
Dr. Mark Raizenne
Director General
Centre for Food-borne, Environmental and Zoonotic Infectious Diseases
Public Health Agency of Canada
December 7, 2011
Why are Zoonoses a concern to Public Health?

Exposure to diseases through animals

• PHAC has a federal role in surveillance for diseases (zoonoses) that are transmitted from animals to humans and some of these diseases also impact on animal health and welfare.

• Farmed animal health outcomes and objectives are linked to human health outcomes through One-Health.

• Public health outcomes regarding infectious diseases and pathogens arising from the agro-environment require involvement of multiple agencies.
Why are Zoonoses a concern to Public Health?

• High risk of zoonoses from livelihoods and diet
  – Most cases of West Nile in the 2007 epidemic occurred in rural communities in the Prairies
  – Farmers are at risk from Hantavirus transmitted from mice infesting barns
  – Swine workers at risk of triple-reassortant swine origin H3N2
  – Most Northern indigenous people subsist by hunting, fishing and trapping
  – Inuit consume uncooked meat and fish and other country foods
New public health concerns surrounding farm animals

U.S. Food & Drug Administration (FDA)

- Estimates 5,000 deaths
- 76 million cases of **food-borne disease** illness annually (*E. coli*, *Salmonella* …)
- **Animal hormones** (groundwater aquifers and surface waters)
- **Anti-microbial resistance**
Economic Impact of Emerging Infectious Disease

Economic Impact of Selected Infectious Disease Outbreaks

- **SARS**
  - China, Hong Kong, Singapore, Canada
  - $30-50bn

- **H5N1 Avian Flu**
  - Worldwide
  - $30bn

- **H1N1**
  - Worldwide
  - $45-55bn

- **Foot & Mouth**
  - Taiwan
  - $5-8bn

- **BSE**
  - UK
  - $5bn

- **Nipah**
  - SE Asia
  - $550-650m

- **Lyme Disease**
  - US
  - $200m

- **BSE**
  - Europe
  - $3.5bn

- **BSE**
  - Canada
  - $3bn

- **E. Coli**
  - US
  - $1.8bn

- **MRSA**
  - US
  - $5-10bn

Figures are estimates and are presented as relative size.
Diseases acquired from Cattle

- Anthrax
- Brucellosis
- Campylobacteriosis
- Cowpox
- Cryptosporidiosis
- Escherichia coli 0157:H7
- Tuberculosis
- BSE
- Giardiasis
- Salmonellosis
- Q- Fever
- etc....
Diseases acquired from Pigs

- Anthrax
- Botulism
- Brucella suis
- Cryptosporidiosis
- Influenza
- Leptospirosis
- Pasteurella aerogenes
- Salmonellosis
- Taenia solium (picture)
- Trichinella spiralis
- Yersinia enterocolitica
- etc……
« Livestock farm emissions raise risk of infectious disease” (Medical Post, Oct 18, 2011)

« People living within one kilometre of goat or sheep farms are at increased risk of Q fever… people with asthma and chronic obstructive pulmonary disease (COPD) living near animal farms are at increased risk of infections » (European Respiratory Society)
PHAC’s role on Zoonoses

• Public Health is committed to engaging partners to monitor, prevent, control and respond to zoonoses events.

• PHAC conducts a number of surveillance activities that involve the agro-environment or livestock and/or are linked to surveillance activities designed to control disease in livestock.

• PHAC is involved in a number of prospective initiatives with relevance to surveillance in farmed animals.

• PHAC is involved in a number of prospective initiatives with relevance to surveillance in wildlife.
The Role of Animal Sentinel Surveillance

• Value of livestock animal sentinels:
  – Share environments with humans
  – Respond to many infectious agents in analogous ways to humans
  – Early indicator for human risk for diseases that do not cause high morbidity/mortality rates in wildlife or animal hosts

• Sentinel surveillance is an effective tool to identify potential Public Health risks, such as West Nile virus and avian influenza

• Links to food safety and biosecurity

• Public health concerns can affect production and consumer confidence
Use of Sentinel Surveillance Data

West Nile virus positive wild birds in Canada, 2001-2005

Risk areas identified by wild bird surveillance reflect areas with human West Nile virus cases

West Nile virus human disease in Canada, 2002-2010
The Role of Animal Sentinel Surveillance

Other diseases that impact animal and/or public health that would benefit from sentinel surveillance to identify human risk, e.g. Q fever, arboviruses, zoonotic influenzas.
PHAC Role in Human Influenza Surveillance

Surveillance & Outbreak Response Division and CIRID

- FluWatch
- P/T Reports
- FluWatch Sentinel Physician Network
- Respiratory Virus Detection Surveillance System (RVDSS)
- Immunization Monitoring Program Active (IMPACT)
Key Activities

The key animal health surveillance activities or prospective initiatives underway at PHAC are:

• Surveillance for Avian Influenza
• One Health – Science to Policy Initiative - Food Safety and Antimicrobial Resistance (AMR)
• C-EnterNet On Farm Surveillance
• Canadian Integrated Program for Antimicrobial Resistance Surveillance
• Sentinel Animal Surveillance for Arboviral Zoonoses
• Targeted Animal Surveillance for Potential Swine Influenza Zoonoses (prospective)
National Integrated Enteric Disease Surveillance Program (C-EnterNet)

C-EnterNet is an integrated, sentinel surveillance program designed to monitor human enteric illness and to inform food & water safety policy.

OBJECTIVES:
• Detect changes in trends of human enteric disease incidence and pathogen exposure levels from food, animal and water sources
• Source Attribution – determine the proportion of human cases that are due to water, food & animals

Critical need to strengthen source attribution efforts in Canada and determine statistically significant risk factors for enteric illness
Canadian Integrated Program on Antimicrobial Resistance Surveillance

Antimicrobial Resistance

Human Population
- Medical Visit
- Local Lab
- Provincial/Territorial Lab
- NML

Animal Population
- Farm
- Abattoir
- Retail Meat
- Sick Animals
- Healthy Animals
- Veterinary Lab
- Provincial Lab
- CIPARS PHAC Lab

Data Integration

CIPARS

PICRA

Antimicrobial Use

Human Population

Animal Population

Passive Surveillance
- Salmonella
- Escherichia coli
- Campylobacter
- Enterococcus

Active Surveillance

1. Canadian Integrated Program for Antimicrobial Resistance Surveillance
2. Public Health Agency of Canada
3. Laboratory for Foodborne Zoonoses, Guelph (ON) and Saint-Hyacinthe (QC)
4. National Microbiology Laboratory, Winnipeg (MB)
National and International Projects

- Inter-Agency Wild Bird Influenza Survey & Chronic Wasting Disease
- Current Avian influenza (H5N1) affected areas
- West Nile virus & Lyme disease surveillance
- Canada-USA-Mexico tri-lateral collaborations for North American Rabies Management Plan
- Canada-USA-Mexico tri-lateral collaborations for continental surveillance for avian influenza
- Modelling on vector-borne infections & zoonoses
Moving Forward – One Health Approach

• Surveillance systems / early warning systems should have the precision, specificity and flexibility to detect new and emerging infectious disease threats

• Surveillance systems should move towards being more integrated and comprehensive – incorporating data from animal, human and ecosystem health domains
  – Inclusion of companion animal and wildlife data into surveillance systems
  – Better inclusion of ecosystem health information

• In addition to surveillance, future One Health activities may include the areas of research, education and communication
Key Issues for Public Health

Recognizing that:
- Some important zoonoses do not significantly impact livestock production e.g. swine influenza
- There is concern in the industry of consequences of surveillance impacts this (e.g. Alberta farm affected by pH1N1)
- There are potential loss of livelihoods from zoonoses that affect domestic animals and associated mental health consequences for farm families

Opportunities exist to:
- Minimize impacts of public health issues on livestock trade
- Develop future partnerships in surveillance
- Address constraints such as security of surveillance information in transfer to and use by public health (USCDC have developed some processes for this)