Alberta Agriculture and Forestry's Response to the 2014 Outbreak of *E. coli* O157:H7 in Alberta

Jeff Stewart
Alberta Agriculture and Forestry

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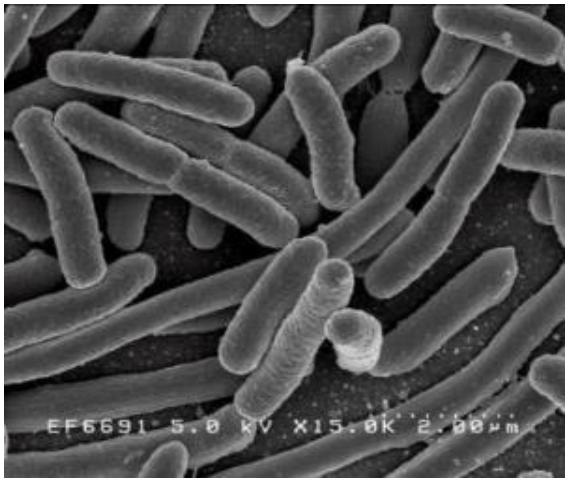
E. coli O157:H7: What is it and why is it important?

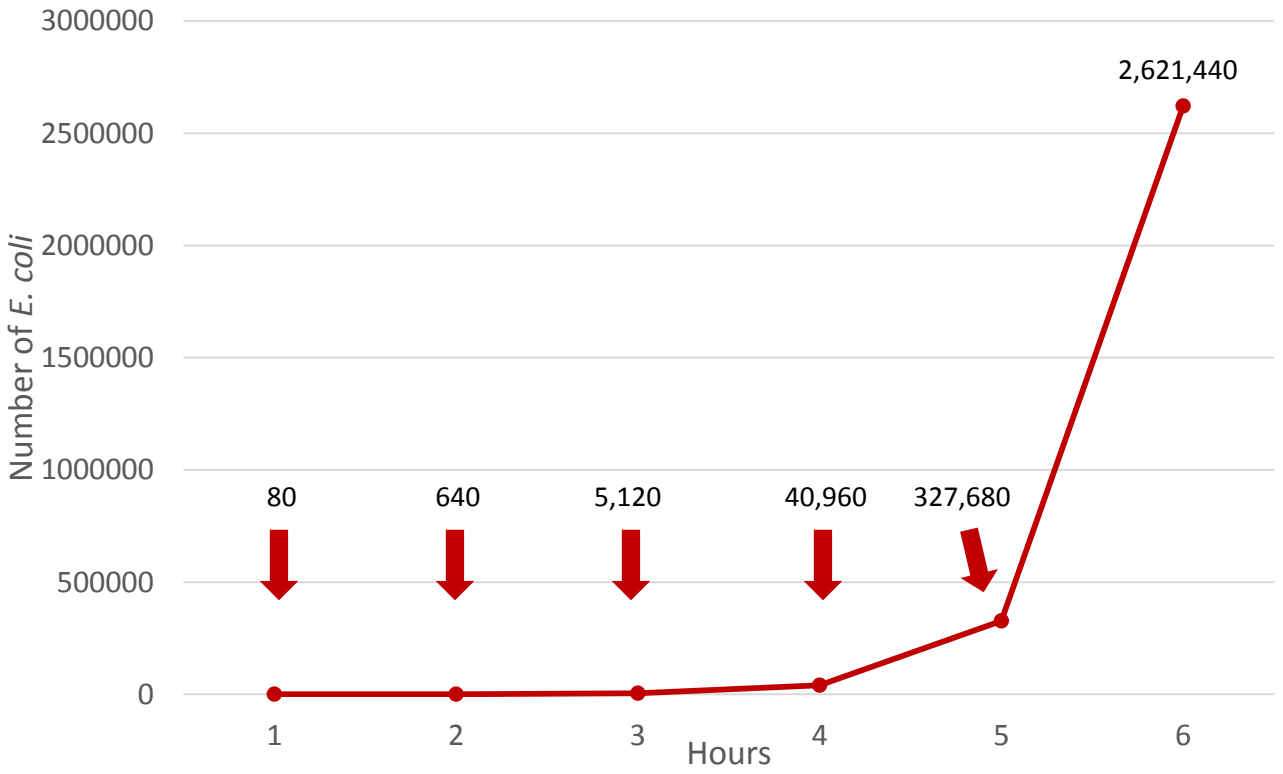


http://www.phac-aspc.gc.ca/fs-sa/fs-fi/ecoli-eng.php

- ***Escherichia coli*, *E. coli***
- **Large group of bacteria**
- **Commonly found in the intestines of humans and animals**
- **Most strains are harmless**
- **Some strains, such as *E. coli* O157: H7, can make people sick**
- **Symptoms range from severe stomach cramps, diarrhea, and vomiting**
- **Serious complications of an *E. coli* O157:H7 infection can include kidney failure**

E. coli O157:H7: What is it and why is it important?

- **As few as 10 bacterial cells can make a person sick**
- **An *E. coli* population can double every 20 minutes under ideal conditions**



E. coli O157:H7: What is it and why is it important?

- ***E. coli*** **infections are generally caused by eating contaminated food, drinking contaminated water, coming into direct contact with someone who is sick, or with animals that carry the bacteria**
- **Proper hygiene and safe food handling and preparation practices are key to preventing the spread of *E. coli***

http://www.microbiologyinpictures.com/escherichia%20coli.html

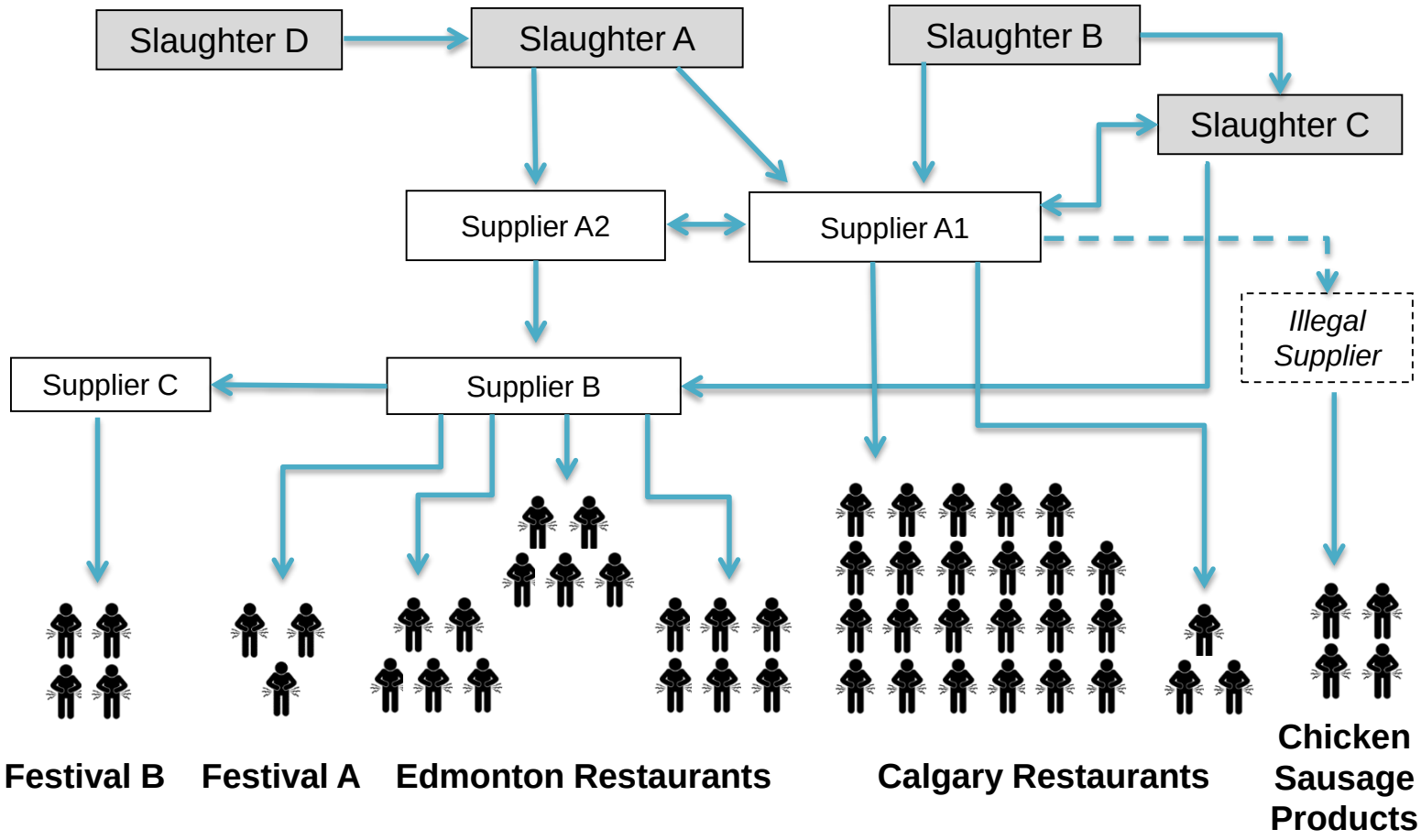
E. coli O157:H7 Outbreak 2014: July 28 – November 13, 2014

- **A total of 119 illnesses reported**
- **Second largest foodborne outbreak in Canadian history**
- **Complex case:**
  - Exposure to foods at Asian style restaurants common in many cases
  - Initial evidence pointed to mung bean sprouts, beef, lettuce, carrots, cucumbers, green onions, and pork
  - Strong epidemiological evidence linking the outbreak to pork and pork products produced in Alberta

Chronology of Events: *E. coli* O157:H7 Outbreak 2014

- **July 28:** AHS identified sudden increase in *E. coli* O157:H7 cases in the Edmonton zone
- **July 29:** Environmental Public Health initiated an outbreak investigation; alert posted on Canadian Network for Public Health Intelligence
- **August 1:** Foodborne Illness and Risk Investigation Protocol Coordinating Committee formed
- **September 8:** Four AF facilities identified as a potential source
- **September 8 – October 8:** Active Incident Response, Root Cause Analyses initiated by AF
- **November 13:** Investigation closed
- Outbreak linked to pork and pork products produced in Alberta

Connectivity: Many Possibilities



August 1, 2014	September 8, – October 8, 2014	November 13, 2014
FIRIP CC Activated	Active AF Incident Response	Investigation Closed

Connectivity courtesy of AHS

OVERSIGHT OF ALBERTA PROVINCIAL MEAT FACILITIES

AF Licensed

Ante mortem

slaughter

cooling

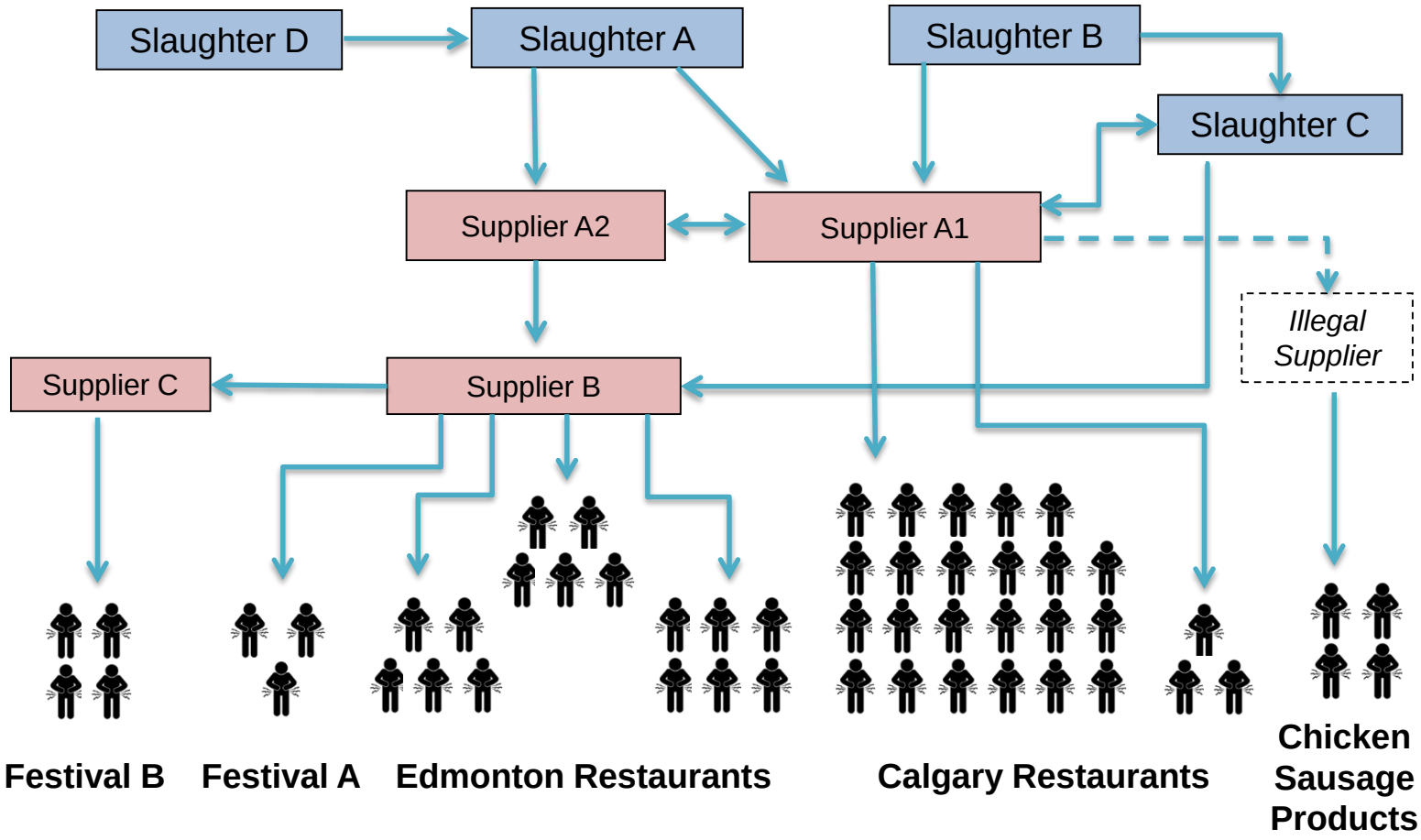
processing

retail

AHS Permitted

No slaughter/no abattoir

Connectivity: Many Possibilities



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Connectivity courtesy of AHS

AF Incident Response

- **CFIA trace back at six AF PLMF**
- **Two facilities ruled out**
- **Environmental sampling at remaining four PLMF**
- **Root Cause Analyses conducted**
- **One facility with two positive composite environmental samples**

Response Objectives

- **Ensure no contaminated product entered the food chain**
- **Maintain public confidence in the food system**
- **Return affected businesses to normal operations as quickly as possible**

Approach

- **Root Cause Analyses**
  - Performed at 4 provincially-licensed abattoirs by certified auditors and AF staff
  - Review of facility including:
    - Facility and Equipment
    - Personnel Practices
    - Operational Practices
    - Leadership and Culture

- **Environmental sampling**
  - Food and Non-Food Contact Surfaces
  - Carcass swabbing, where possible

Sampling Results

- **~ 112 samples (food and environmental) were collected and analyzed for *E. coli* O157:H7**
- **3 of the 4 AF provincially-licensed facilities tested negative**
  - No further investigation
- ***E. coli* O157:H7 was detected in 2 environmental samples from one facility**
  - PFGE patterns were non-case defining
  - All product placed on “ALBERTA HELD” status
  - Facility was directed to cook or dispose of suspect product
  - Facility was ordered to implement and maintain strict inventory control measures

Disposition of Affected Product

- **Disposal (landfill)**
- **Heat treatment**
- **Custom product (processed and provided to owner with instructions**

Common Observations

- **Pens are shared among multiple species and are not thoroughly cleaned between species**
- **Frequent opportunities for cross-contamination related to:**
  - Cleaning and sanitizing of knives and equipment between carcasses
  - Operational flow
  - Cleanliness of animals awaiting slaughter
  - Aerosols and overspray
- **Inconsistent personnel hygiene and training practices**
- **Lack of awareness for the control of pathogenic *E. coli***
- **Little understanding of a culture of food safety**

Corrective Actions

- **Provincial Boot Dip Policy was implemented**
- **Dressing procedures have been updated**
- **Meat Inspection Section has developed an operational plan to address future investigations**
- **Meat Inspection Section is developing and implementing a surveillance program for AF licensed abattoirs**

AF Learnings

- **Review the *Meat Inspection Act* and *Regulation***
- **Establish a policy for pathogen awareness and management in AF facilities**
- **Enhance training requirements (e.g., slaughter floor employees**
- **Review current requirements for training records/procedure monitoring by AF staff**
- **Provide information to AF licensed abattoir operators on procedures and responsibilities during an investigation**

Response Objectives

- **Ensure no contaminated product enters the food chain**
  - Immediate steps taken to oversee cleaning and sanitation of AF facilities
  - Potentially affected products placed on hold, heat treated, or sent for disposal
- **Maintain public confidence in the food system**
  - Good information was provided through the media and other online sources.
  - Public confidence was maintained.
- **Return affected businesses to normal operations as quickly as possible**
  - Additional cleaning and sanitizing efforts in place
  - Suspect product held and segregated

Unconfirmed source of contamination

- **While there is strong epidemiological evidence to indicate the cause of the outbreak was exposure to contaminated pork products, the originating source of the contamination was not confirmed**
  - No single production facility or linear pork distribution chain linked to all contaminated pork products
  - Documentation confirming the source of pork products was not always available or complete
  - Most pork production facilities also processed and/or distributed beef, a common source of *E. coli* O157:H7
  - Pork was not identified as a leading hypothesis for the investigation for the first several weeks, during which the original source of contamination may have dissipated

Next Steps

- **Maintain ongoing communication; internally, inter-agency, and with the industry**
- **Increase coordination of inter-agency laboratories**
- **Increase food safety extension**
- **Maintain appropriate emergency response training**

What went well

- **Dedication of AF staff during the investigation**
  - Incident Command Team
  - Meat Inspection Staff
  - Other staff who stepped in to ensure day to day operations continued
- **Cooperation from plant owners/ operators**
- **Willingness of multiple jurisdictions to work together**
- **Ensuring confidence in the food safety system**

What we can do better

- **Targeted training for staff**
- **Enhanced communication among regulatory partners, especially those on the front line**
- **Enhanced communication for industry stakeholders**
- **Enhanced use of evidence-based policies and procedures for dealing with food borne pathogens at PLMF.**

Conclusions

- **Outbreak investigation required a collaborative and multi-jurisdictional response**
- **Systematic approach used in the trace back investigation highlights the benefits of a collaborative investigation among epidemiology, food safety and inspection partners**
- **Opportunities for improvement have been identified and are being implemented both within government and at AF regulated facilities**

Solving the *E. coli* Outbreak Mystery

http://www.popmatters.com/post/131775-its-technology-my-dear-watson-sherlock-for-the-21st-century/

“Answers were always important, but they were seldom easy.”

(Patrick Rothfuss)

Acknowledgements

- **Incident Command Team**
- **AH/AHS Colleagues**
- **CFIA**
- **FIRIP CC: AHS, AH, AF, CFIA, OFSR, HC, PHAC, Provlab Alberta, FNIHB**
- **AF Meat Facilities Owners and Operators**