The Challenges in Identifying the Source of Salmonella Enteritidis Infection in Humans

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Dean Middleton, BSc, DVM, MSc.

Surveillance and Epidemiology Section
Ontario Agency for Health Protection and Promotion
The Challenges in Identifying the Source

1. Human Epidemiology of SE
2. Routine Public Health Reporting
3. Outbreak Investigations
4. The Hypothesized Source
5. Poultry Data
6. Ontario Multi-Agency SE Working Group
The Challenges in Identifying the Source

1. Human Epidemiology of SE

- Difficult to keep up with the variable number of SE
- Difficult to keep up with the changing Phage Types
SE in Ontario, by Month, Jan 2002 to Oct 2010

Note: Nov. 2005 = 456 cases, Dec. 2005 = 165 cases

Source: Public Health Lab - Toronto
SE in Ontario, by Phage Type

SE PT13 in Ontario, by Month, Jan 2002 to Jun 2010

Source: Public Health Lab - Toronto
SE in Ontario, by Phage Type

Source: Public Health Lab - Toronto
SE in Ontario, by Phage Type

SE PT13a in Ontario, by Month, Jan 2008 to Jun 2010

Source: Public Health Lab - Toronto
SE in Ontario, by Phage Type

Source: Public Health Lab - Toronto
The Challenges in Identifying the Source

1. Human Epidemiology of SE

- The PTs have varied in incidence over 2005 to 2010
- Assumption: there is a different source for each of the PT 13, 8, and 13a
- Focusing on one PT has been difficult
- SE findings in other provinces differ
The Challenges in Identifying the Source

2. Routine Public Health Reporting

- Does not frequently identify a source of enteric illnesses
Routine Public Health Reporting

- 36 health units

- More than 36 people obtaining info on SE cases means lack of uniform data collection

- Not centralized interviewing from 1-2 interviewers
The Challenges in Identifying the Source

3. Outbreak Investigations

- Dedicated investigations have had limited success
- The outbreak of SE is different
- Case-control study is resource intense
Case-Control Study

- Cases = ill from pathogen
- Control = healthy

- Cases interviewed approx. 10-14 days after illness onset
- Cases interviewed without knowing the PT of the case
SE in Ontario, by Month, Jan 2002 to Oct 2010

Note: Nov. 2005 = 456 cases, Dec. 2005 = 165 cases

Source: Public Health Lab - Toronto
A. “Outbreak” Case-Control Study

Bean Sprout Outbreak

- >500 SE PT13 cases in 2 months
- Strong suspicion that bean sprouts was the source prior to implementing the C-C study
- Single source and a “single” disease
Note: Nov. 2005 = 456 cases, Dec. 2005 = 165 cases

Source: Public Health Lab - Toronto
B. “Non-Outbreak” Case-Control Study

- PT13, but no good hypothesis present

- In the past 7 days, ...
  - 91% people consumed chicken*
  - 82% people consumed eggs*

* Nesbitt et. al., 2008

- High prevalence of items consumed in controls makes comparison difficult
B. “Non-Outbreak” Case-Control Study

- Many types of chicken and egg products
- Many sources, many “diseases” for one PT
- Rate the cases occurring would require at least 6 months to achieve statistical power
SE in Ontario, by Month, Jan 2002 to Oct 2010

Note: Nov. 2005 = 456 cases, Dec. 2005 = 165 cases

Source: Public Health Lab - Toronto
C. “Sporadic”
Case-Control Study

- Investigating multiple sources (exposures) and “multiple” diseases (PT8, 13, 13a)

- Often the frequency of these sources (exposures) are < 50%

- Phage typing does not have great “discriminatory” power for SE
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4. The Hypothesized Source

- Chicken and/or eggs
- The characteristics of these food items make it difficult to identify them as a source
Chicken

- **Source** – imported, provincial, federal plant.
- **Type** – raw, processed, fresh, frozen, deli.
- **Purchase Location** – supermarket, small retail, farm gate
- **Cooking Method** - barbequed, fried, baked, microwaved
- **Setting** – home, restaurant, fast food
- **Contact** - with food or live poultry
Eggs

- **Source** – imported, provincial, federal plant.
- **Type** – cooked, raw eggs as an ingredient.
- **Purchase Location** – supermarket, small retail, farm gate
- **Cooking** – scrambled, fried, boiled, runny
- **Setting** – home, restaurant, fast food
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If the Reservoir is poultry/eggs:

- mode of transmission and exposure of SE to humans is not well understood or quantified
- likely exposure to humans from many sources
- likely intermittent contamination
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5. Poultry Data

- There is a gap in the link between data findings from poultry and humans.
- There are no available poultry data that are routinely collected specifically for monitoring SE.
Ontario Fluff Sample Data

SE Phage Type Distribution (2003 - 2010, January to October)

Source: Ontario Hatchery Supply Flock Policy
Broiler Chicken Abattoir Data

- Altecruze et. al., SE in Broiler Chickens, United States, 2000 – 2005
- Annual # of SE positive rinses increased more than 4-fold
- The # of establishments with SE positive rinses increased nearly 3-fold
- PT13 accounted for 50% of all isolates
- PT8 accounted for 35% of all isolates
6. Ontario Multi-Agency SE Working Group

The multi-disciplinary WG has met with limited success at identifying the source of SE.
SE in Ontario, by Phage Type

Source: Public Health Lab - Toronto
Ontario Multi-Agency SE Working Group

- Ministry of Health and Long-Term Care
- Ministry of Agriculture, Food and Rural Affairs
- Canadian Food Inspection Agency
- Public Health Agency of Canada
- Ontario Agency for Health Protection and Promotion
Ontario Multi-Agency SE Working Group

- Multi-disciplinary governmental approach
- Communicated findings to Ontario industry “Feather Boards” periodically
The WG has been useful in many regards.

However;

The WG has met with limited success at:

- identifying the source of human SE infection
- preventing human cases of SE
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Acknowledgements

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