Assessing the possible association between veterinary antimicrobial consumption and resistance in indicator *E. coli* isolated from farm animals in Belgium

CARGNEL M.[1] SARRAZIN S.[2] CALLENS B.[1] WATTIAU P.[1] WELBY S.[1]

[1]Veterinary and Agrochemical Research Center,B−1180 Brussels,BELGIUM

[2]Faculty of Veterinary Medicine,Department of Obstetrics,Reproduction and Herd health, B−9820 Merelbeke,BELGIUM

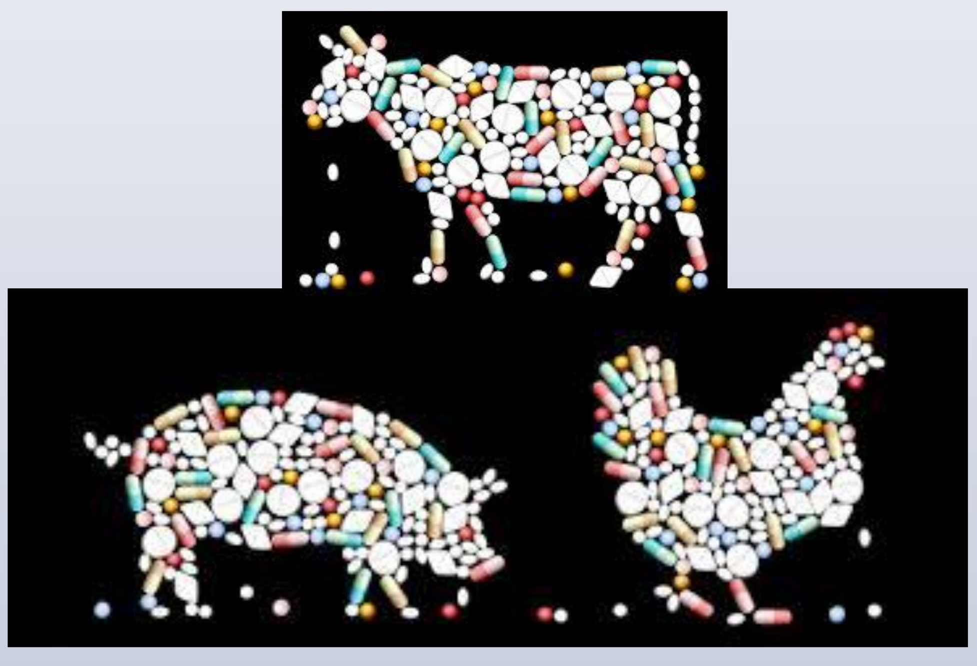
Introduction

Antimicrobial use is significant factor accounting for the selection and spread of antimicrobial resistance in commensal and pathogenic bacteria (Burow *et al*., 2014; Horigan *et al*., 2016). Bacteria are frequently found resistant to many antimicrobials to the point that both animal and public health are now seriously challenged (Megha *et al*.,2014). Exploring the trend possibly associating antimicrobial consumption and resistance is a highly desirable exercise, that was tentatively completed in the present study focused on indicator *Escherichia coli* from farm animals in Belgium.

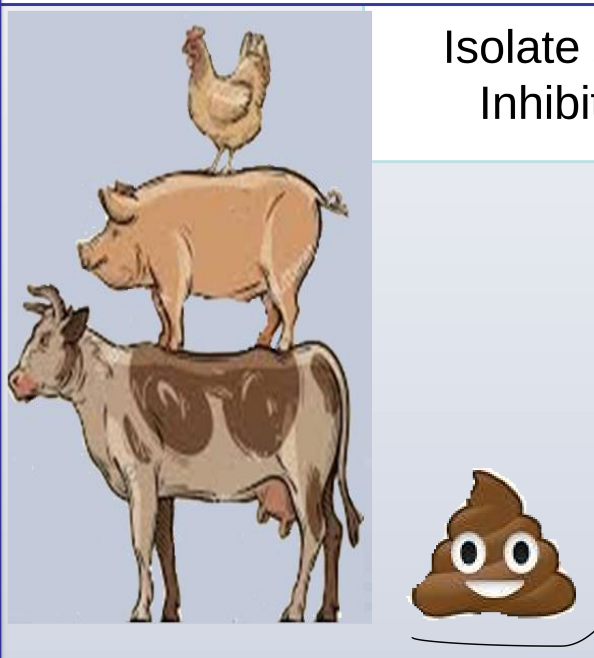
Materials and methods

Antimicrobial consumption evaluation

Total of all veterinary antimicrobials sold in Belgium (2011 to 2015) adjusted with the biomass



Antimicrobial resistance evaluation

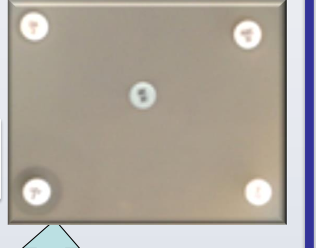


Isolate *E. coli* and determine Minimal Inhibitory Concentration (MIC) for

- Ampicillin (AMP)
- Chloramphenicol (CHL)
- Ciprofloxacin (CIP)
- Colistin (COL)
- Cefotaxime (FOT)
- Gentamicin(GEN)
- Nalidixic acid (NAL)
- Sulphamethoxazole (SMX)
- Ceftazidime (TAZ)
- Tetracycline (TET)
- Trimethoprim (TMP)

≥170 fecal isolates per year (2011-2015) for veal calves, beef cattle, broiler chickens, pigs

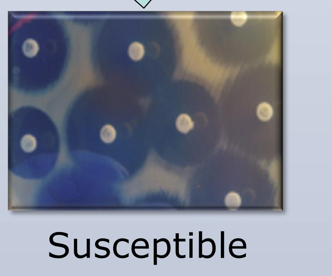
Resistant



If MIC>cut-off

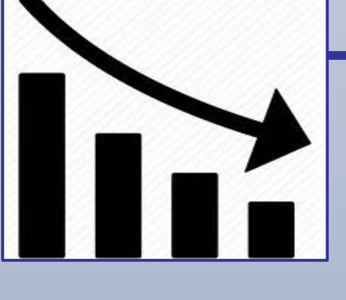
Epidemiological Cut-offs defined by the European Committee on Antimicrobial Susceptibility Testing

If MIC≤cut-off



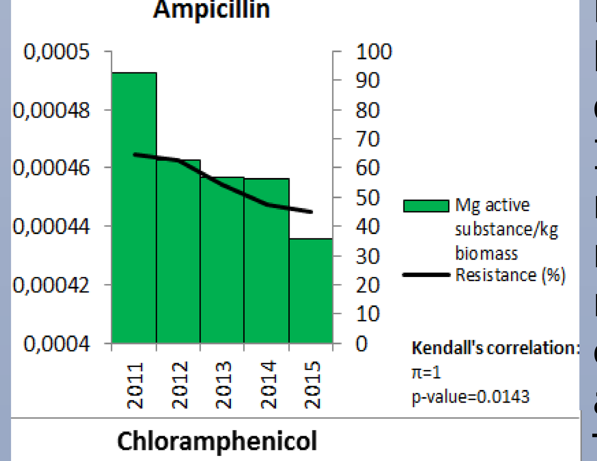
Susceptible

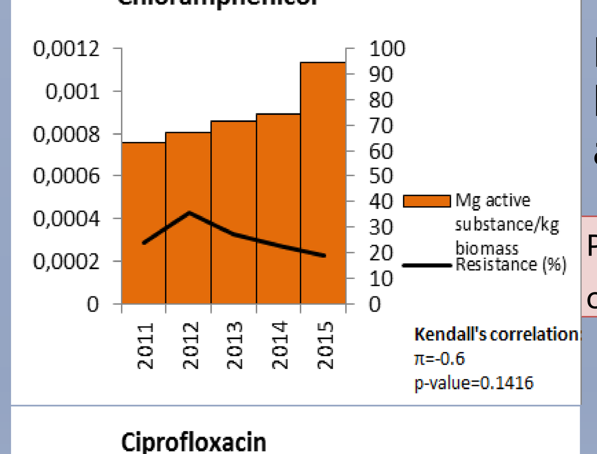
Correlation?

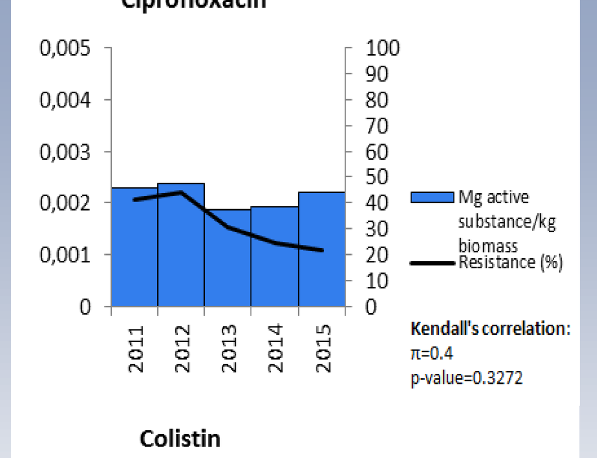


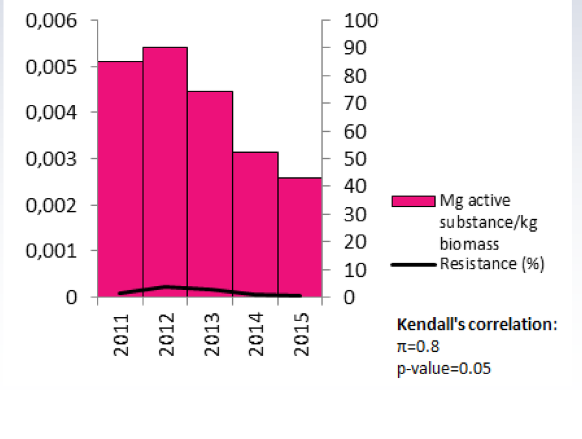
Pearson
Spearman's rho
Kendall's tau
Logistic regression

Results and perspectives









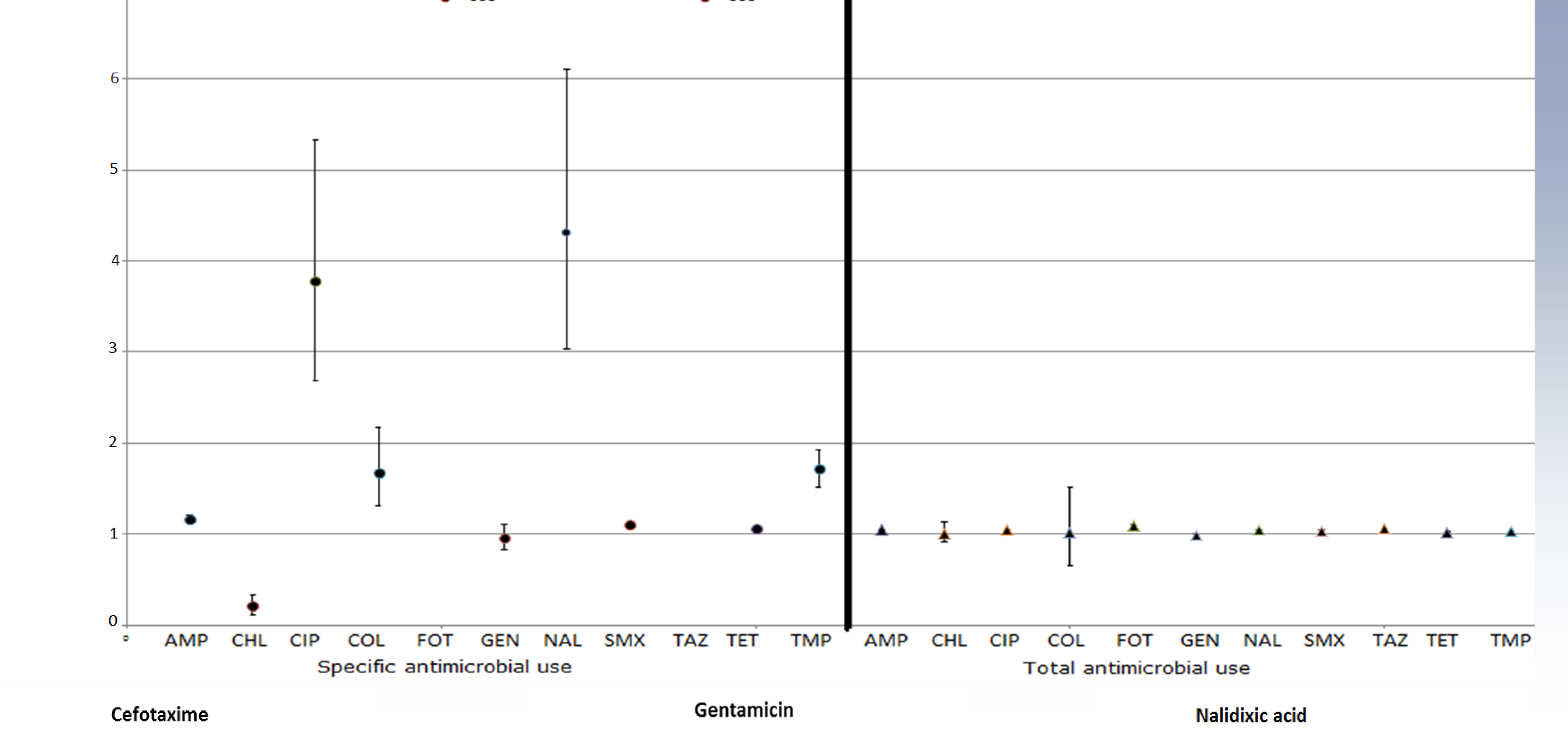
Results were obtained by Kendall's model that best suited our aggregated, non-parametric, non-linear data. It is also better resistant to outliers than the Spearmans' model (Croux and Dehon,2010). The effect was subsequently quantified via logistic regression.

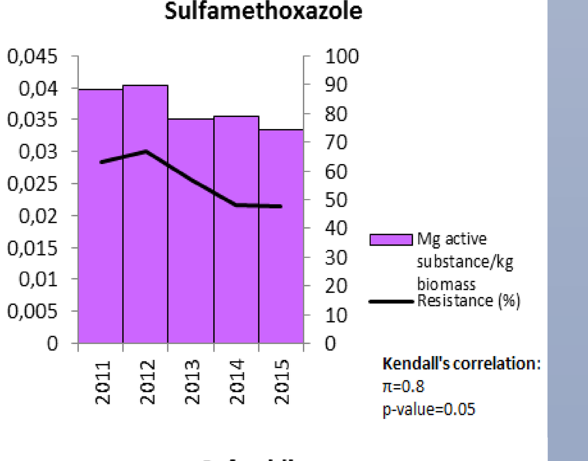
Interestingly, in spite of continuous decrease in consumption of some antimicrobials and complete prohibition for CHL, marked resistance is still observed. Results should only be considered valid for indicator *E.coli* and should not be readily extrapolated to other antimicrobial–bacteria combinations. Consumption can induce direct resistance but resistance can also occur through indirect selection (co-resistance) (Bell et al., 2014;Harada and Asai,2010), through exposure to disinfectants, antiseptics, preservatives and heavy metals (European Food Safety Authority, 2016; Wales and Davis,2015).

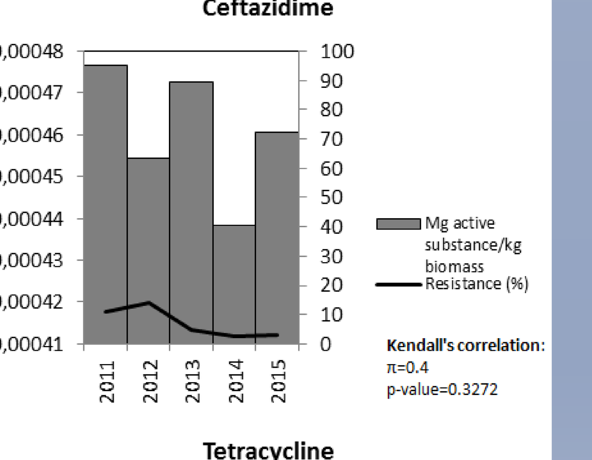
These analyses were performed on small datasets, though, and care must be taken while making inference.

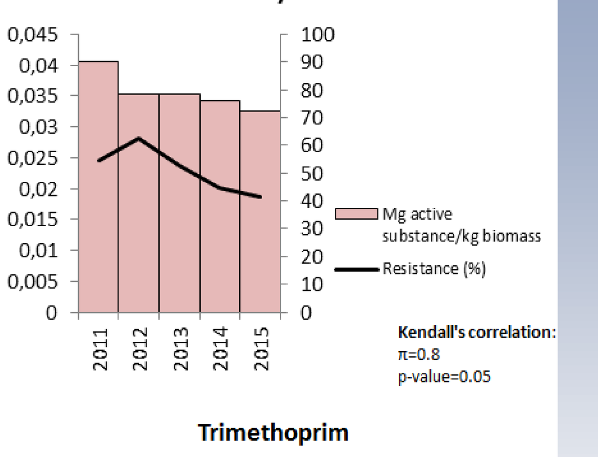
From 2017 onwards, data concerning resistance and consumption will be collected each year in Belgium following the launching of a mandatory notification and documentation system (SANITEL-MED) allowing the analysis on non-aggregated data.

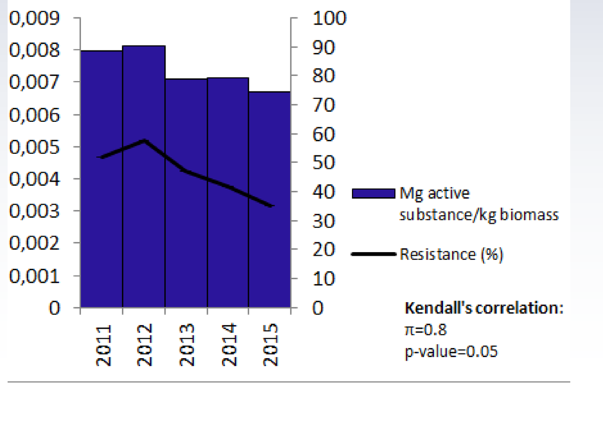
Probabilities (Odds ratios and 95% Confidence Interval (CI)) for an *E. coli* isolate to be resistant to an antimicrobial tested per increase in use of 1 kg of the corresponding antimicrobial class/kg biomass or the total antimicrobial use/kg biomass for all animals in Belgium between 2011 and 2015.

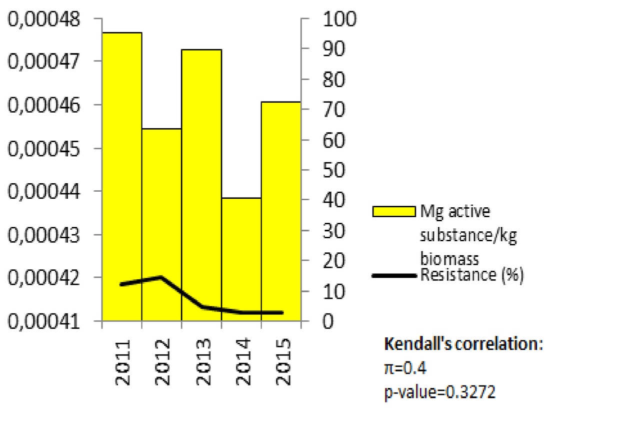


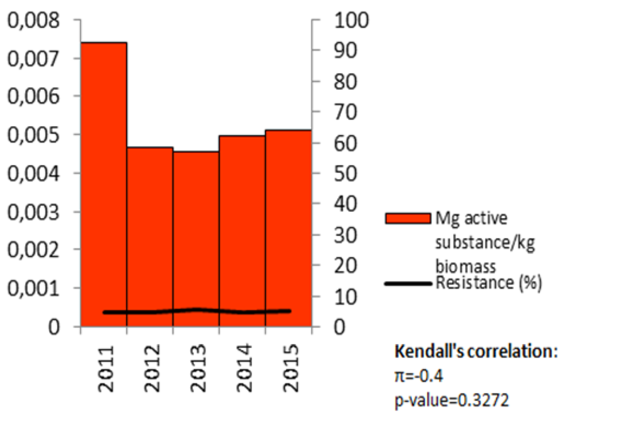


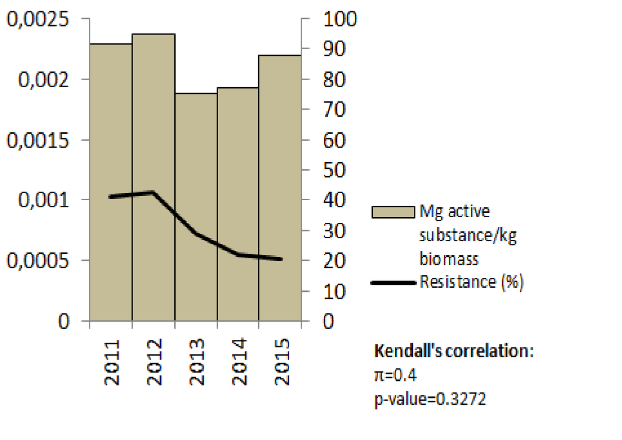












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