

STUDY OF THE RELATIONSHIP BETWEEN ANTIMICROBIAL CONSUMPTION AND ANTIMICROBIAL RESISTANCE – APPLICATION IN POULTRY BROILER PRODUCTION

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Introduction

It is of worldwide concern that antimicrobials use in food-production animals might contribute to antimicrobial resistance increase. Observational (2) or experimental studies (4) sustained the hypothesis of a relation between antibiotic consumption and antibiotic resistance. Nevertheless, epidemiological approach rarely has been applied in veterinary medicine.

Objectives of the study were to analyse bacterial antibiotic resistance data according to the previous antibiotic exposition of animals sampled in order to identify relationships between antibiotic consumption and resistance.

Material et methods

As part of the French antimicrobial resistance monitoring program 300 caeca samples of broilers from three different production types are annually collected since 1999 by veterinary officers on the slaughterline. Randomly collected caeca are sent to the laboratory with historical background of antibiotic consumption of the broiler flock sampled. One *Escherichia coli* and *Enterococcus faecium* isolate per sample is subjected to minimal inhibitory concentration determination for several antibiotics, secondly converted in a dichotomous susceptibility variable using CASFM thresholds. Relation between antibiotic-susceptibility and characteristics of the broiler flock sampled and antibiotics consumed were explored through PLS and logistic regressions.

Results

649 *Escherichia coli* and 540 *Enterococcus faecium* strains were included in this study.

Statistically significant associations were found between antibiotic consumption and antibiotic resistance ($p < 0.05$). Consumption of betalactamines significantly increased risk of isolation of an ampicillin resistant *Escherichia coli* strain (OR=3.2, CI_{95%} =1.8-5.8). Same findings were found for *Enterococcus faecium*. Consumption of quinolones significantly increase the risk of isolating a nalidixic acid resistant *Escherichia coli* (OR=1.9, CI_{95%} =1.1-3.7). Broiler production type was also found to be a significant factor. The risk of isolating a nalidixic acid resistant strain increased when the age at slaughter decreased, associated with an increasing rearing density.

Discussion

This study emphasised the usefulness of large databases and pharmaco-epidemiological approach to study the relationship between antibiotic consumption and antibiotic resistance. Relations assessed between carriage of resistant *E. coli* and *E. faecium* at slaughter and previous antibiotic use are consistent with medical findings (3) and other veterinary studies (1).

Further studies are now needed to explore in a more detailed way relationships between antibiotic use and animal carriage of a resistant *E. coli* or *E. faecium* strain. Particularly, age at treatment, treatment dosages and duration are to be explored to identify putative 'at risk' treatment practices. In this study, broiler production type was also found to influence carriage of antibiotic-resistant bacteria for some antibiotics. The role of the rearing conditions (density, age at slaughter...) should be further explored too.

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