Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS): On-farm surveillance

Avery, B\textsuperscript{1}; Léger, D\textsuperscript{1,2}; Deckert, A\textsuperscript{1,2}; Gow, S\textsuperscript{1,3} ; Dutil, L\textsuperscript{1,4}; Daignault, D\textsuperscript{1}; Reid-Smith, R\textsuperscript{1,2}; Irwin, R\textsuperscript{1} and CIPARS collaborators.

\textsuperscript{1}Antimicrobial Resistance Surveillance Unit, Laboratory for Foodborne Zoonoses, Public Health Agency of Canada, Guelph / St-Hyacinthe / Saskatoon, Canada; \textsuperscript{2}Department of Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, Canada; \textsuperscript{3}Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Canada; \textsuperscript{4}Faculté de médecine vétérinaire, Université de Montréal, St-Hyacinthe, Canada.

Abstract

Objectives of CIPARS On-farm surveillance are to: establish infrastructure to support a national surveillance program; provide data on antimicrobial use and resistance; investigate associations between antimicrobial use and resistance; and provide data for human health risk assessments. CIPARS On-farm surveillance focuses on finishing swine in the major pork producing provinces across Canada. The rationale for selecting swine included: extensive implementation of the Canadian Quality Assurance (CQA\textsuperscript{®}) program, absence of a recent foreign animal disease outbreak and a similar initiative in swine in the United States (Collaboration in Animal Health and Food Safety Epidemiology). Swine veterinarians facilitate the sampling. Purposive, weighted selection of veterinarians from a national sampling frame was conducted. The number of participating herds per province is proportional to the number of finisher operations in that province. Veterinarians sample a set number of herds based on specified inclusion/exclusion criteria. Antimicrobial use data is collected using enhanced CQA\textsuperscript{®} forms and questionnaires. Pooled fecal samples are collected from pens of finisher hogs that are close-to-market weight three times annually. In a subset of herds, specific cohorts of pigs are followed by collecting pooled fecal samples at arrival and when close to market. Cohort-specific forms are used to ideally capture all antimicrobial use data for designated cohort pens. All fecal samples are cultured for generic \textit{E. coli}, \textit{Enterococcus} and \textit{Salmonella} and quantitative antimicrobial susceptibility testing will be performed. Sampling and data collection began in January 2006.

Introduction

The Canadian Integrated Program for Antimicrobial Resistance Surveillance was initiated in 2002 to monitor trends in antimicrobial use and antimicrobial resistance in selected bacterial organisms. CIPARS is dedicated to the collection, integration, analysis and communication of timely, ongoing and representative information derived from animals, foods, humans and the environment. The program is based on several representative and methodologically unified surveillance components which can be linked to examine the relationship between antimicrobials used in food animals and humans and the associated health impacts. These components include surveillance at federally registered abattoirs and retail outlets in the three major commodities: beef, poultry and pork. Passive data is also being collected from human and animal cases of \textit{Salmonella}. Human antimicrobial use data is reported and attempts are currently being made to generate accurate estimates of antimicrobial use in the agri-food sector using a variety of methodologies.

This knowledge will support (i) the creation of science-based policies to control antibiotic use in hospital, community and agricultural settings and thus prolong the effectiveness of these drugs and (ii) identification of appropriate measures to contain the emergence and spread of resistant bacteria between animals, food and people. The ultimate objective is to mitigate the impact of antimicrobial resistance on Canadians.
Development of the on-farm component of CIPARS was initiated in 2003. On-farm data collection and sampling is focused on swine initially. The rationale for selecting swine as the “proof of concept” commodity included; the extensive implementation of the Canadian Quality Assurance (CQA®) program, the absence of a recent foreign animal disease outbreak in this industry, and a similar initiative being piloted in swine in the United States (Collaboration in Animal Health and Food Safety Epidemiology, CAHFSE). Implementation of this program on swine operations began in early 2006. It is expected that this component will be expanded to include poultry and feedlot beef with the possibility of replication in other commodities beyond these core sectors.

Methods

Swine veterinarians are an integral component of the Canadian Quality Assurance (CQA®) program and were selected to carry out implementation of the program on farm. Swine practitioners were purposively selected from the Canadian Association of Swine Veterinarians (CASV) membership list. The need to implement this surveillance framework in operations that are representative of the majority of grower-finisher production in Canada directed the selection and recruitment of veterinarians to this program as well as the selection of inclusion and exclusion criteria for participating farms. The selection was a census of swine veterinarians in some provinces due to relatively few swine practitioners in some practice areas. Once selected, veterinarians whom agreed to participate selected sentinel sites according to the specified inclusion/exclusion criteria. The inclusion criteria were: a validated herd under the Canadian Quality Assurance (CQA®) program, herd production of greater than 2000 finisher hogs per year, and herds that were demographically and geographically representative of the veterinarian’s swine practice. Exclusion criteria were: herds with organic production, herds feeding Edible Residual Material (ERM), and herds raised on pasture. These exclusion criteria will be modified in the future if justified by a significant contribution by these production types to overall Canadian pork production.

The initial program has been implemented in the major pork producing provinces of Alberta, Saskatchewan, Manitoba, Ontario and Québec. The number of sampling sites per province that are funded by the federal program, is proportional to the number of finisher operations in each province. British Columbia has replicated the surveillance system using supplementary provincial funding. Alberta and Saskatchewan have also utilized additional provincial funding to increase the number of sampling sites in their respective provinces. A total of 109 herds are currently participating in the program.

Pooled fecal samples are collected from hogs at close-to-market weight. The herd veterinarian or their technician collects these samples three times per year using a standardized protocol. In a subset of sentinel herds, additional samples are collected at arrival from two pens (COHORT pens); these cohort pens are subsequently sampled again as close-to-market pens. The samples are shipped to the laboratory and cultured for generic E. coli, Enterococcus and Salmonella. Antimicrobial susceptibility testing is performed using the Sensititre Microbiology System (Trek Diagnostics Cleveland, Ohio, USA, www.trekds.com) and the National Antimicrobial Resistance Monitoring System (NARMS) Veterinary Public Health Plate configuration.

Antimicrobial use information is collected across all available stages of production using enhanced CQA® forms and/or other existing on-farm data collection systems. Both paper and electronic based forms are used to collect this data. Information is collected on herd demographics, husbandry, etc. through the use of enrollment and sampling day questionnaires. Ultimately, a personal digital assistant (PDA) with electronic questionnaires will be made available to participating veterinarians to facilitate data entry and increase data integrity. Producers and veterinarians receive nominal

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compensation for their participation in the program. The demographic information from the sentinel herds in the surveillance program will be compared to that of the Canadian pork industry to assess the ability to generalize this information.

In order to establish a completely voluntary sentinel herd surveillance system, it is imperative that individual herd data be held in strict confidence. Herd identifying data is held by the herd veterinarian and only coded information is passed on to the Public Health Agency of Canada.

Results

Herd specific results are provided to producers and veterinarians. Aggregated national results will be reported in the CIPARS annual report in conjunction with results from the retail meat, abattoir, clinical animal, clinical human, and antimicrobial use components of CIPARS. Preliminary results for the first six months of the program will be presented at ISVEE XI.

Discussion and Conclusion

On-farm surveillance creates unique challenges in the areas of logistics, data management, confidentiality, and representativeness. The diverse nature of the Canadian swine industry with respect to both geography and management, as well as the large number of producers involved in swine production, provides challenges with respect to the physical collection of data and the selection of representative herds. Antimicrobial use data is problematic to collect and analyse due to the large number of formats in which it is collected on-farm as well as the lack of collection of applicable denominator data in most swine production systems. The CIPARS On-farm component was designed to meet these challenges and establish an infrastructure to support a national on-farm surveillance program.

In addition to providing information on antimicrobial resistance and use in the swine industry in Canada, the CIPARS On-Farm surveillance network will also provide other valuable opportunities and information. It is envisioned that the surveillance framework will provide a research platform from which studies can be launched to answer questions regarding antimicrobial resistance specifically or swine production in general. Additionally, the surveillance system will provide valuable information to help refine methodologies for antimicrobial use and resistance surveillance. Finally, critical information will be gained regarding resources and support required for a broader, sustainable multi-commodity national surveillance system for both antimicrobial resistance and zoonotic enteric pathogens.

References


