

Monitoring antimicrobial resistance in commensal *Escherichia coli* isolated from cecal content of market swine and sows at slaughter in the United States, 2013–2019

Csaba Varga, *University of Illinois Urbana-Champaign*

Background

The emergence of antimicrobial resistance in enteric bacteria is a global public health concern. There is a national and global call to reduce the dissemination of antimicrobial-resistant commensal and pathogenic bacteria and improve antimicrobial stewardship programs. Longitudinal monitoring of antimicrobial resistance patterns in commensal *E. coli* of swine at slaughter plants is an effective way to evaluate changes in antimicrobial resistance and identify emerging trends.

Materials and Methods

Publicly available data on antimicrobial resistance in *E. coli* isolated from swine cecal contents at slaughter establishments across the US by the National Antimicrobial Resistance Monitoring System (NARMS) was evaluated to estimate overall and yearly antimicrobial resistance prevalence, and multidrug resistance patterns using descriptive statistics and single-linkage clustering dendrogram, respectively. Logistic regression models were constructed to assess associations between resistance to individual antimicrobials and sample source (market hogs vs. sows) and sampling period (2013-2016 vs. 2017-2019).

Results

Among 3,237 recovered *E. coli* isolates, the highest prevalence of resistance was identified against tetracycline (67.62%) followed by streptomycin (29.94%), and ampicillin (21.10%). A low level of resistance ($\leq 6\%$) was also found against chloramphenicol, trimethoprim-sulfamethoxazole, ceftriaxone, ciprofloxacin, amoxicillin-clavulanic acid, ceftiofur, and gentamicin. Added to that, a very low level of resistance ($\leq 1\%$) was detected against azithromycin and sulfamethoxazole/sulfisoxazole. It should be noted that 832 (25.7%) of the isolates were susceptible to all antimicrobials tested. The most common multidrug-resistant patterns were ampicillin-streptomycin-tetracycline (178 isolates), and chloramphenicol-streptomycin-tetracycline (35 isolates). All antimicrobials had higher odds of resistance during 2017-2019 among market swine, except streptomycin. The highest odds of being resistant was observed for ceftriaxone (OR=3.24, $p < 0.001$) among commensal *E. coli* obtained from market swine (OR=1.65, $p = 0.02$).

Conclusions

This study provided information on antimicrobial resistance trends of commensal *E. coli* isolated from swine at slaughter across the US which indicated an increase in the odds of resistance in *E. coli* isolated from market swine to most of the antimicrobials during 2013-2019. Future on-farm surveillance studies are needed to identify key factors that impact the development of resistance among commensal and pathogenic bacteria of swine.

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