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

December 1, 2010

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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

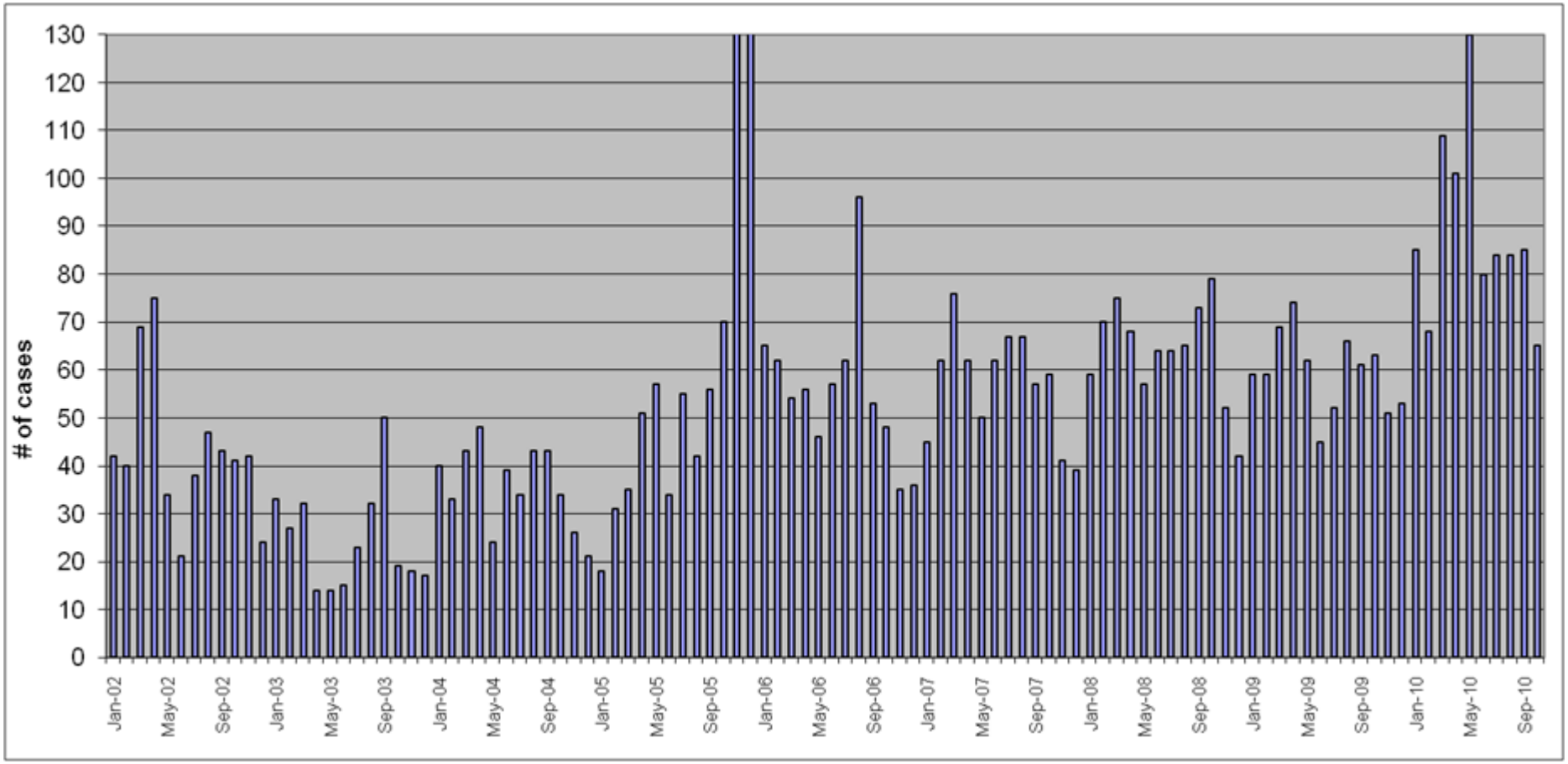
The Challenges in Identifying the Source

1. Human Epidemiology of SE

- Difficult to keep up with the variable number of SE

- Difficult to keep up with the changing Phage Types

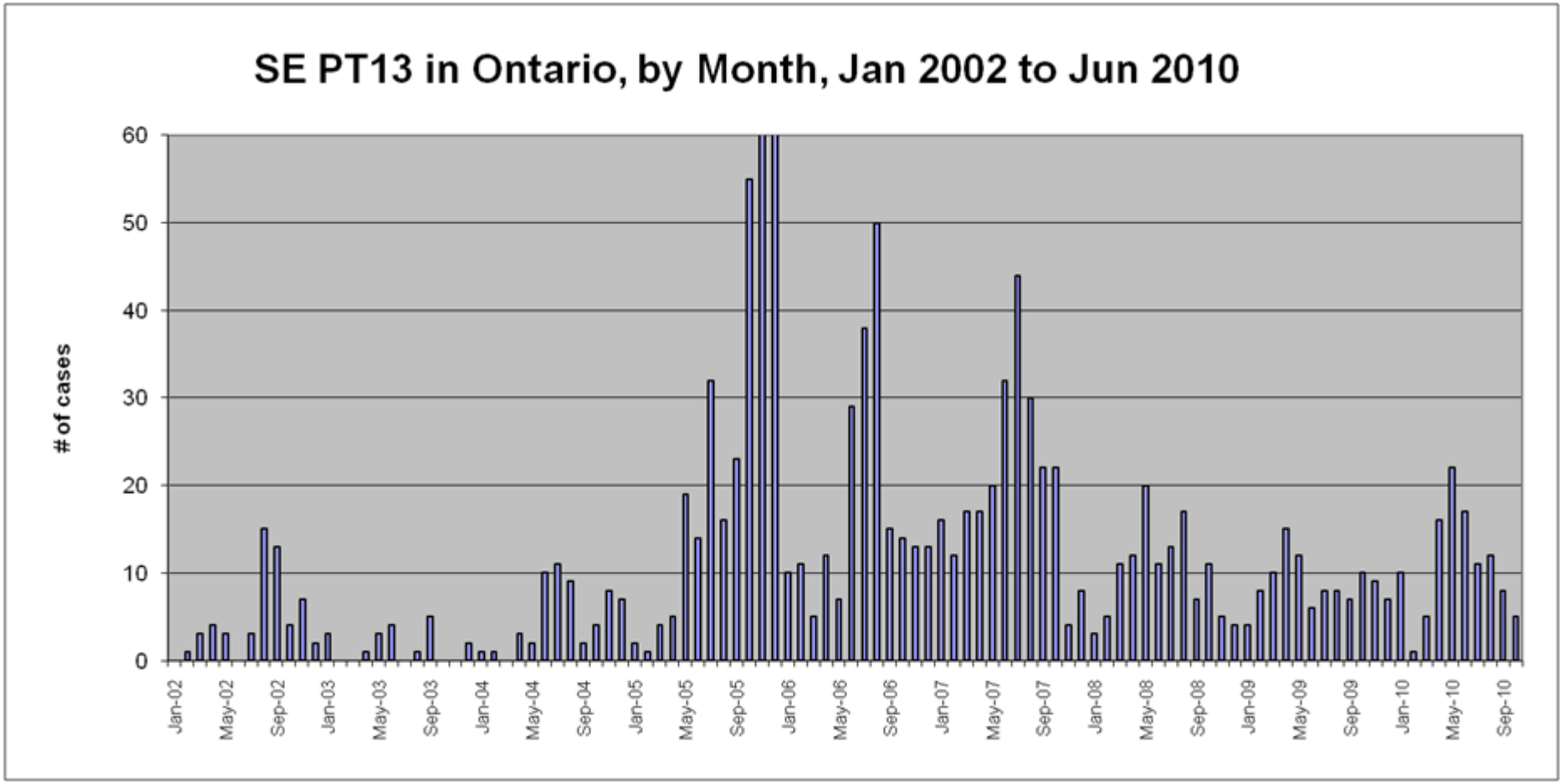
SE in Ontario, by Month, Jan 2002 to Oct 2010



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

Source: Public Health Lab - Toronto

SE in Ontario, by Phage Type



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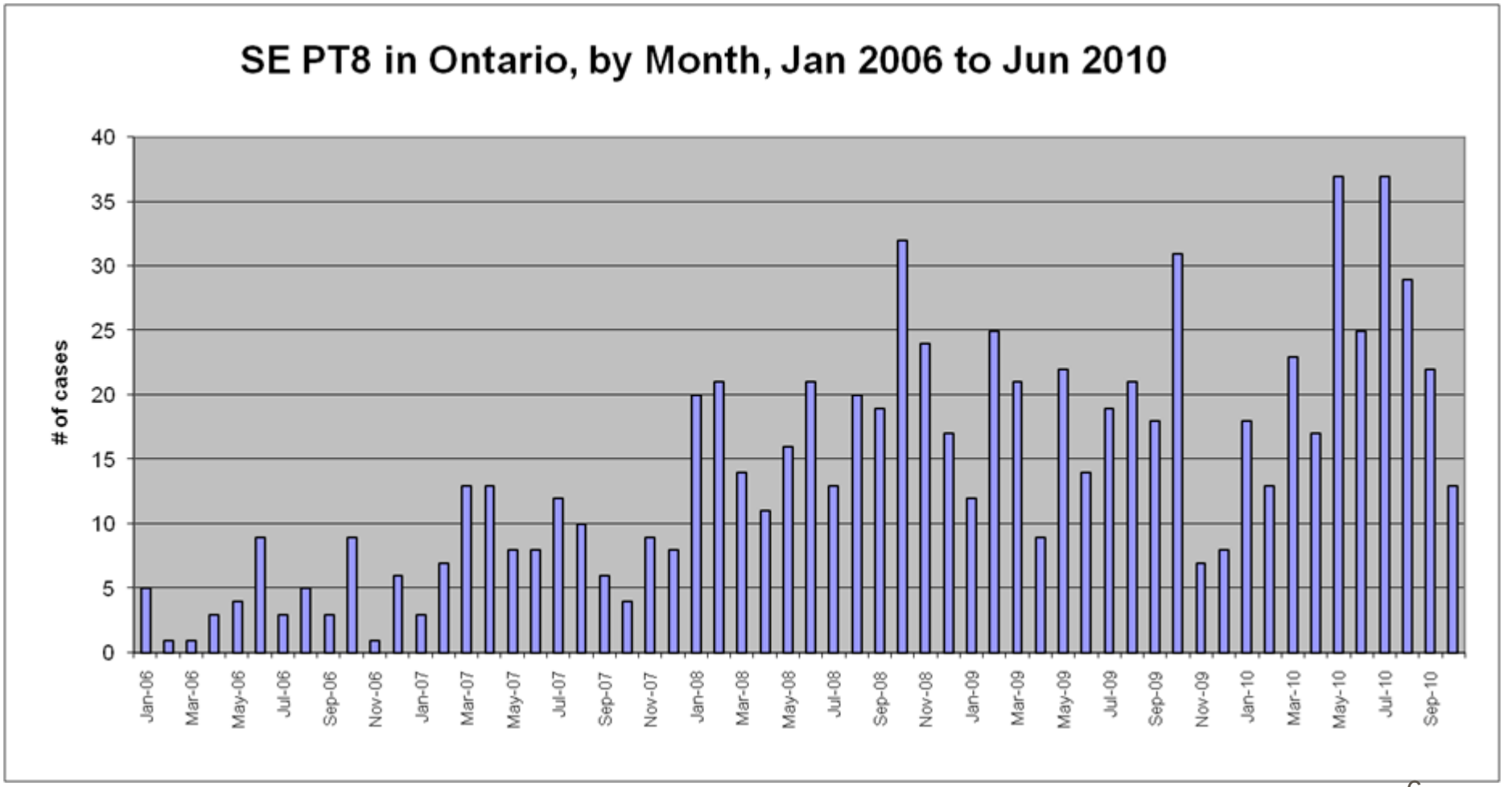
SE in Ontario, by Phage Type



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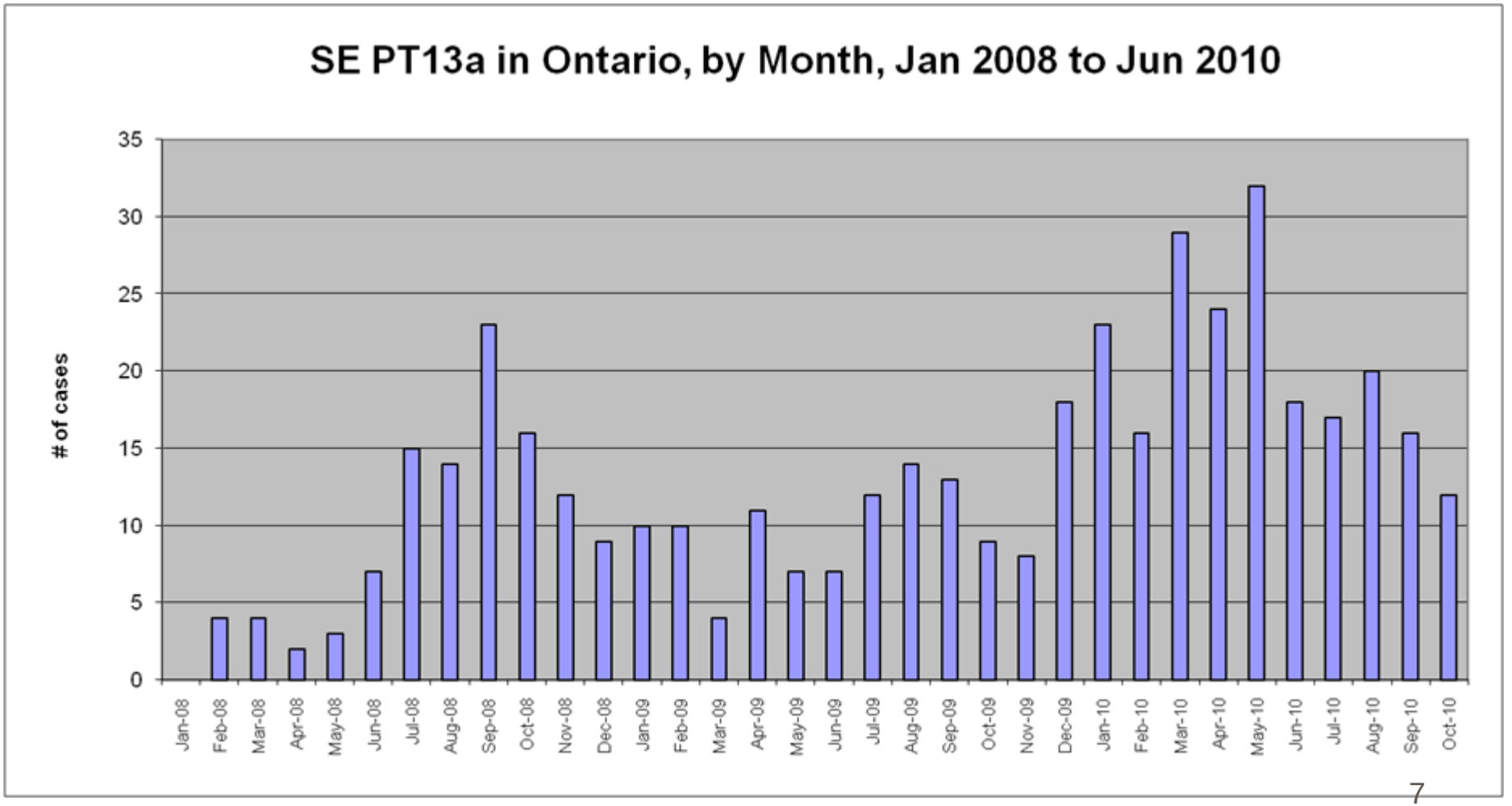

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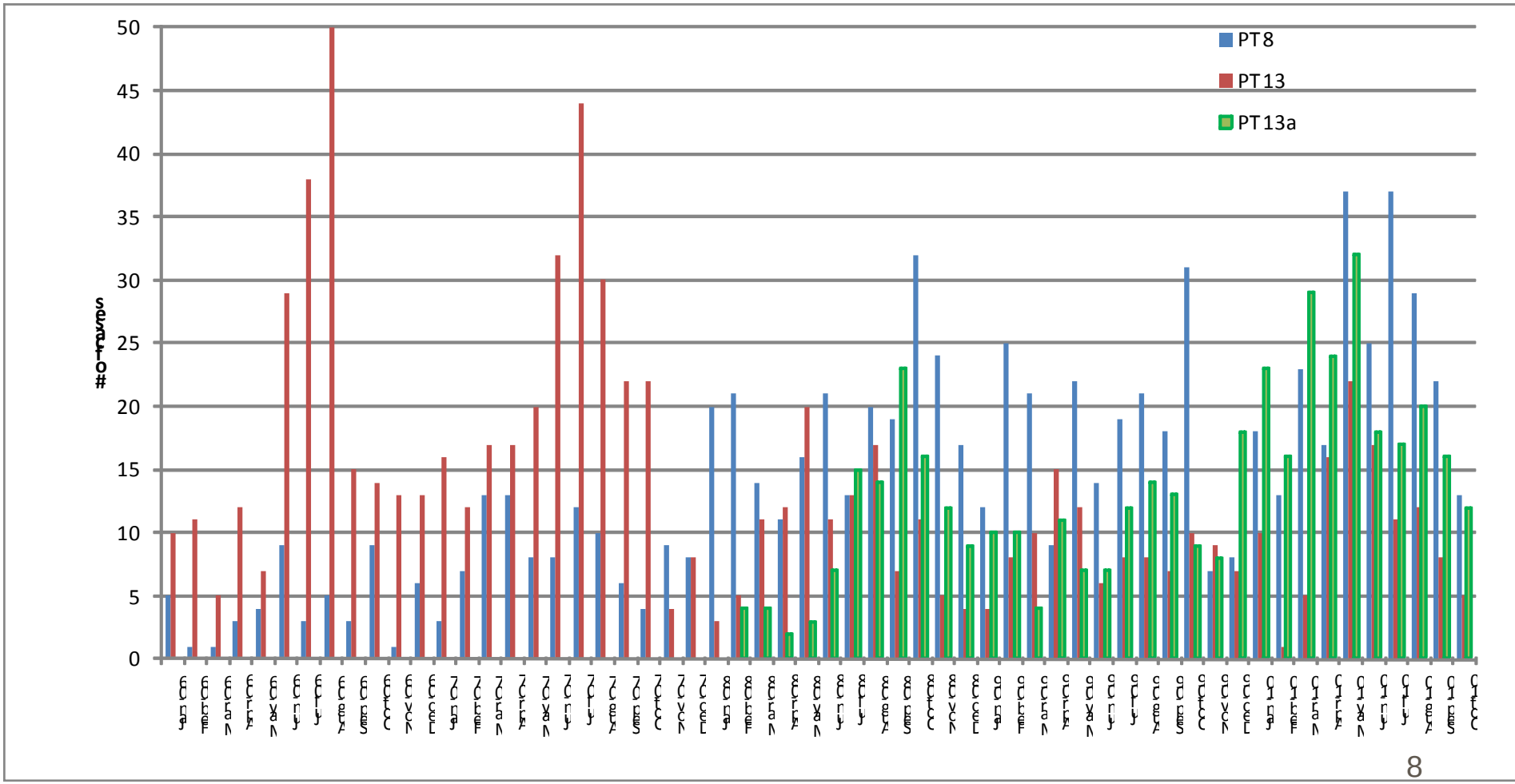

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The Challenges in Identifying the Source

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

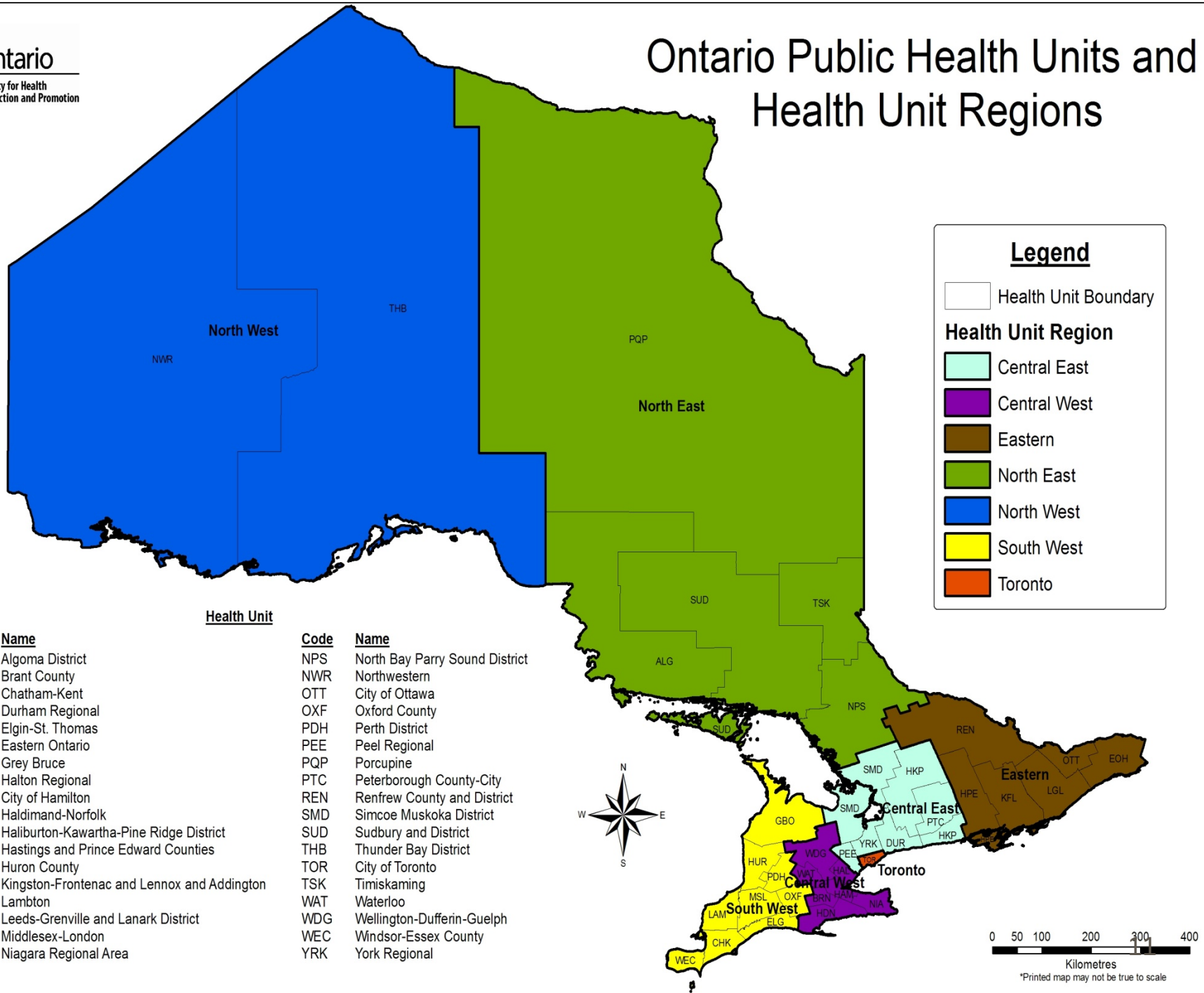
The Challenges in Identifying the Source

2. Routine Public Health Reporting

- Does not frequently identify a source of enteric illnesses

Ontario
Agency for Health Protection and Promotion

Ontario Public Health Units and Health Unit Regions



Health Unit

Code	Name
ALG	Algoma District
BRN	Brant County
CHK	Chatham-Kent
DUR	Durham Regional
ELG	Elgin-St. Thomas
EOH	Eastern Ontario
GBO	Grey Bruce
HAL	Halton Regional
HAM	City of Hamilton
HDN	Haldimand-Norfolk
HKP	Haliburton-Kawartha-Pine Ridge District
HPE	Hastings and Prince Edward Counties
HUR	Huron County
KFL	Kingston-Frontenac and Lennox and Addington
LAM	Lambton
LGL	Leeds-Grenville and Lanark District
MSL	Middlesex-London
NIA	Niagara Regional Area

Code	Name
NPS	North Bay Parry Sound District
NWR	Northwestern
OTT	City of Ottawa
OXF	Oxford County
PDH	Perth District
PEE	Peel Regional
PQP	Porcupine
PTC	Peterborough County-City
REN	Renfrew County and District
SMD	Simcoe Muskoka District
SUD	Sudbury and District
THB	Thunder Bay District
TOR	City of Toronto
TSK	Timiskaming
WAT	Waterloo
WDG	Wellington-Dufferin-Guelph
WEC	Windsor-Essex County
YRK	York Regional

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

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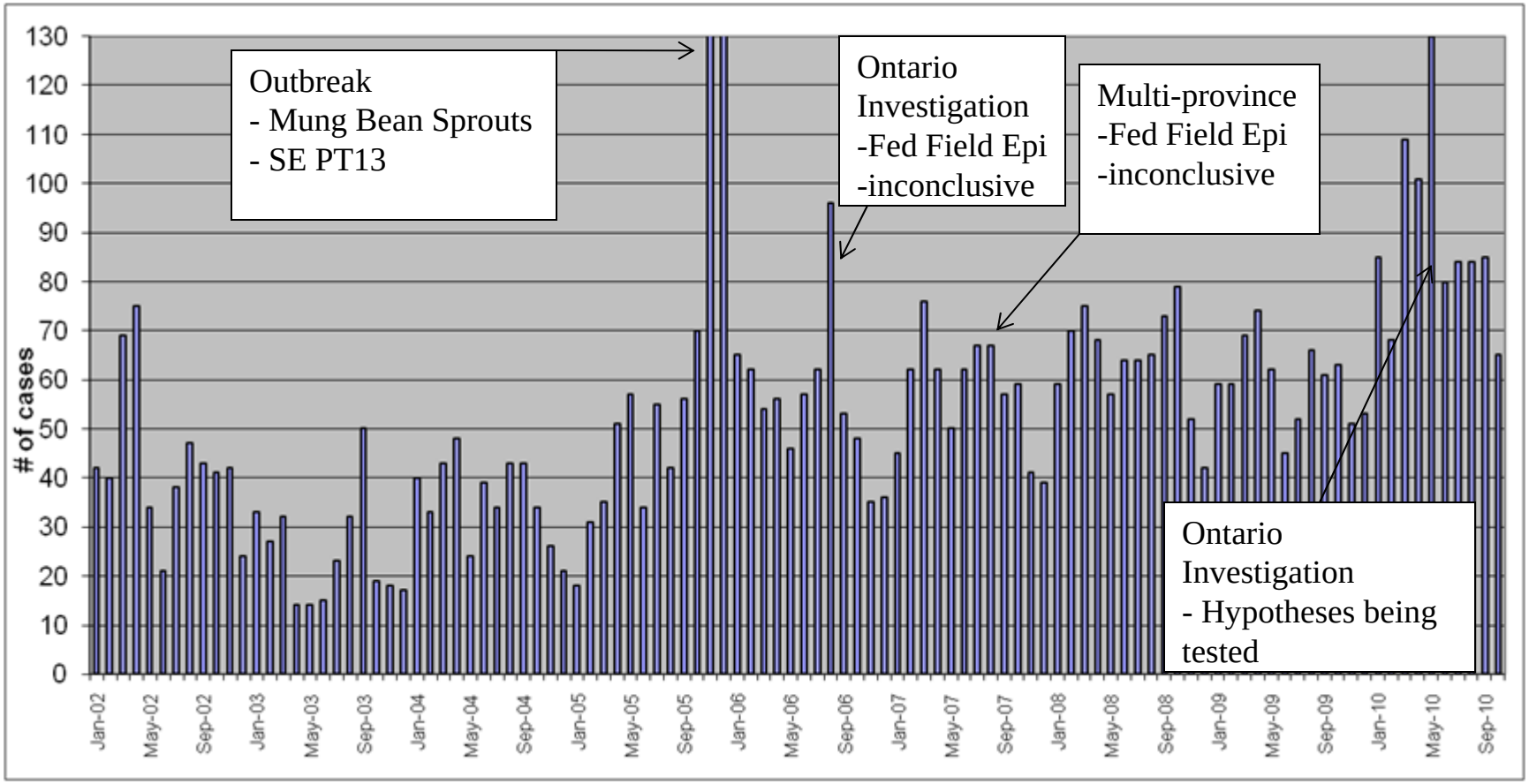

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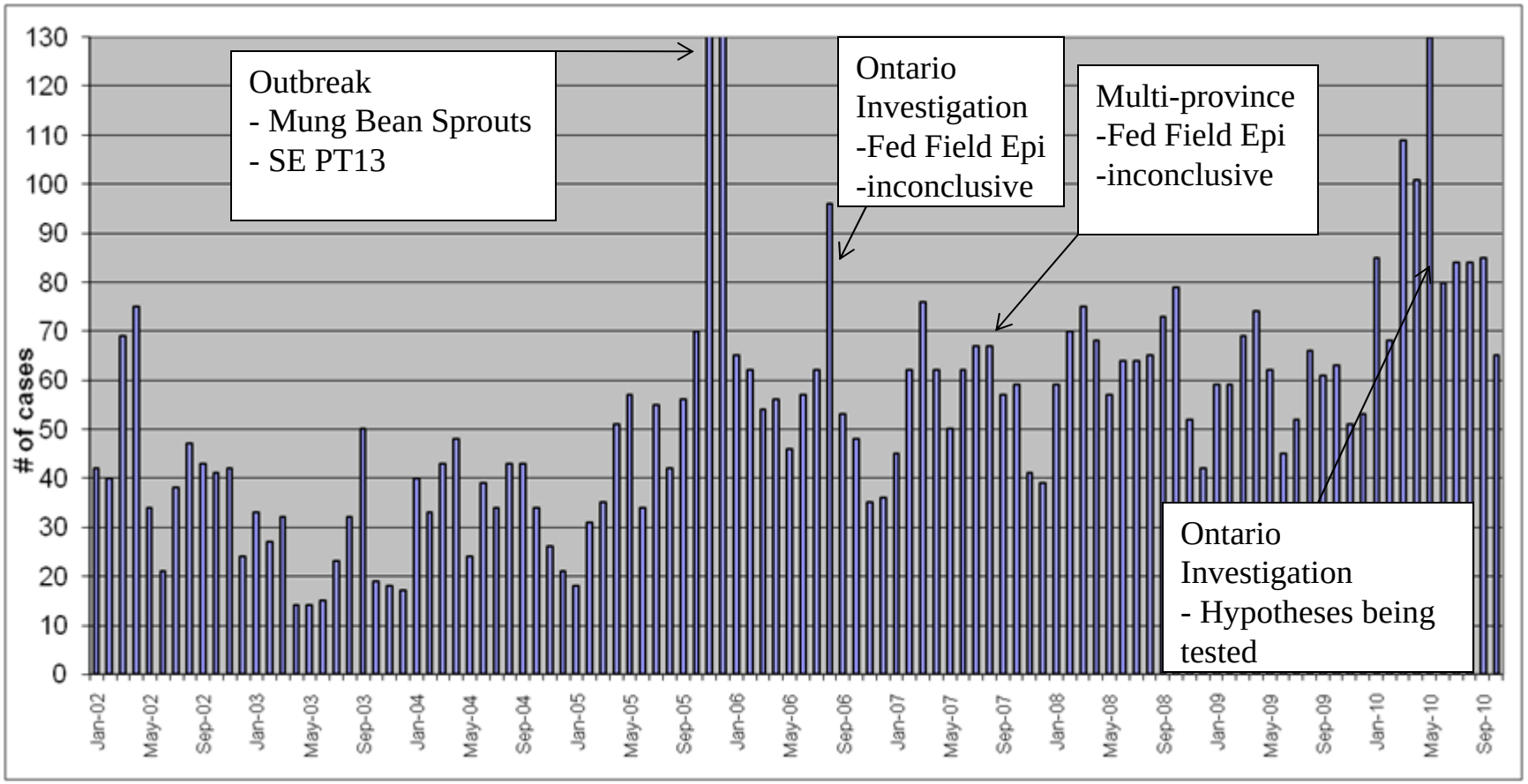
A. "Outbreak" Case-Control Study

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

SE in Ontario, by Month, Jan 2002 to Oct 2010



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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

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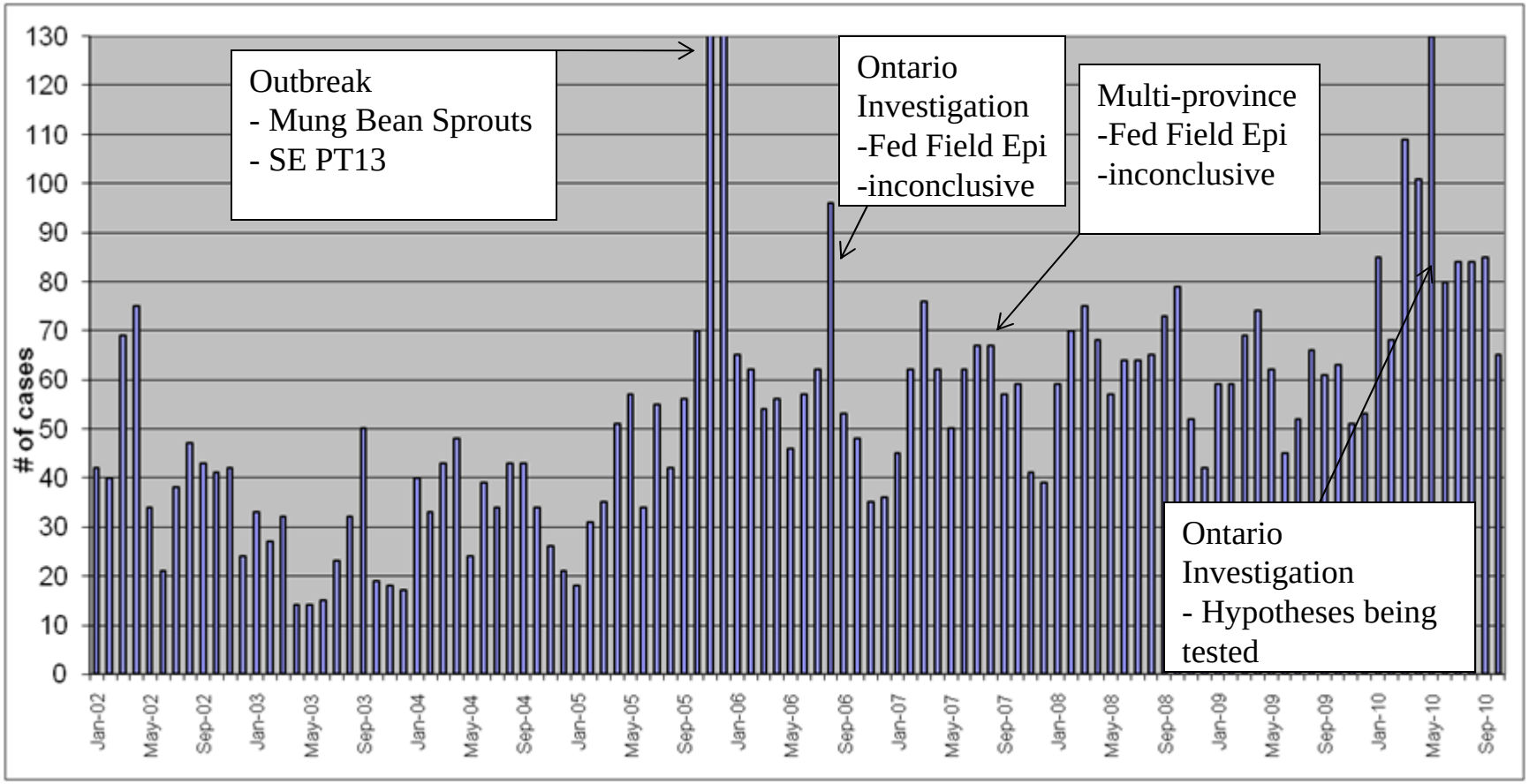

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C. “Sporadic” Case-Control Study

- 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

The Challenges in Identifying the Source

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

The Challenges in Identifying the Source

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

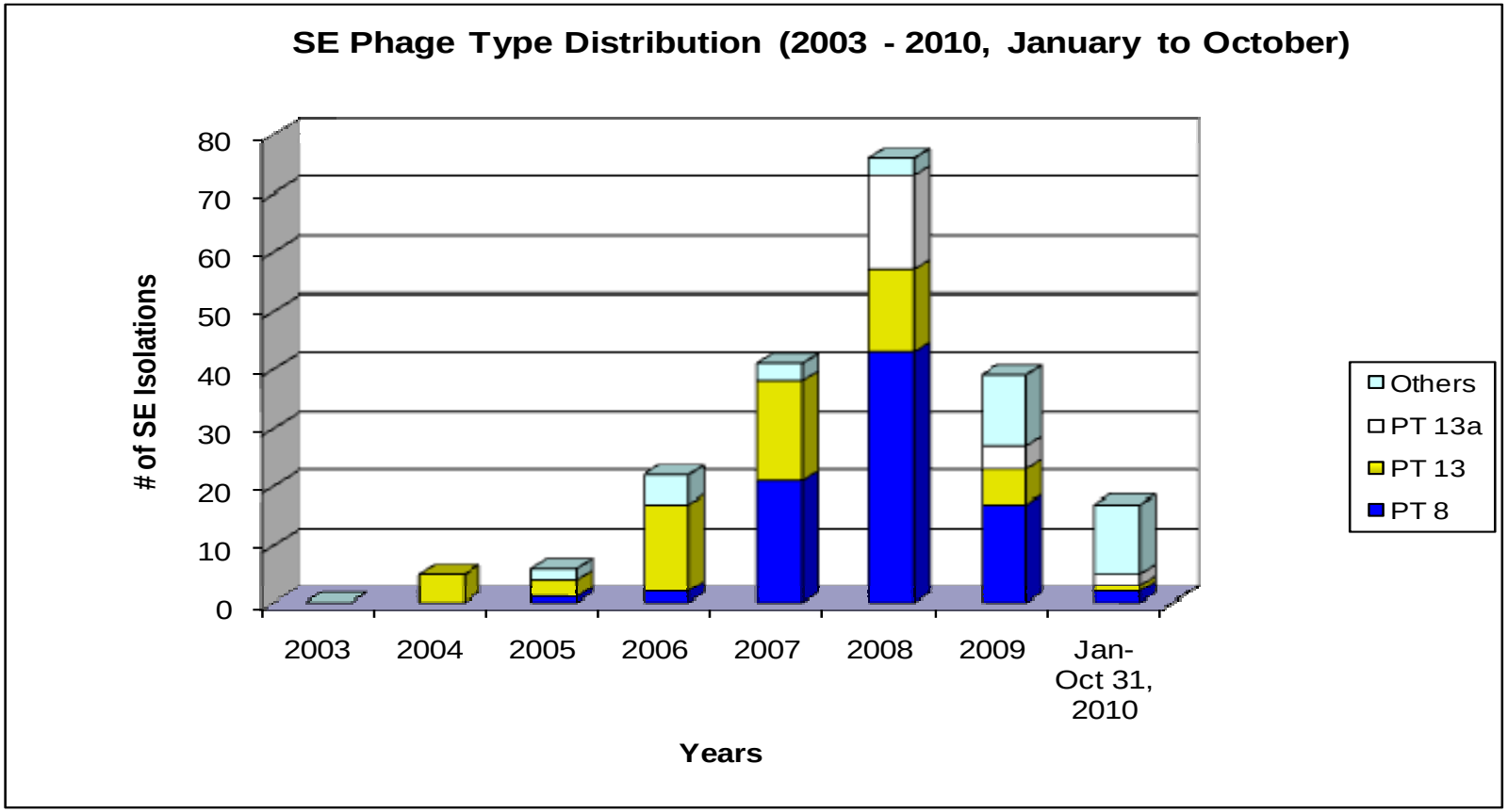
The Challenges in Identifying the Source

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



Source: Ontario Hatchery Supply Flock Policy

Broiler Chicken Abattoir Data

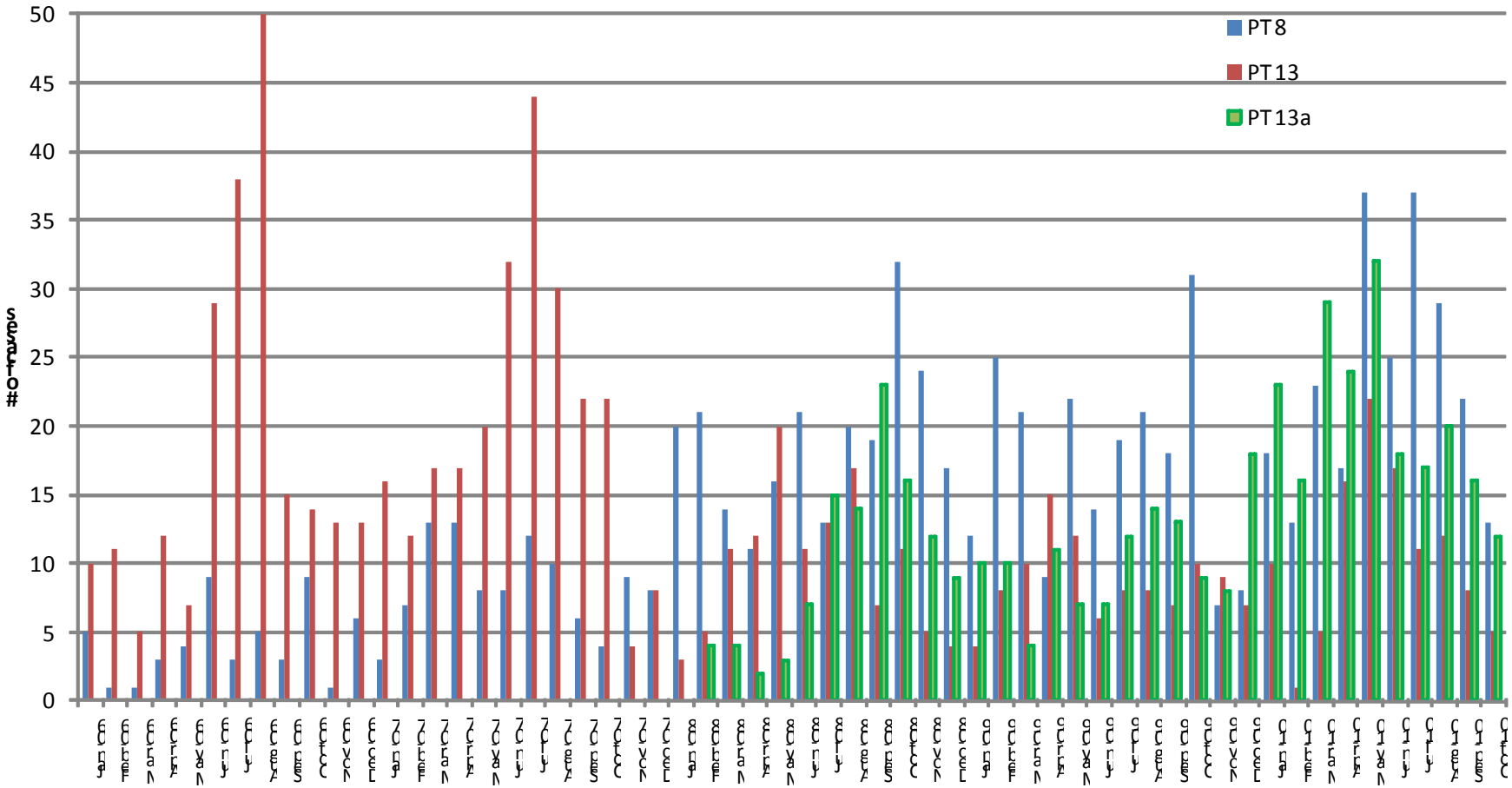
- Altecruze et. al., SE in Broiler Chickens, United States, 2000 – 2005
- Annual # of SE positive rinses increased more than 4-fold
- The # of establishments with SE positive rinses increased nearly 3-fold
- PT13 accounted for 50% of all isolates
- PT8 accounted for 35% of all isolates

The Challenges in Identifying the Source

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



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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

Ontario Multi-Agency SE Working Group

- 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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