Time trend analysis of antibiotic resistance in Beta-hemolytic *Escherichia coli* isolated at MVDL (2006-2016)

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Key Points:

- MVDL data was analyzed to study temporal trends in antibiotic resistance in Beta-hemolytic *E.coli*
- There were no to moderate changes in antibiotic resistance against majority of the antibiotics
- A significant increase in resistance against Enrofloxacin was observed in recent years

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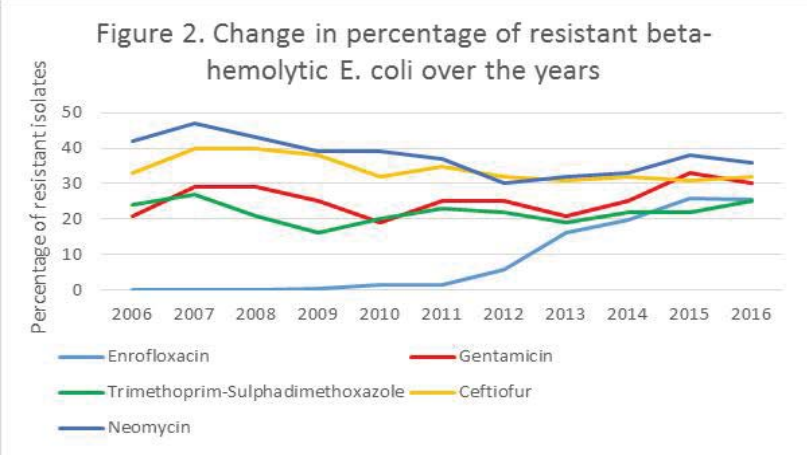
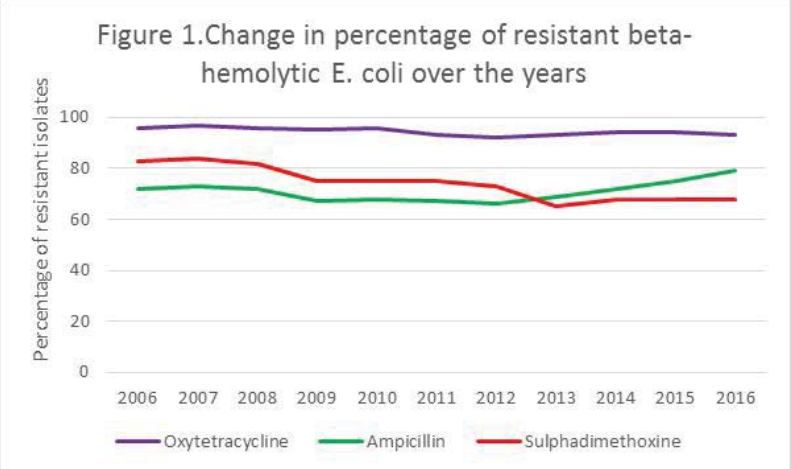
Introduction - Emergence of antibiotic resistant microorganisms is considered a major concern for both swine and public health. For this reason, studies looking at the evolution of antibiotic resistance over time are valuable to characterize the situation. The objective of this study was to assess antibiotic resistance patterns over a long time period (2006-2016) in a pathogen commonly isolated from clinical samples of swine origin, beta hemolytic *Escherichia coli*, recovered at the MN-Veterinary Diagnostic Laboratory (MVDL).

Methods- Between January 2006 and August 2016, 8,071 beta-hemolytic *E. coli* isolates were cultured from clinical samples (feces, tissues or fluids) of swine origin using routine culture methods, and further screened for resistance against a panel of antibiotics. Minimum Inhibitory Concentrations (MIC) for Ampicillin (A), Ceftiofur (C), Enrofloxacin (E), Gentamicin (G), Neomycin (N), Oxytetracycline (O), Sulphadimethoxine (S) and Trimethoprim-Sulphamethoxazole (T) were obtained using the Sensititre automated microdilution method. Isolates were then classified as either resistant or susceptible according to cutoff values provided by the Clinical & Laboratory Standards Institute (CLSI) (1). We had a final sample size of 7,998 isolates.

Results - Percentage of isolates resistant to A, O, S, G and T remained relatively constant during the study period, and ranged between 65 and 97% for A, O and S (Figure 1) and 19 to 47% for C, G, N and T. In contrast, the percentage of isolates resistant against E increased from negligible in 2006 to nearly 26% in 2016. A modest (<3 % annual rate of decrease) but statistically significant decrease in resistance against C, O, S, N ($p < 0.01$) and a significant increase (~114 % annual rate of increase) in resistance against E ($p < 0.001$) was observed. No trends in resistance were observed against A, G and T. A similar increase in resistance against E was also observed in *Salmonella* isolates of swine origin recovered at the MVDL in a recently published study (Hong et al., 2016). Interpretation of these results must be done carefully since only clinical isolates (i.e., likely coming from sick animals) were included here and therefore we might overestimate the true prevalence of resistance present in healthy animals. Still, changes (or lack thereof) in the prevalence of resistance may be indicative of real changes in the proportion of resistant *E. coli* in swine farms. Future analyses regarding antibiotic resistance in *E. coli* of swine origin will involve incorporating variables such as age, seasonality and virulence factors.





References

1. CLSI. Performance standards for antimicrobial susceptibility testing; twenty-second informational supplement. M100-S22. 2012; 32(3).
2. Hong, et al. "Serotypes and Antimicrobial Resistance in Salmonella enterica Recovered from Clinical Samples from Cattle and Swine in Minnesota, 2006 to 2015." *PloS*