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Canadian Integrated Program for Antimicrobial Resistance Surveillance: ON-FARM SWINE PROGRAM

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Introduction

The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) was initiated in 2002 to monitor trends in antimicrobial use and resistance in selected bacterial organisms. The on-farm active surveillance program is the newest component and is currently supported by the Agricultural Policy Framework (APF) agreement between Agriculture and Agri-Food Canada and various partners including Health Canada and the Public Health Agency of Canada. Information on the entire CIPARS program can be found at http://www.phac-aspc.gc.ca/cipars-picra/index_e.html

Objectives

Establish infrastructure to support a national surveillance program

Provide representative on-farm data on antimicrobial use and resistance

Provide data for human health risk assessments

Describe temporal & regional patterns and trends in antimicrobial use and resistance

Investigate associations between antimicrobial use and resistance together with targeted research

CIPARS On-Farm Surveillance Program Design, Implementation & Data Analysis

- Sentinel herds in the five major pork producing provinces
- Allocation of herds per province is proportional to the number of Grower/Finisher Units in each province. Provincial funding provided 10 additional herds in Alberta and Saskatchewan (Fig. 1)
- Purposively selected swine veterinarians enrolled client producers using specific inclusion / exclusion criteria

Sample and Data Collection
- Pooled fecal sampling of Market Hogs (>80 kg) 3 times per year by herd veterinarian
- "Cohort" Sampling in a sub-set of herds, in any one of the 3 sampling seasons per year
  - Fecal sampling of 2 pens within a grower / finisher unit:
    - by the producer within 6 hrs of arrival (approx. 25 kg)
    - and again by the herd veterinarian at > 80 kg.
- Data on herd demographics, management, pig health, and antimicrobial use collected by questionnaire annually
- Pig health and antimicrobial use data collected by questionnaire at each close-to-market sampling visit
- Sampling for the implementation year was conducted between March and December 2006
- 462 samples were collected and a maximum of 5 *E.coli*, 1 *Salmonella*, and 3 *Enterococcus* isolates were utilized from each sample
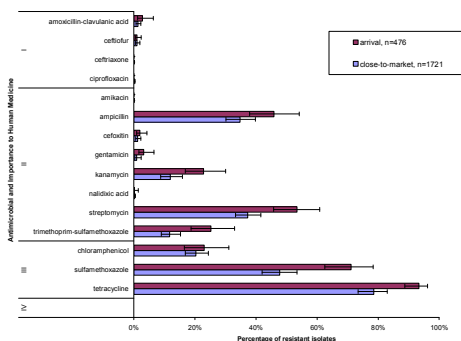
Data Analysis
- CIPARS reports antimicrobial susceptibility results in accodance with the categorization of importance to human health as determined by the Veterinary Drugs Directorate, Health Canada http://www.hc-sc.gc.ca/dhp-mps/consultation/vet/consultations/amr_ram_hum-med_e.html
- All statistical analyses accounted for clustering of resistance within herds through generalized estimating equations. Clustering within veterinarian and province was evaluated

FIGURE 1: Distribution of sentinel herds and veterinarians

Nationally: 108 Herds
29 Veterinarians

24 / 8   15 / 5   12 / 3   29 / 7   28 / 6
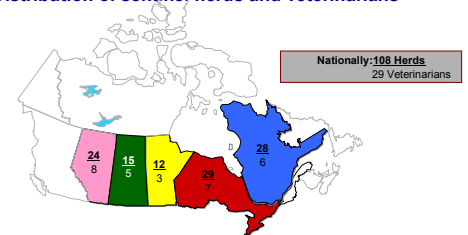
2006 Antimicrobial Resistance Results

FIGURE 2. Adjusted individual antimicrobial resistance in *E.coli,* with confidence intervals.

arrival, n=476
close-to-market, n=1721

Table 1. Number of antimicrobials in resistance patterns in *Salmonella* isolates by serovar (n=71*).

Serovar	n (% total)	Number of antimicrobials in resistance pattern			
		0	1-4	5-8	9-16
All samples: (n=71)					
Derby	15 (21.1)	1	12	2	0
Typhimurium var. 5-	11 (15.5)	2	3	6	0
London	5 (7.0)	2	3	0	0
Typhimurium	5 (7.0)	1	1	3	0
Bovismorbificans	4 (5.6)	2	2	0	0
Less frequent serovars	31 (43.7)	15	16	0	0
Total		23	37	11	0

* 23 isolates awaiting typing results

FIGURE 3. Adjusted individual antimicrobial resistance in *Salmonella,* with confidence intervals

arrival, n=22
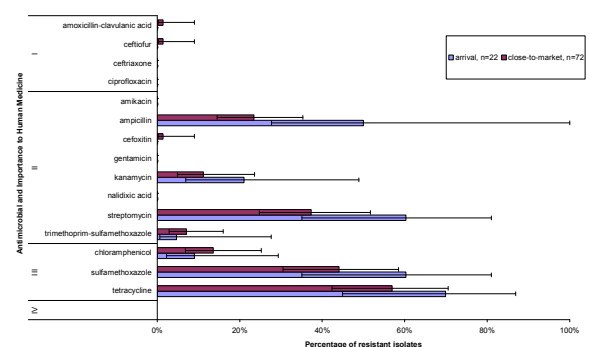close-to-market, n=72

E.coli isolates
- Frequency of resistance was similar to findings from CIPARS abattoir surveillance
- Isolates from young pigs had greater odds of being resistant to two or more drugs and were markedly less likely to be susceptible to all of the drugs tested
- Majority of the models assessing the effect of the veterinarian would not converge due to insufficient data
- 7 of 9 models found province was a significant predictor for resistance

Salmonella isolates
- 94 *Salmonella* were isolated from 43 of the 108 participating farms (39.8%)
- Frequency of resistance was similar to findings from CIPARS abattoir surveillance
- Resistance to ampicillin (23%) was higher than previously reported in Canada.
- Dataset was too small to evaluate the role of province, veterinarian, or serotype as predictors of AMR.

Acknowledgements

...working towards the preservation of effective antimicrobials in humans and animals

...pour préserver l'efficacité des antimicrobiens pour l'homme et l'animal