The relationship between antimicrobial use, antimicrobial resistance and health and biosecurity status in Canadian grow-finish swine herds

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Introduction: Antimicrobial resistance (AMR) is a global threat to public health. The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) is a national integrated program dedicated to the collection, integration, analysis, and communication of trends in antimicrobial use (AMU) and AMR in selected bacteria from humans, animals, and food sources across Canada.

Materials and Methods: From approximately 95 sentinel grow-finish (GF) farms across the 5 major pork producing provinces, the CIPARS Farm Surveillance component actively collects pen fecal samples for susceptibility testing and data on farm demographics, animal health and AMU via questionnaires.

Results: In 2014, notable resistance detected in 147 *Salmonella* and 1672 generic *E.coli* isolates included: azithromycin 4%, 1%; ceftriaxone 4%, 2%; ampicillin 41%, 34%; and tetracycline 69%, 73% respectively. There were no *Salmonella* or *E. coli* isolates resistant to ciprofloxacin.

Overall (feed, water, and/or injection) the most commonly used antimicrobials in 2014 in the 95 enrolled herds included: penicillin G (59%), lincomycin (40%), tylosin (36%) and chlortetracycline (32%). Parenteral ceftiofur and florfenicol use was reported by 19% and 13% of farms respectively. Antimicrobials were used in feed in 82%, by injection in 62%, and in water in 28% of GF herds. In 9% of herds no AMU was reported. There were an estimated 83 mg of tetracyclines, 33 mg of macrolides, and 28 mg of lincosamides consumed in feed during the GF period after adjusting for population and pig weight (Total mg of antimicrobials consumed through feed / (Total number of pigs in the sampled GF periods x ESVAC standard weight of 65 kg).

Reported use of antimicrobials was most common for *Streptococcus suis* and *Lawsonia*. The number of diseases reported on each farm ranged from 0 to 11 with a median of 5. Boots, coveralls and a biosecurity sign were the most commonly reported biosecurity measures.

Preliminary modelling results showed significant factors associated with AMU in GF herds included: number of diseases, PRRS status, and region (increased use) and *Mycoplasma* status of the sow herd and *Lawsonia* vaccination in the nursery (decreased use). Significant factors associated with ceftiofur use in GF herds included: *E.coli* and *Salmonella* status, multiple sources of pigs, and region (increased use) and number of diseases (decreased use). Further modelling will be conducted to examine additional relationships between disease pressure, biosecurity measures, AMU and AMR.

Conclusion: Significant relationships exist between GF AMU and demographic factors, specific diseases, and vaccinations and can include earlier stages of production.