



Antimicrobial resistance in pathogenic bacteria of animal origin: results from the RESAPATH surveillance network on *E. coli* isolated from diseased animals

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RESAPATH

RESAPATH is a surveillance network of antimicrobial resistance in pathogenic bacteria from animal origin. French public or private laboratories participating to RESAPATH on a voluntary basis send the results of the antibiograms they performed for veterinary practitioners to the surveillance network (1). In 2008, 54 laboratories submitted a total of 18,058 antibiograms addressing the different animal sectors: cattle, pig, poultry, sheep, goat, rabbit, horse, dog and cat.

For each antibiotic tested, the pathogen is classified as sensible (S), intermediate (I) or resistant (R) regarding its inhibition zone diameter, according to the approved French breakpoints in veterinary medicine (veterinary CA-SFM). From an epidemiological point of view, a strain is considered resistant as soon as there is a shift in the wild-type sensible population, even if the clinical resistance is not fully acquired yet. Hence the epidemiological resistance is the combination of the R and I groups.

Escherichia coli data in 2008

E. coli represented 49% of the antibiograms collected in 2008, it was the most frequent bacteria for the main animal sectors monitored by RESAPATH: cattle, pig and poultry. Moreover, this bacteria presented numerous antimicrobial resistance phenotypes, among which resistance to several beta-lactam antibiotics.

Antibiograms from *E. coli* isolated from young cattle with digestive pathology: resistance proportion for tested antimicrobial agents

Antimicrobial	Total (N)	Résistant (=R+I) (%)
Amoxicillin	1 444	86
Amoxicillin + clavulanic acid	1 625	59
Cefalexin	1 075	31
Cefuroxime	317	50
Ceftiofur	1 626	5
Cefquinome 30 µG	702	11
Streptomycin 10 UI	910	88
Gentamicin 10 UI	1 644	20
Tetracycline	1 598	86
Colistin	1 646	2
Florfenicol	1 541	19
Oxolinic acid	530	52
Enrofloxacin	1 460	32
Trimethoprim - Sulfonamides	1 563	42



Antibiograms from *E. coli* isolated from pigs: resistance proportion for tested antimicrobial agents

Antimicrobial	Total (N)	Résistant (=R+I) (%)
Amoxicillin	1 466	60
Amoxicillin + clavulanic acid	937	21
Cefalexin	610	15
Ceftiofur	1493	6
Gentamicine 10 UI	1 169	11
Tetracycline	1 216	83
Oxolinic acid	1 368	30
Flumequine	1 338	29
Enrofloxacin	1 494	13
Trimethoprim - Sulfonamides	1 498	64

Antibiograms from *E. coli* isolated from poultry: resistance proportion for tested antimicrobial agents

Antimicrobial	Total (N)	Résistant (=R+I) (%)
Amoxicillin	2701	57
Ceftiofur	2399	4
Gentamicine 10 UI	2376	3
Tetracycline	2708	83
Oxolinic acid	2646	35
Flumequine	2755	36
Enrofloxacin	2815	9
Difloxacin	1649	35
Trimethoprim - Sulfonamides	2826	32

Resistance to beta-lactam antibiotics

More than one in two *E. coli* strains is resistant to amoxicillin, and even if the activity is partly restored by the clavulanic acid, this resistance remains quantitatively important in the main food-producing animals sectors. Resistance to

third and fourth generation cephalosporins is much lower, but of major concern. This resistance is an emerging resistance pattern of global epidemiological importance and relevant to human medicine (2). The constant raise over the past years is due to the increased spread of broad-spectrum enzymes such as extended-spectrum beta-lactamases (ESBLs) and cephalosporinases.

Conclusions

Level of resistance to "old" antimicrobials widely used in food-producing animals, such as amoxicillin or tetracycline, is rather high. Therefore the recommendations that should be addressed to veterinary practitioners and farmers are thought-worthy, and a global discussion should be conducted with all the protagonists of each animal sector. The emerging resistance pattern concerning last generations of cephalosporins had first been identified in French animal populations through RESAPATH, which allows now to monitor its evolution. RESAPATH is an essential tool to provide the scientific community and authorities with reliable information on resistance trends by bacterial species and animal sector in France.

References

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- Livermore D.M., Woodford N. (2006) The beta-lactamase threat in *Enterobacteriaceae*, *Pseudomonas* and *Acinetobacter*. *Trends in Microbiology*. 14:413-20.