52.6
Pasteurella multocida	355	14.4
Streptococcus suis	209	8.4
A. pleuropneumoniae	159	6.4
E. coli K88	146	5.9
Staphylococcus	119	4.8
Salmonella	75	3.0
Haemophilus parasuis	56	2.3
*Streptococcus**	36	1.5
Actinobacillus suis	18	0.7

** different from serovar K88 or not serotyped with K88 reagent*
*** different from S. suis*

The lowest percentages of *E. coli* susceptible strains were obtained for amoxicillin, spectinomycin, tetracycline and trimethoprim/sulfonamide with respectively 46.8 %, 60.9 %, 12.1 % and 33.5 %. The percentages of susceptible strains to the 12 other studied antimicrobials were between 74.8 % and 99.6 % (table 2).

Table 2 : Percentages of E. coli susceptible strains for 16 antimicrobials

Antimicrobial	Number of tested strains	Percentage of susceptible strains
Amoxicillin	1356	46.8
Amox.+ Clav.*	863	81.6
Cephalexin	759	96.0
Ceftiofur	1440	99.2
Colistin	1263	99.6
Neomycin	1241	88.2
Gentamicin	1262	93.7
Apramycin	1144	95.5
Spectinomycin	1239	60.9
Florfenicol	966	96.3
Tetracycline	1432	12.1
Trim.+Sulf.**	1442	33.5
Flumequine	1351	74.8
Oxolinic acid	1346	80.5
Enrofloxacin	1442	92.4
Marbofloxacin	1337	94.6

** Amoxicillin + clavulanic acid*
*** trimethoprim-sulfonamide*

Discussion

Excepting four antimicrobials (ceftiofur, florfenicol, enrofloxacin and marbofloxacin), the number of *E. coli* susceptible strains was calculated with breakpoints used in human medicine [4]. The therapeutic impact of these percentages depends on pharmacokinetic parameters of the antimicrobials in animals.

Nevertheless, these data show the ratio of bacteria with one or more resistance mechanisms (epidemiological aspect). RESAPATH allows the monitoring of resistance to antimicrobials used in veterinary medicine and the detection of potential emergence of new resistance phenotypes. Thus, the resistance to colistin or ceftiofur for a few *E. coli* strains from animal origin was confirmed by AFSSA. A particular surveillance is focused on the evolution of these resistances and their molecular mechanisms.

Reliability of antimicrobial resistance monitoring and successful therapeutic treatments in veterinary medicine depend on quality of *in vitro* antimicrobial susceptibility results and their interpretation. Therefore, the RESAPATH coordinators work on standardisation of antimicrobial susceptibility tests with the collaboration of some veterinary laboratory managers. Moreover, a sub-committee associated with the CA-SFM [4] works on determination of interpretative criteria for antimicrobials used both in human and veterinary medicine and those used only in animals.

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