The Canadian Integrated Program for Antimicrobial Resistance Surveillance
Building a Voluntary Farm Surveillance Framework

NIAA Symposium – *Antibiotic Use & Resistance: Moving Forward Through Shared Stewardship*
November 13, 2014 – Session III Metrics of Success to Minimize Resistance
Dr. Dave Léger, Laboratory for Food-borne Zoonoses
Presentation Outline

• Background and the CIPARS Program
• Farm surveillance framework development process
  » Building collaboration
• CIPARS Farm Surveillance
  » Grower-Finisher Swine
  » Broiler Poultry
• Surveillance Framework implementation / sustainability
• CIPARS Farm Surveillance Summary
  » Outputs – Example data
• Acknowledgements
Recommendation

To establish a national surveillance system to monitor antimicrobial resistance and use in the agri-food and aquaculture sectors...
Coordinated by the Public Health Agency of Canada (PHAC)

- Veterinary epidemiologists
- Species/commodity specialists

Partnerships include:

- Veterinary Drugs Directorate (VDD), Health Canada
- Canadian Food Inspection Agency (CFIA)
- Agriculture & Agri-foods Canada (AAFC)
- Provincial agriculture and public health
- Academia
- Private industry

CIPARS: Active and Passive Surveillance Components

Antimicrobial Resistance

Human population
- Medical visit
- Local laboratory
- Provincial/territorial laboratory
  - NML

Animal Population
- Sentinel farm
- Healthy animals
- Abattoir
- Retail meat
- Sick animals
- Provincial or private animal health laboratories
  - LFZ

Data Integration

CIPARS
- Physician diagnoses
- Hospital purchases
- Pharmacy sales

PICRA
- Sentinel farm questionnaire
- Kilograms of antimicrobials distributed for use in animals

Antimicrobial Use

1 National Microbiology Laboratory, Winnipeg, MB
2 Laboratory for Foodborne Zoonoses, Guelph, ON and Saint-Hyacinthe, QC
3 Canadian Integrated Program for Antimicrobial Resistance Surveillance, Public Health Agency of Canada
4 Programme intégré canadien de surveillance de la résistance aux antimicrobiables, Agence de la santé publique du Canada
5 IMS Health Canada, Inc.
6 Canadian Animal Health Institute (CAHI)
Objectives

• Establish an infrastructure supporting a national farm surveillance program for the collection of antimicrobial use and resistance data
• Describe trends in farm AMU and AMR
• Investigate associations between farm antimicrobial use and resistance
• Provide sound data for human health risk assessments
Contentious Issue
- Challenging existing management practices
- “Not on our radar!”

Anxiety... Fear... Mistrust
- Data confidentiality
- Farm biosecurity
- Time investment
- Findings... Communication
- Big Government

Mandate For Farm Surveillance $Funded
Obstacles to Collaboration
Volunteer Data Providers
National Farm Surveillance System
CIPARS Farm Surveillance: Framework development

- National in scope
- Sentinel farm network design
  » Grower-Finisher (G-F) production
- Broiler Poultry (2013)
  » Hatchery (AMU) and Broiler flocks
CIPARS Farm Surveillance: Framework development

- Operational logistics
- Sampling kits and protocols
- Questionnaires development
Recommendations - Expert Panel / Working Group

- Approve objectives
- Herd selection/recruitment: inclusion/exclusion criteria
- Field work: Herd veterinarians
  - Confidentiality and biosecurity
  - Compensation for producers and vets
- Composite pen fecal samples
  - \textit{E. coli, Salmonella (Campylobacter)}
  - AMR testing: Sensititre® System
    - NARMS panel of antimicrobials
- Questionnaires
  - Antimicrobial use data
  - Herd demographics, pig inventory and animal health data
- Communication process
Sample & Data Collection - Implementation

Regular Herds

Cohort Herds

Approximately 30% of enrolled herds in 2006-08

- **COHORT Arrival and Close-to-market (CTM)* Sampling**

  - Composite samples: **Regular** CTM* pens
  - Composite samples: **Cohort** pens on arrival
  - Composite samples: **Cohort** CTM* pens

  - **CTM* Sampling Day Questionnaires:**
    - Herd & Site Info. (winter only)
    - Sample Information
    - AMU, pig inventory and health

  * CTM = Close-To-Market, pigs > 80 Kgs (175 Lbs)
At implementation, herds were allocated per province proportional to the number of Grower/Finisher Units in each province.

Provincial funding provided 10 additional herds in Alberta and Saskatchewan during the 2006-07 surveillance periods.

Nationally:
- 108 Herds
- 29 Vets
CIPARS Farm Surveillance: Framework development

- CIPARS Farm Working Group
- Expert Review Panel – Round 1
- Expert Review Panel – Round 2
- Swine/Poultry Working Group
- Producer/Veterinarian Sub-Committee
- CIPARS Farm Working Group
- CIPARS Data Analysis
- Collaborating Veterinarians
- Swine/Poultry Working Group

DRAFTs:
- DRAFT 1
- DRAFT 2

Refined:
- Refined 2007
- Refined 2009
- Refined 2011
Sample & Data Collection - Refined

- Composite fecal samples from CTM* pens collected & submitted by the herd veterinarian
- CTM* Questionnaire:
  - Herd/site demographic data
  - Number of pigs, mortalities, marketed
  - Antimicrobial use data
  - Animal Health data

* CTM = Close-To-Market, pigs > 80 Kgs (175 Lbs)
Characterization of:
1) Vertically-transmitted *E. coli* and *Salmonella* spp
2) Carry-over
3) AMR emergence associated with subcutaneous & *in-ovo* drug uses

- Reflects barn-level AMR associated with total antimicrobial exposure and barn characteristics;
- Proximal to consumer
Poultry: Distribution of sentinel flocks and veterinarians

- At least 30 flocks in major poultry producing provinces or in FoodNet Canada Sentinel Sites (chicks sourced from major hatcheries=16 hatcheries)

Nationally:
- 105 flocks
- 12 Vets

In 2014 – 30 flocks in AB; 9 flocks in SK
CIPARS Farm Surveillance: Framework development

Contentious Issue
- Challenging existing management practices
- “Not on our radar!”

Anxiety... Fear... Mistrust
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Responsive
- Data quality, findings and feedback
- Builds trust and contributes to sustainability
Number of Farms Reporting Hogs

- **Canada**: 2000, 2005, 2010
- **Maritimes**: 2000, 2005, 2010
- **Quebec**: 2000, 2005, 2010
- **Ontario**: 2000, 2005, 2010
- **Manitoba**: 2000, 2005, 2010
- **Sask**: 2000, 2005, 2010
- **Alberta**: 2000, 2005, 2010
- **BC**: 2000, 2005, 2010

Source: Statistics Canada, Agriculture Division
Established a national framework for antimicrobial use and resistance surveillance

» On-going: G-F Swine and Broiler poultry
» Expand Farm Surveillance - Collaboration with FoodNet Canada
  • Beef, Cow-Calf and Feedlots (AB)
  • Dairy (BC, AB, ON… QC)
  • Turkey (BC)
  • Layer (BC and ON)

Outputs: information for evidence/risk-based policy

» Trends – Spatial (Regional) and temporal (Years)
  • AMU (use frequency, quantitative – PCU, ADD…)
  • AMR (prevalence, MCR, emergence)
» Integration of data across CIPARS components and agriculture industry/commodity sectors
Percentage of pig farms with reported use of antimicrobials in feed, by weight category of pig (n=89). Farm-Swine Surveillance, 2013
Swine: Regional and temporal variation in feed AMU frequency (%Swine Farms)
Quantitative estimates of AMU in feed (median grams/1000-pig-days) by reason for use. Farm-Swine Surveillance, 2013

Number of farms, year and primary reason for antimicrobial use
Poultry: Overview of antimicrobial use (n=99 flocks), 2013

Ceftiofur use (n=31 flocks)
Poultry: Temporal variation in ceftiofur resistant generic *E. coli*

Farm level results parallel the retail and abattoir results in 2013.

- Retail
- Abattoir
- Farm

Year and province:
- British Columbia
- Saskatchewan
- Ontario
- Québec
- Maritimes

Percentage of Retail S. Heidelberg isolates ceftiofur resistant:
- '10: 15 flocks using TIO
- '11: 0 flocks using TIO
- '12: 8 flocks using TIO
Differences in reported antimicrobial use by food animal sector

**G-F Swine: Feed***
- Tetracyclines: 40%
- Lincosamides: 19%
- Ionophores: 10%
- Macrolides: 22%
- Sulfonamides: 3%
- Pleuromutilins: 2%
- Penicillins: 2%
- Flavophospholipids: 1%
- Streptogramins: 1%

**Broiler Poultry: Feed***
- Tetracyclines: 1.32%
- Flavophospholipids: 0.04%
- Trimethoprim-sulfonamide: 5.73%
- Penicillins: 1.56%
- Streptogramins: 6.64%
- Macrolide: 1.91%
- Bacitracins: 21.49%
- Ionophores and chemical coccidiostats: 61.30%

* Based on kg active ingredients (PCU);
Estimates include ionophores and chemical coccidiostats.
Primary reasons for antimicrobial use in feed

Reasons for AMU in feed*, 2013

Broiler Poultry
- Disease Prevention: 71%
- Production Claims: 9%
- Disease Treatment: 20%

Swine: Feed
- Production Claims: 28%
- Disease Treatment: 17%
- Disease Prevention: 55%

Swine: Trends in reasons for use in feed*

<table>
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<th>Year</th>
<th>Production Claims</th>
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<th>Disease Prevention</th>
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<tr>
<td>2013</td>
<td>82</td>
<td>25</td>
<td>37</td>
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</tbody>
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Mgs of antimicrobial use per Kg Population Corrected Unit (PCU)

* Ionophores & chemical coccidiostats excluded
Acknowledgements

- Participating Veterinarians and Producers
- Canadian Pork Council and Provincial Pork Boards
  » Swine Industry Antimicrobial Resistance and Use Working Group (Veterinarians, Pork Board and Ministry of Agriculture representatives)
- Chicken Farmers of Canada, Canadian Poultry and Egg Processors Council, and Provincial Marketing Boards
  » Poultry Industry Antimicrobial Resistance/Antimicrobial Use Working Group (Veterinarians and Feather Board representatives)
- Alberta Agriculture and Rural Development and Saskatchewan Agriculture
- Agriculture and Agri-Food Canada
- Public Health Agency of Canada