Reported antimicrobial use and *Salmonella* resistance on 90 Alberta swine farms

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Summary: The study objectives were to describe antimicrobial use (AMU) and *Salmonella* resistance on 90 Alberta swine farms. The vast majority of antimicrobials were used in-feed. In weaners, in-feed use did not vary among farms, suggesting heavy reliance on in-feed antimicrobials. For grow-to-finish production phases, most farms reported heavy reliance on in-feed antimicrobials, but 6 and 14 farms did not report any in-feed AMU in growers and finishers, respectively. The tetracycline-sulphametazine-penicillin combination and carbadox were the most common antimicrobials added to the weaner rations, while tylosin and lincomycin were the most common antimicrobials added to grower and finisher rations. No resistance was observed to nalidixic acid, ciprofloxacin, amikacin and ceftiraxone. A low frequency of resistance (<5%) was observed to gentamicin, apramycin, cephalotin, ceftiofur, amoxicillin/clavulanic acid and trimethoprim-sulphamethoxazole. Most common resistances were detected to tetracycline, streptomycin, sulphamethoxazole, kanamycin and ampicillin. Despite widespread AMU, 40.19% of *Salmonella* isolates were susceptible to 17 antimicrobials.

Keywords: antimicrobial drugs, susceptibility, *Salmonella* serotypes

Background: The emergence of antimicrobial resistance (AMR) is believed to be associated with the use of antimicrobial drugs in human medicine, veterinary medicine and food animal production. The scope and magnitude of the public health impact of antimicrobial use (AMU) in animals remains unclear since there is relatively little information on AMU and the prevalence of resistant bacteria in food animals (McEwen & Fedorka-Cray, 2002). The objectives of this study were to describe AMU and *Salmonella* resistance on 90 Alberta swine farms.

Materials and Methods: Ten swine veterinarians selected 90 Alberta swine farms. AMU data were gathered through a questionnaire, which was completed by the owner or operator of the farm along with the herd veterinarian. Fifteen fecal samples and five environmental samples per farm were collected over a four-month period from the finishing swine and the farm environment. All samples were tested for *Salmonella* using bacteriological culture. *Salmonella* isolates were serotyped by the Health Canada O.I.E Reference Laboratory for Salmonellosis (Guelph, Ontario). Susceptibility testing was performed on all isolates using a Sensititre Custom MIC Panel (Trek Diagnostic Systems Ltd.).
Results: Selected farms represented approximately 25% of the Alberta annual market pig production. Eleven AMU farm patterns were reported. Among 78 farrow-to-finish farms, 45 farms reported use of in-feed antimicrobials more than 95% of the time in the weaner, grower and finisher rations. Seven farms reported use of in-feed antimicrobials more than 95% of the time in the weaner and grower rations and 50-95% the time in the finisher rations. Eight farms reported use of in-feed antimicrobials more than 95% of the time in the weaner and grower rations and 0% of the time in the finisher rations. Six farms reported use of in-feed antimicrobials more than 95% of the time in the weaner, grower and finisher rations, and 0% of the time in grower and finisher rations. The tetracycline-sulphamethazine-penicillin combination and carbadox were the most common antimicrobials added to the weaner rations. Tylosin and lincomycin were the most common antimicrobials added to grower and finisher rations. Mainly occasional AMU in water was reported in weaners, growers and finishers. Penicillin and tetracycline were the most common antimicrobials added to water for all three production categories.

At least one Salmonella isolate was recovered from 60 of 90 participating farms. Among 418 Salmonella isolates, 40.19% of isolates were susceptible to all antimicrobials. No resistance was observed to nalidixic acid, ciprofloxacin, amikacin and ceftiofur. A low frequency of resistance (<5%) was observed to gentamicin, apramycin, cephalotin, ceflufor, amoxicillin/clavulanic acid and trimethoprim-sulphamethoxazole. Most common resistances were detected to tetracycline (44.3%), streptomycin (29.7%), sulphamethoxazole (25.4%), kanamycin (15.1%) and ampicillin (10.4%). Among 418 isolates, 67 (16.0%) were resistant to 4 or more antimicrobials. Salmonella Derby, Typhimurium and California were the most resistant serotypes.

Discussion and Implications: On most farms the vast majority of antimicrobials were used in-feed. Reported in-feed AMU patterns in weaners did not vary among farms, suggesting heavy reliance on in-feed antimicrobials at this stage of production. Similar findings have been recently reported in USA (Bush & LeRoy-Biehl, 2002). In growers and particularly in finishers reported in-feed AMU patterns varied among farms. Some farms reported heavy reliance on in-feed antimicrobials in these stages of production, but 6 and 14 farms did not report any use of in-feed antimicrobials in growers and finishers, respectively. Most common resistances were detected to tetracycline, streptomycin, sulphamethoxazole, kanamycin and ampicillin. These antimicrobials have been extensively used in swine production and medicine for decades. Levels of most common resistances observed in our study were relatively moderate (<50%) compared to some USA studies (Wondwossen et al., 2000; Farrington et al., 2001). These studies reported higher levels of resistance to these antimicrobials, particularly for tetracycline (>80%). A moderate level of resistance (16.9%) was observed for chloramphenicol, an antimicrobial not been used in veterinary medicine for decades, suggesting a genetic linkage between this resistance and resistance to other antimicrobials. Despite widespread reported AMU, 40.2% of Salmonella isolates were susceptible to all antimicrobials. Further analysis of data may improve the understanding of the relationship between AMU and Salmonella resistance. The information obtained from this study might provide valuable surveillance information for appropriate and sound decisions regarding prudent AMU practices in swine, and future courses of action relating to AMU and AMR issues.

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References: