# Is it the chicken or the egg? The ongoing investigation of *Salmonella* Enteritidis in BC: Challenges, collaboration and next steps

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BCCDC Rounds
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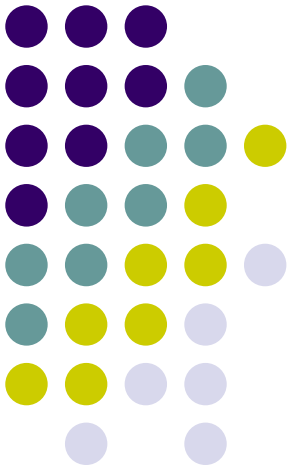


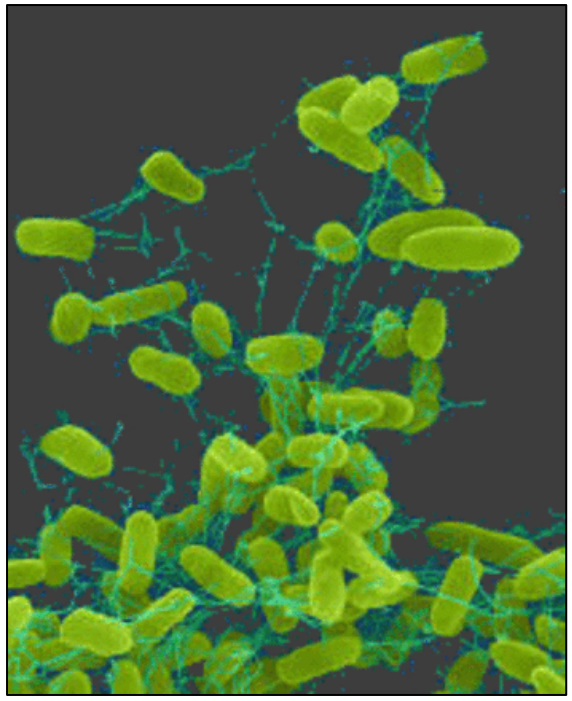
BC Centre for Disease Control
An agency of the Provincial Health Services Authority

# Outline

- *Salmonella* Enteritidis (SE) background
- Epidemiology of SE in humans in BC
- Outbreak investigation in BC (2008-2010)
  - Epidemiological
  - Environmental
  - Collaboration with animal health colleagues
  - Actions taken
- Lessons learned

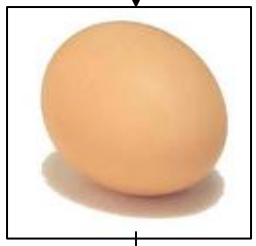
# *Salmonella* Enteritidis (SE) illness

- Incubation
  - 12-36h
- Clinical illness
  - Diarrhea, fever, nausea
  - Duration: few days
  - 22% hospitalized
  - Death rare

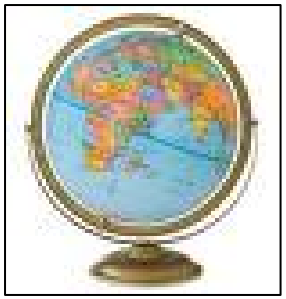


# SE reservoir and transmission

- Reservoir: poultry
- Horizontally transmitted to other poultry
- Vertically transmitted to eggs
- Source: contaminated food
  - Occasionally via contact with poultry
  - Rarely person-to-person

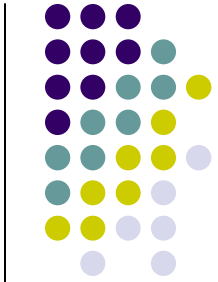


# SE global pandemic



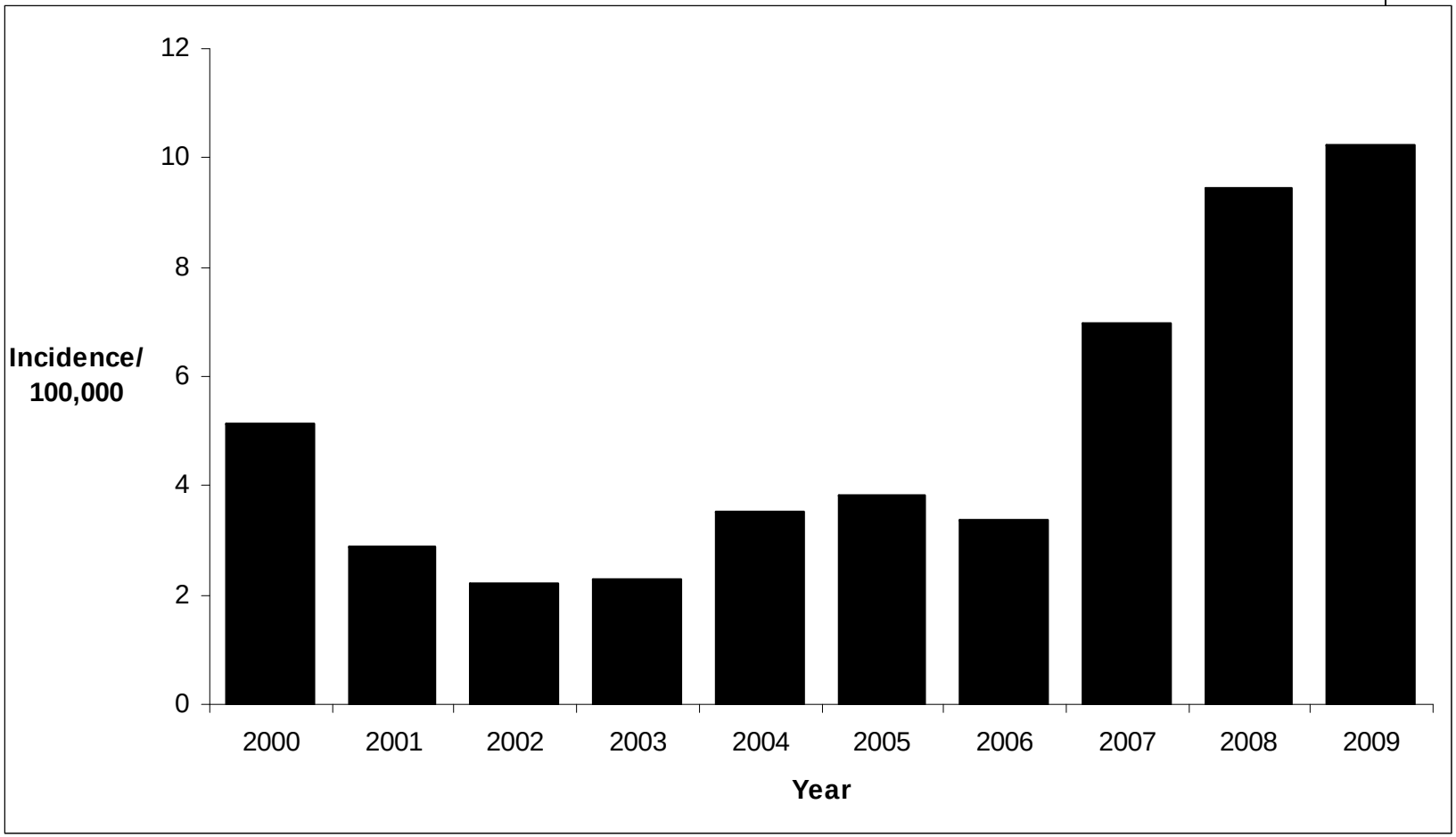
- SE caused global pandemic in 1970-90s
  - Mostly due to PT4
  - Avoided Canada
- Initially, eggs were virtually sole source
- More recently, chicken has also been implicated
- Some countries have successfully controlled SE, others not
  - Requires intensive on farm control measures and top-down approach

# SE from a BC perspective



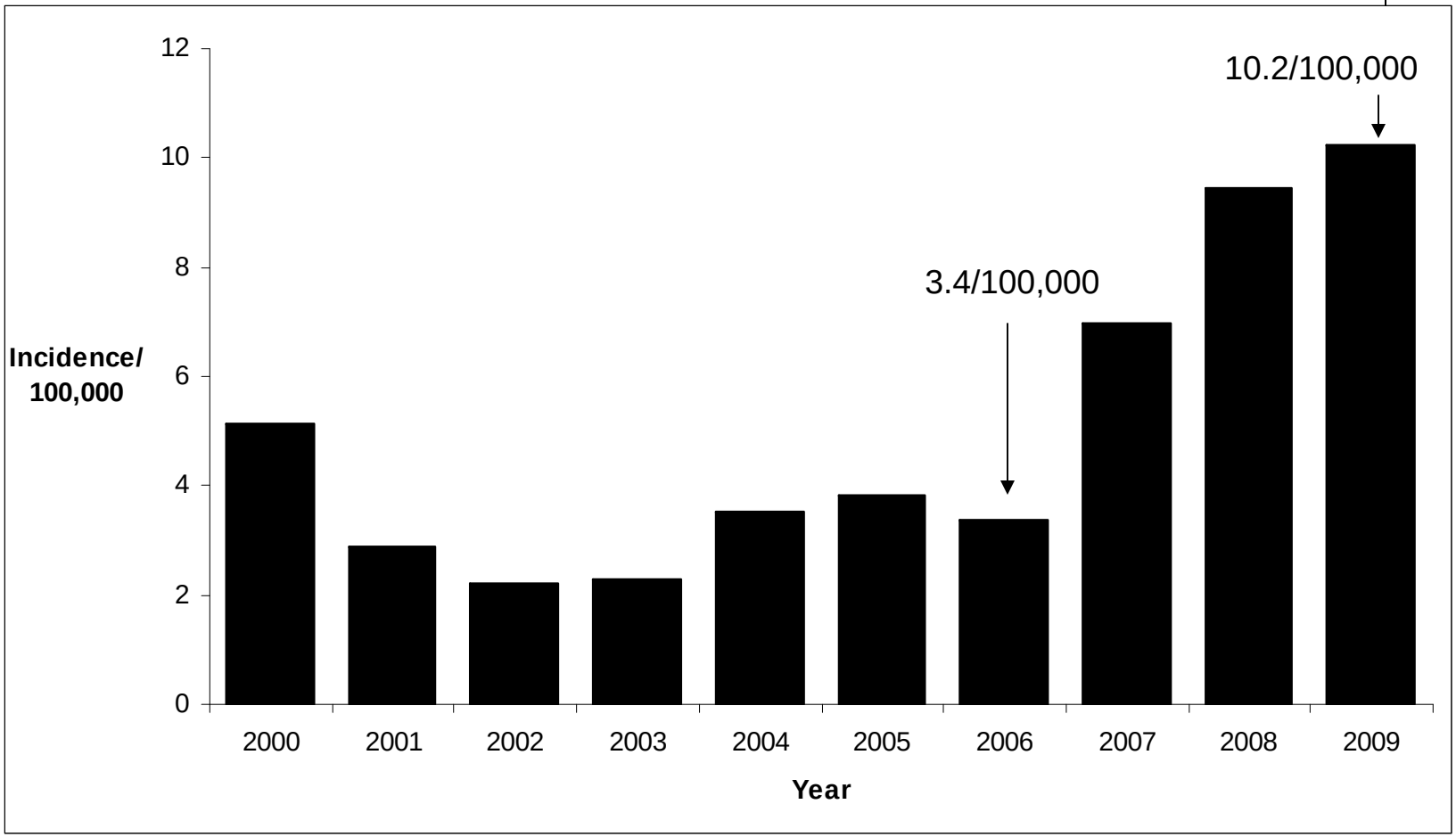
- *Salmonella* is the second most common enteric pathogen in BC
  - 952 cases reported in 2009
- SE has been the most common serotype since 2004
  - 2004: 20% of all *Salmonella* isolates
  - 2009: 45% of all *Salmonella* isolates

# SE Incidence in BC, 2000-2009



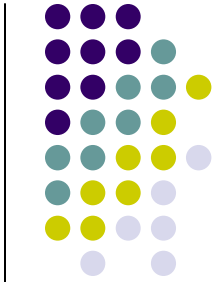

Source: BCCDC PHRML

# SE Incidence in BC, 2000-2009




Source: BCCDC PHRML

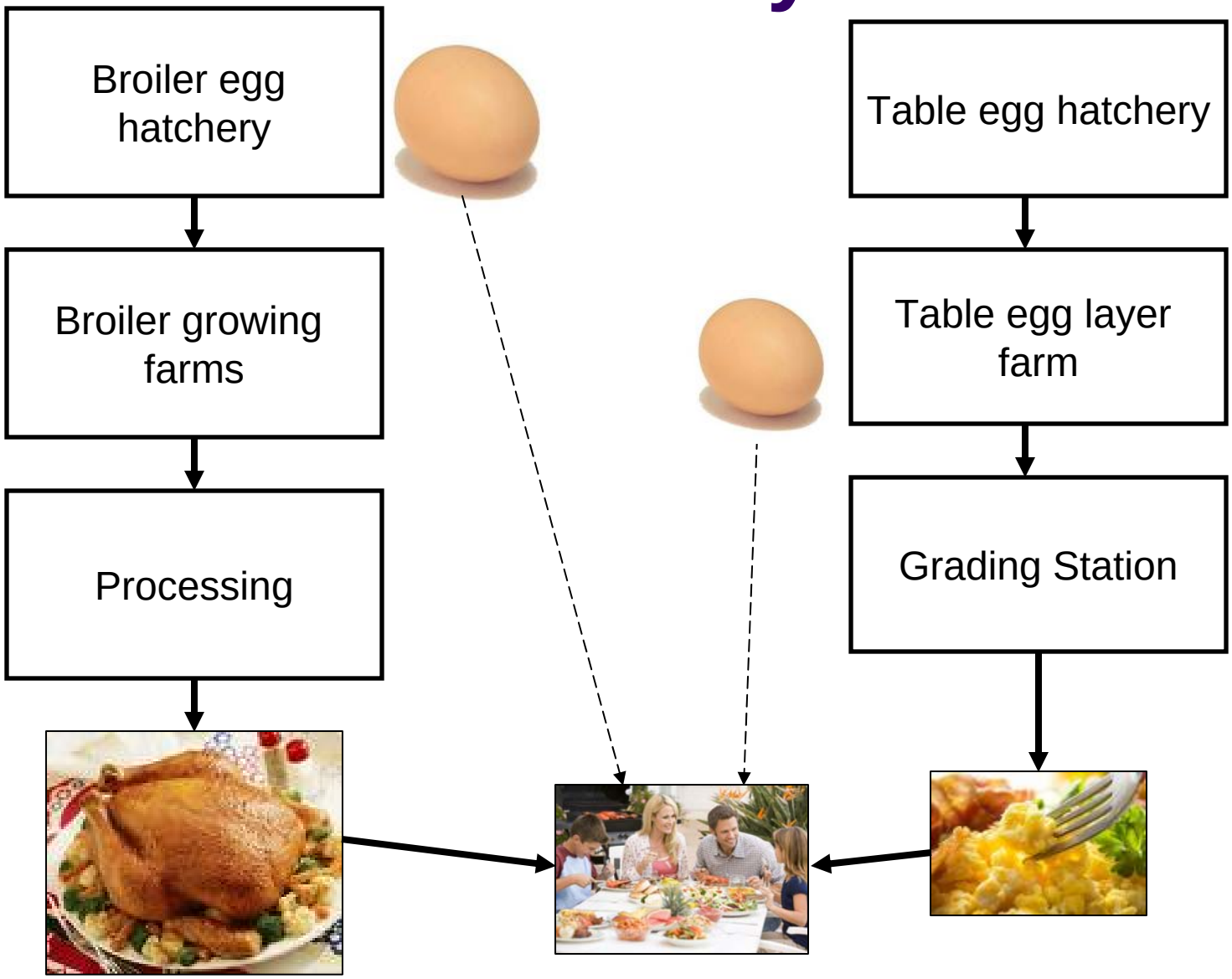
# Emergence of SE 3 in BC



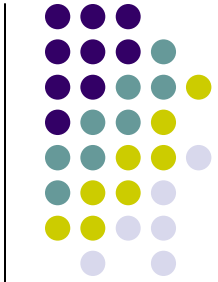
- Restaurant cluster associated with raw egg mayo in June 2008
- Previous outbreaks
  - 2000: egg wash*
  - 2007: egg noodle factory
  - 2007: chicken omelette
- Animal data
  - BC Ministry of Agriculture
  - CIPARS

*B Strauss, M Fyfe, K Higo, M Sisler, A Paccagnella, A Trinidad, K Louie, C Kurzac, B Zaharia. *Salmonella* Enteritidis Outbreak Linked to a Local Bakery, British Columbia, Canada. CCDR. April 1, 2005. Vol 31-07.

# Supply managed poultry industry

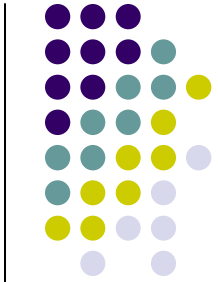


# Investigation methods



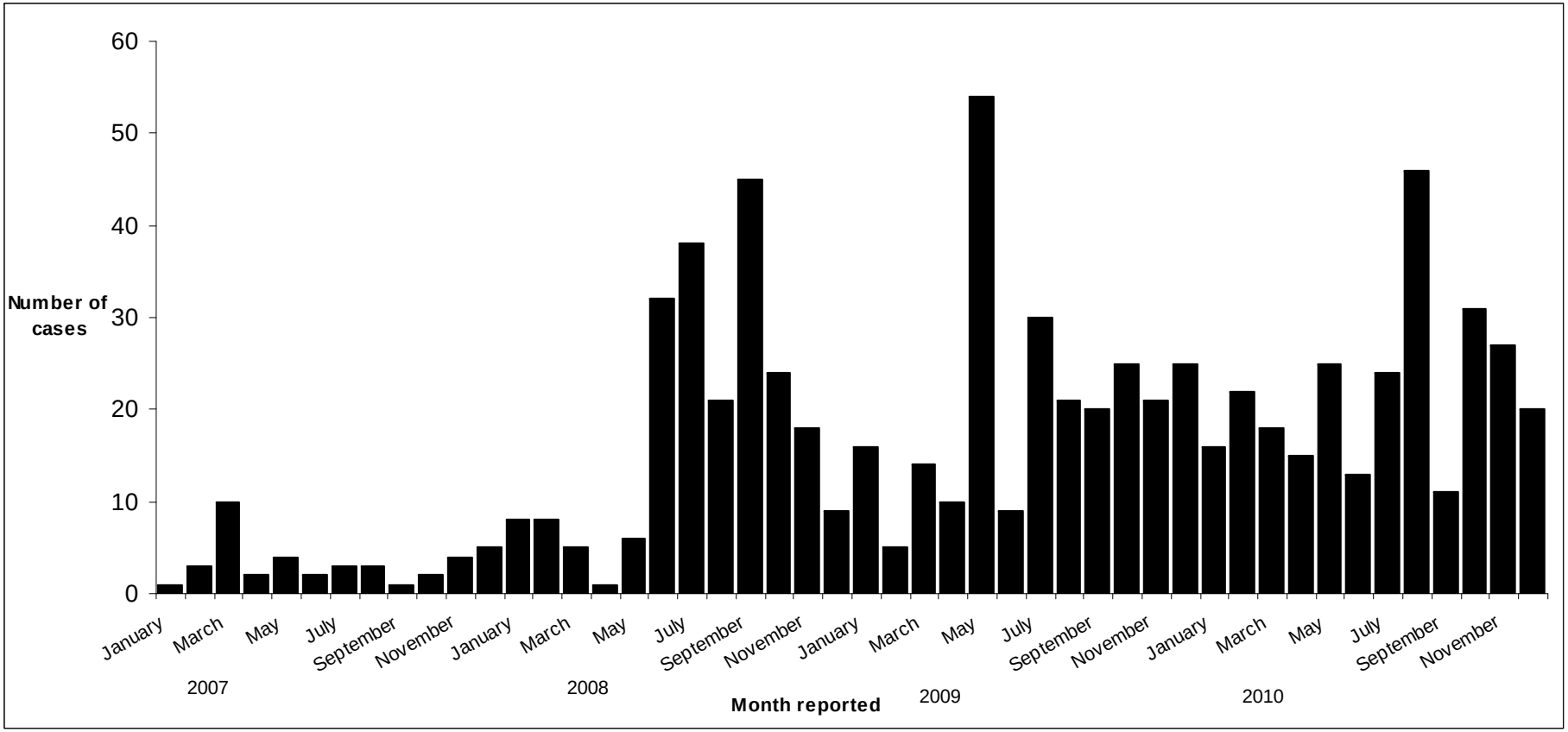
- Epidemiology
  - Case follow-up
  - Case control study
- Environmental
  - Cluster investigations
  - Egg confiscations
- Laboratory
  - Food testing
- Animal health (Animal Health Centre)
  - Diagnostic
  - Monitoring data
    - Registered broiler hatcheries (CFIA monitoring)
    - Regulated table egg industry (Industry monitoring)

# Case follow-up



- Case interviews conducted with all cases of salmonellosis in BC
- Routine and enhanced questionnaires used
- Questionnaires forwarded to BCCDC for central analysis
- Matched to PFGE information

# SE 3 infections, BC, by reported week, January 2007-December 2010




Source: BCCDC PHRML

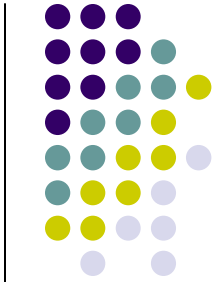
# Cluster investigations


- Cluster = multiple cases associated with a common food place or event
- Investigation conducted by an EHO
  - Information on food sources collected
  - Investigate hygiene, food preparation, appropriate food storage.
- Information on incidents of egg confiscations due to dirty, cracked or inappropriately stored eggs collected

# Investigation results- Environmental

- Traceback
  - Attempted for all clusters and sporadic cases where possible
  - No single common source was identified
  - Significant challenges identified during ungraded egg traceback
    - Lack of receipts, supplier information
  - Redistribution of eggs from farms

# Case Control Study

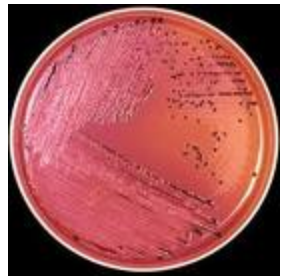


- Retrospective case control conducted from November, 2008-February, 2009
- 92 cases matched to one control
  - Geography and age range (0-4, 5+)
- Controls recruited through sequential digit dialing
- Controls were asked about exposures for same three days case had been asked about

# Laboratory Investigation

- Food samples from case homes and clusters were sent for testing to BC PHRML Food Laboratory

- 53 food samples tested during the investigation
  - 39 in 2008 and 14 in 2009
- Mayonnaise made with raw egg on-site from the first restaurant cluster was positive.
  - Matched the outbreak PFGE pattern (SE 3)
- 48 samples were ungraded broiler hatching eggs found during investigation and inspection



# Investigation results-Animal data

- Ill and dead chicken diagnostics and registered broiler hatchery monitoring
- Registered table egg monitoring

# What is causing illness in humans?

- We believe eggs are the most likely source
  - Epidemiological data: exposure information, case control study
  - Cluster investigations
  - Other documented outbreaks of SE 3 associated with eggs

- The role of chicken meat is unclear
  - Animal data
  - Not all cases consumed eggs

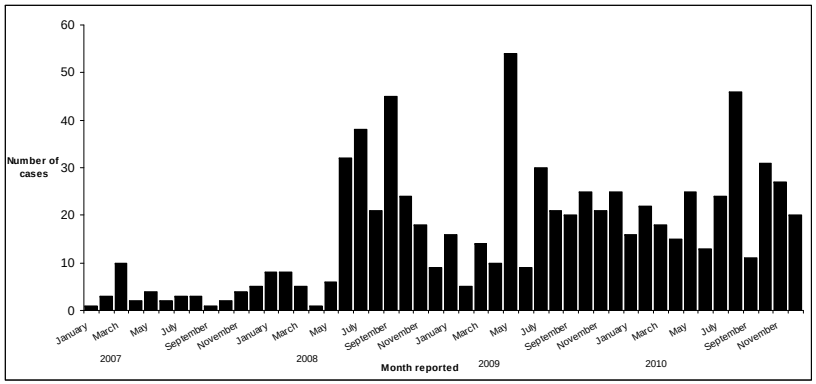
# Actions taken in BC

- Public
  - Annual media releases to raise awareness
- Restaurants/retail
  - Confiscation of eggs
  - Progressive enforcement
- Farm level
  - MAg: awareness raising among industry
  - Broiler hatching egg industry
    - SE vaccination
    - Pilot of increased SE testing
    - Recommended ceasing sale of hatching eggs at farmgate

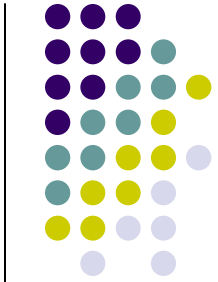
# Impact

- Decrease in number of restaurant egg confiscations and clusters identified
- No decrease in overall incidence rate in humans or animals
  - Too early?
  - Insufficient actions?
  - Inappropriate actions?

SE incidence in BC 2007-2010

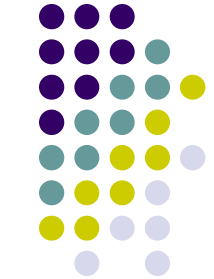


# Lessons learned



- Current SE subtyping methods insufficient to discriminate between sources of SE
  - NML assessing SNP analysis
- Commonly consumed food item is difficult to identify as source of outbreak
  - Collaborate multi-sectorally
  - Use variety of methods and data sources

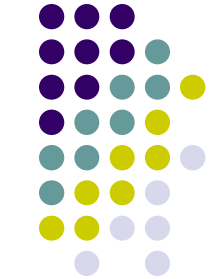
# Lessons learned



- Egg and layer farm environment testing do not readily identify SE
  - Rely on epidemiology
  - Consider alternate testing methods

- Animal data mostly generated by industry and are proprietary
  - Need standards and data sharing agreements

# Lessons learned



- Current BC regulations insufficient to address problem
  - Rely on education and awareness raising

- Public education has mixed results and is resource intensive because it needs to be sustained and multi-faceted

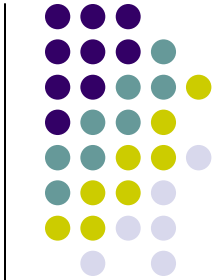
# Regulations (PH)

- Food Premises Regulations (Health Act)
  - An operator of a food premises must not store, display, offer for sale or sell food that is contaminated or unfit for human consumption
  - All food must be obtained from a government-approved source
- Public Health Act
  - MHO may order any action necessary to prevent transmission of infectious or hazardous agent

# Regulations (MAg)

- Shell Egg Grading Regulation (Agricultural Produce Grading Act)
  - All eggs sold in BC must be marked with a grade
    - “Egg” does not include a (broiler) hatching egg
  - Cannot purchase ungraded eggs for the purpose of reselling them
    - Allows farmgate sale of eggs directly to consumer
  - MAg can detain eggs that do not comply
    - MAg does not have resources to inspect

# Next steps



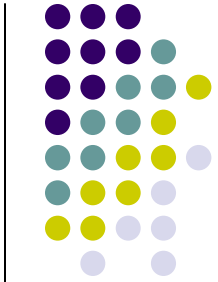
Investigation

- Enhanced surveillance to identify more clusters, characterise and focus on “at risk” restaurants and traceback to source farms

Actions

- More proactive approach with restaurants to avoid purchase of dirty eggs
- Review of regulatory tools
- Continued interaction and sharing of information with industry to encourage action

# Canadian SE Symposium and Workshop, Dec 1-2 2010



Actions recommended for priority challenges:

- Set control goals for SE in Canada
- Agree on the source of SE infections in humans
- Develop common standards for the diagnosis and response to SE
- Facilitate data sharing between sectors
- Identify the focus and means of SE control

Present to CMOH, CVO, PHAC, HC, CFIA and 5 Feather Boards to develop national strategy

# What does this mean for you?

# Acknowledgements


- Vancouver Coastal Health Authority
- Fraser Health Authority
- Vancouver Island Health Authority
- Interior Health Authority
- Northern Health Authority
- BC Ministry of Agriculture
- BCCDC Public Health Microbiology and Reference Lab
- Canadian Food Inspection Agency
- Public Health Agency of Canada
- BC Centre for Disease Control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**THANK YOU**