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Antimicrobial Resistance of Enteric Bacteria from an Integrated Population of Swine and Humans

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Introduction

It is generally perceived by the medical community that antimicrobial resistance (AMR) in human infections is a consequence of sub-therapeutic antibiotic usage in animal production (Anderson, 1999). Because no definitive studies have determined this phenomenon, controlled epidemiologic studies with stable human and animal populations are needed to identify the transmission dynamics of AMR. Our objective was to examine the AMR profiles and potential AMR transmission dynamics of *Escherichia coli* (EC) and *Enterococcus faecalis* (EF) in a semi-closed population of swine and humans.

Materials and Methods

The study population was composed of humans and swine in a semi-closed vertically integrated food system distributed over widely diverse geographical locations. The human population consisted of swine workers and non-swine workers and the swine consisted of all age groups found in farrow-to-finish operations. Human bacterial isolates originated from wastewater samples from housing complex effluent, from lift station sites, and from wastewater treatment plant influent. Swine isolates originated from composite fecal samples and from pre-lagoon wastewater.

Bacterial culture, identification, and AMR testing: Restrictive media were used to culture EC and EF. Identification was accomplished by use of biochemical tests, ribotype analysis, and PCR. Susceptibility to 19 antibiotics was determined by use of a micro-broth Sensititre (Trek Inc.) system that employed NARMS antibiotic panels. AMR sensitivity was performed on 829 human and 857 swine EC, and on 345 human and 279 swine EF.

Results and Discussion

Of the human EC, 53% were pan-susceptible, 26% were singly resistant, 21% were resistant to 2 or more, and 0.81% were resistant to 5 or more antimicrobials. These results compare favorably with that reported earlier in which 50.4% of human EC were pan-susceptible and 15% were resistant to 3 or more antimicrobials (Scott et al., 2005). The swine EC had 12% that were pan-susceptible, 37% that were singly resistant, 51% that were resistant to 2 or more, and 2.1% that were resistant to 5 or more antimicrobials. AMR of swine isolates in our study is considerably higher than that observed in human EC. This agrees with that of White et al., (2001) in which EC from humans, swine, cattle, and poultry were collected over a 24-year period, and swine EC isolates showed greater resistance than human isolates. Of the human EF, 3% were pan-susceptible, 9% were singly resistant, 88% were resistant to 2 or more, and 6.2% were resistant to 5 or more antimicrobials. The swine EF had none that were pan-susceptible, 1% that was singly resistant, 99% were resistant to 2 or more, and 17.1% that were resistant to 5 or more antimicrobials. The EF data appear to mirror that of EC in which swine isolates have greater AMR than human isolates. We were unable to demonstrate evidence for transfer of resistance from swine to humans or *vice versa*.

References

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