



BC Integrated Surveillance of Foodborne Pathogens (BCISFP) Annual Summary

Salmonella Findings

2015

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Introduction

BC Integrated Surveillance of Foodborne Pathogens (BCISFP) was initiated in October 2006. The mission is to provide surveillance along the food chain for safer food and healthy people in British Columbia (BC). *Salmonella* is the first pathogen under surveillance because it is cultured within all sectors (animal, food and humans), is recovered at high rates, has several subtyping methods available, and affects a great variety of food commodities. For more information please visit: www.bccdc.ca/integratedfoodchainsurveillance.

This is the sixth annual summary. The purpose of the summary is to provide integrated information about the occurrence of *Salmonella* in BC among humans and at select points along the food chain. Data are sourced from four distinct sectors: human, animal (farm, domestic, and wild life), abattoir and food. Details about the data sources and how they are integrated are described in [BC Integrated Surveillance of Foodborne Pathogens Methods](http://www.bccdc.ca/integratedfoodchainsurveillance) available at www.bccdc.ca/integratedfoodchainsurveillance. In 2015, the BCISFP report includes two new data sources: 1) farm data from CIPARS/FoodNet Canada, and 2) retail meat data from FoodNet Canada (BC sentinel site).

Results – Overview

In 2015, *Salmonella* was isolated from 703 clinical specimens from locally-acquired human cases, 203 food specimens, 34 abattoir specimens and 827 animals ([Table 1](#)). A total of 87 serotypes were observed in 2015; 24 serotypes were common across two or more sectors while 63 were observed in only one sector each. Three serotypes (*S. Enteritidis*, *S. Typhimurium* and *S. Hadar*) were found in all 4 sectors (human, animal, abattoir and food), eight serotypes were found in three sectors and 13 serotypes in two sectors. As in previous years, serotypes overlapped primarily between humans, chicken/turkey meat products and samples from on-farm chickens and their environments, likely due to the large number of isolates from these sources.

In 2015, the most commonly detected serotype in BC was *S. Enteritidis*. This serotype was particularly common in humans and in chickens, including food products, abattoir and animal sources ([see *Salmonella Enteritidis* section](#)). The second most common serotype was *S. Kentucky*. This serotype is common in chickens and chicken food products, but rarely causes human illness; in 2015 there were no locally acquired human cases of *S. Kentucky*.

S. Typhimurium and *S. Heidelberg* were also frequently identified in 2015. *S. Typhimurium* was isolated from many different animal and food sources as well as humans; however, no commonalities or noteworthy findings were observed. *S. Heidelberg* was recovered from chicken food products and humans ([see *Salmonella Heidelberg* section](#)).

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Table 1. *Salmonella* serotypes reported in two or more sectors (human, food, abattoir, animal) in BC, 2015¹

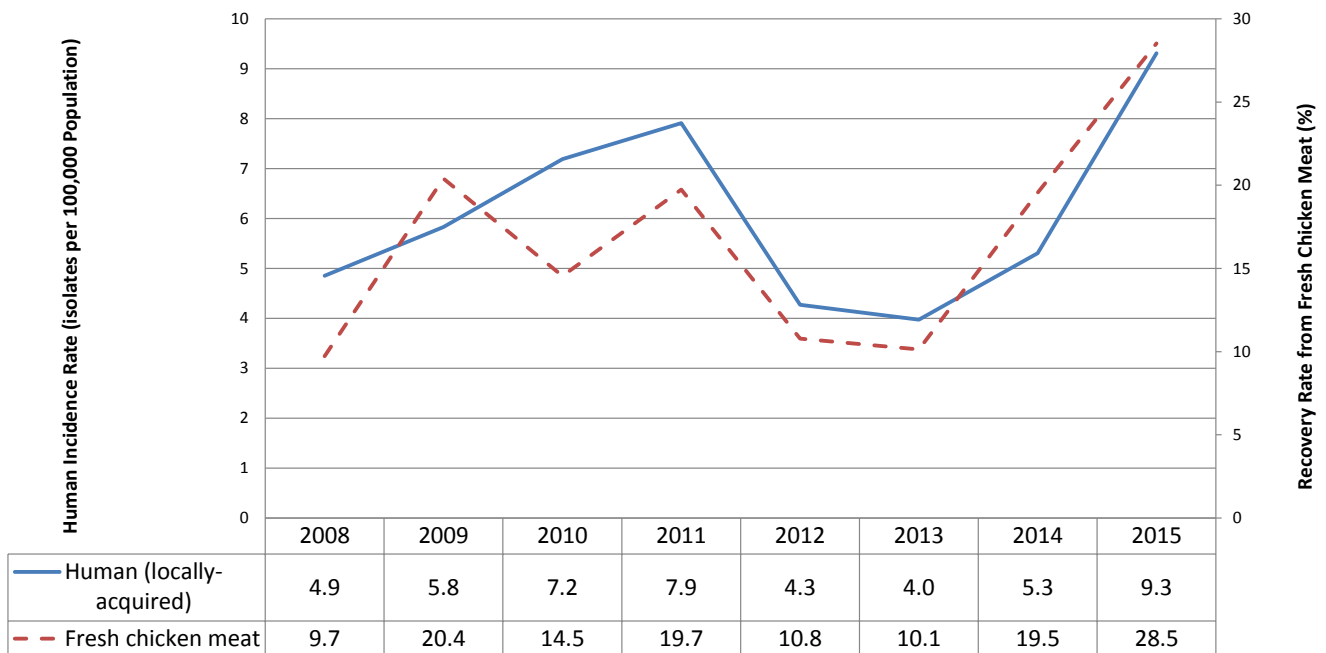
Serotype	Human ²	Food					Abattoir		Animal							Total
		Fresh Chicken	Chicken Nuggets	Beef	Pork	Turkey	Chicken	Pig	Cat/Dog ³	Cattle	Chicken ⁴	Swine	Turkey ⁵	Wildlife ⁶	Other ⁷	
Enteritidis	436	79	19	1		20	24		2	2	484	1	1	2	2	1073
Kentucky		18	3				3				128					152
Typhimurium	40	1	5			1		1	1		2	4	2	5	4	66
Heidelberg	42	4	13													59
Infantis	24	3	1			1			1		9		1			40
Hadar	2	1				5	1				6		18			33
Senftenberg	4					1					19		4			28
4,5,12:i:-	20				1	2										23
Liverpool	1					1					8	1	7			18
Dublin	1									16						17
Newport	11										1					12
Saintpaul	10			1							1					12
Braenderup	6						1				3		1			11
Reading	5					6										11
Thompson	3	4	2								1					10
Albany	3											1	3			7
Agona	2		1										3			6
Brandenburg	5										1					6
Mbandaka			1								4					5
Muenchen	4					1										5
Hartford		1									3					4
Orion							1				3					4
Rissen	2				2						3					4
Schwarzengrund							2				1	1				4
Other	82	3	1					1	1	1	38	2	21	1	3	154
Unknown											3					3
Total	703	114	46	2	3	38	32	2	5	19	714	11	61	8	9	1767

1. For data sources, see "BC Integrated Surveillance of Foodborne Pathogens Methods" (www.bccdc.ca/integratedfoodchainsurveillance).
2. Locally-acquired human cases.
3. One isolate was from a dog and 4 isolates were from cats.
4. Samples taken from on-farm chickens and their environments. In 2015, these include 137 diagnostic isolates, 505 environmental isolates taken from chicken hatcheries/farms, and 72 CIPARS/FoodNet Canada farm isolates (pre-harvest only).
5. In 2015, the turkey isolates include 14 diagnostic isolates and 47 CIPARS/FoodNet Canada farm isolates (pre-harvest only).
6. Wildlife includes 2 skunks, 2 owls, 1 rattlesnake, 1 raccoon, 1 seal and 1 pine marten.
7. Other animals include 4 mice, 2 sheep, 1 goat, 1 domestic duck/goose and 1 snake.

Salmonella Enteritidis

BC has been experiencing an *S. Enteritidis* outbreak since 2008¹. This outbreak continued in 2015², with the highest rate of locally-acquired *S. Enteritidis* human cases since the BCISFP program began. *S. Enteritidis* was also by far the most commonly detected serotype of *Salmonella* in poultry meat (i.e., fresh chicken, fresh turkey and chicken nuggets), in samples taken from chicken at abattoirs, and in samples from on-farm chickens and their environments. There have been similar trends over time in the human and food sectors (Figure 1), suggesting an association between the level of *S. Enteritidis* contamination in food and humans disease rates.

Figure 1. *Salmonella* Enteritidis human incidence (locally-acquired) and recovery rate from fresh chicken meat, BC, 2015



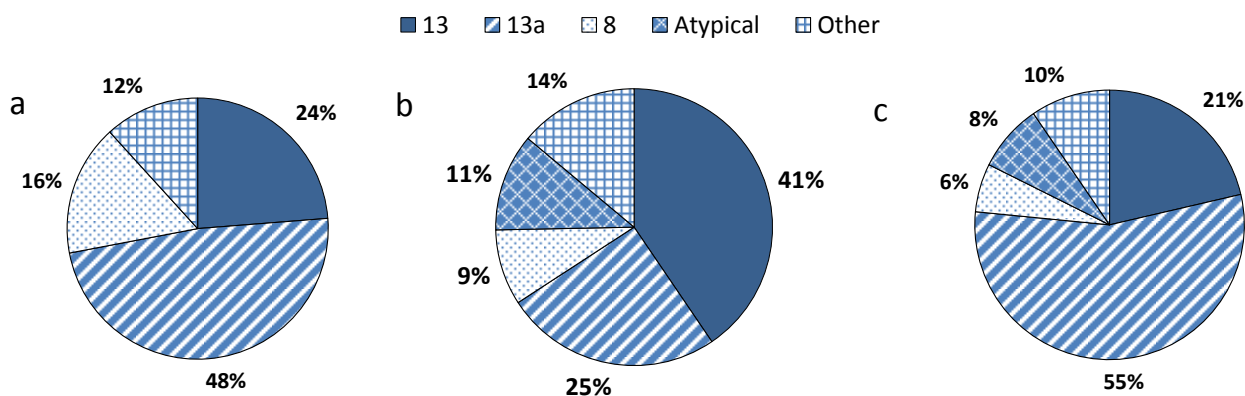
¹Taylor M, Leslie M, Ritson M, Stone J, Cox W, Hoang L, Galanis E, Outbreak Investigation Team. Investigation of the Concurrent Emergence of *Salmonella* Enteritidis in Humans and Poultry in British Columbia, Canada, 2008–2010. *Zoonoses and Public Health* 2012;59(8):584-592. <http://onlinelibrary.wiley.com/doi/10.1111/j.1863-2378.2012.01500.x/full>.

² BC Centre for Disease Control. 2015 Annual Summaries of Reportable Diseases. <http://www.bccdc.ca/health-professionals/data-reports/annual-summaries-of-reportable-diseases>.

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S. Enteritidis isolates are characterized into distinct strains, called phage types (PTs). The PTs most frequently identified in human infections in 2015 were the same as those identified in fresh chicken meat and on-farm chickens and their environments: PTs 13 and 13a (Figure 2). Examining PT results over time revealed that temporal trends are similar across the different sectors. Overall, the proportion of *S. Enteritidis* caused by PT 13 and PT 13a has been increasing since 2012, whereas the proportion of *S. Enteritidis* caused by PT 8 has decreased (Figure 3). These results reinforce the close connection between human health, animal health and food safety in British Columbia.

Figure 2. *Salmonella* Enteritidis phage type distribution among isolates from locally-acquired human cases, on-farm chickens and their environments and fresh chicken meat, BC, 2015

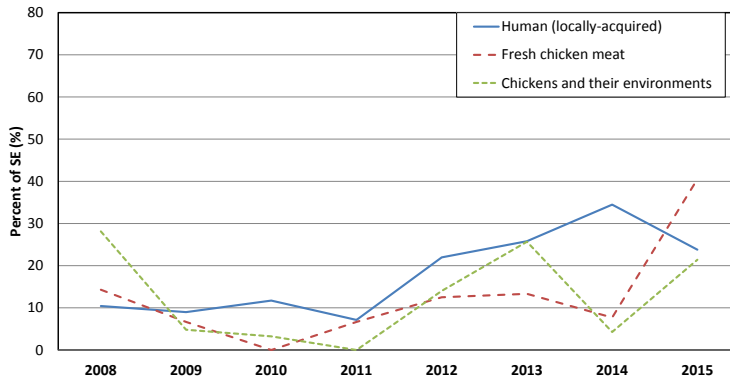


- a. Locally-acquired human cases (N=400)
- b. Fresh chicken meat (N=79)
- c. On-farm chickens and their environments (N=482)

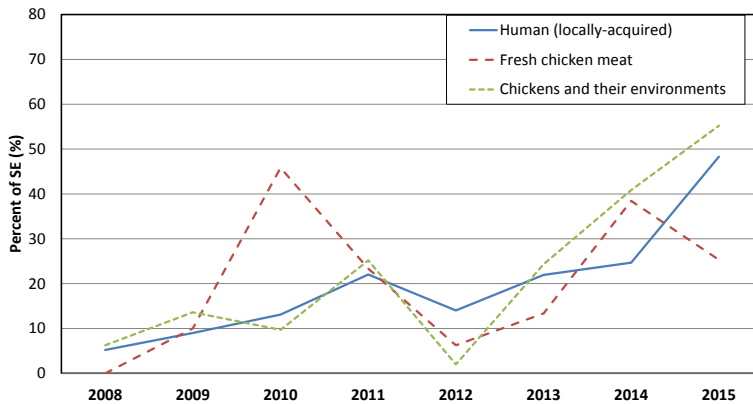
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Figure 3. Percent of *Salmonella* Enteritidis isolates classified as phage types 13, 13a and 8 by sector and year, BC, 2008-2015

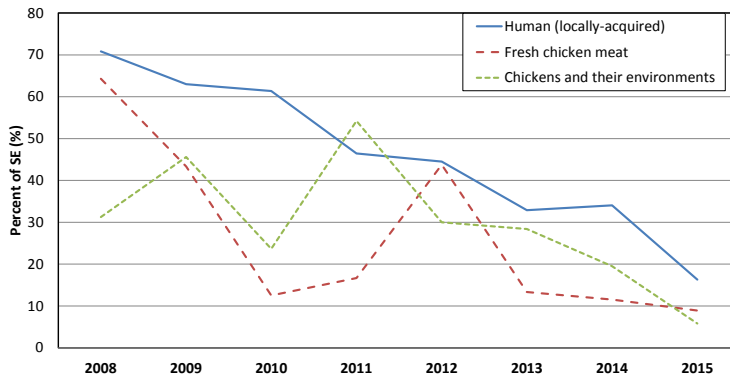
a. Phage type 13



b. Phage type 13a



c. Phage type 8

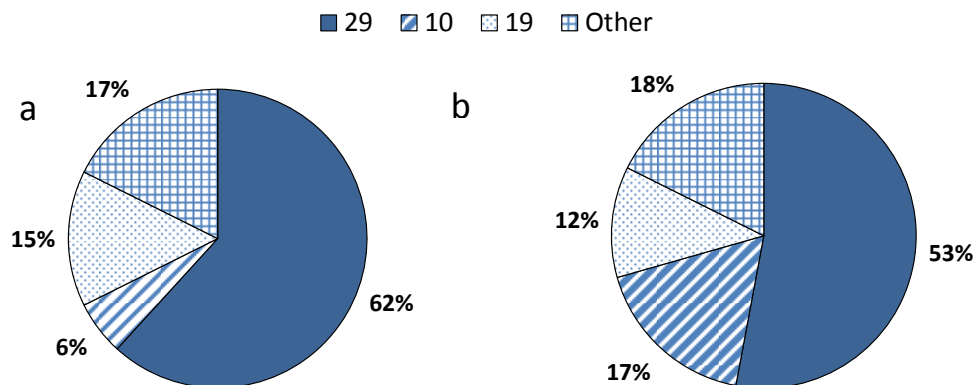


Salmonella Heidelberg

S. Heidelberg was the fourth most common serotype, with a total of 59 isolates; 42 from locally-acquired human cases, 17 from food and none from animals (Table 1). The majority of the food isolates were from chicken nuggets (76.5%). The phage type distributions in human and food isolates were very similar with PT 29 accounting for more than 50% of isolates with phage typing in both sectors, followed by PT 10 and PT 19 (Figure 4).

Although no outbreaks were identified, 93.8% of locally-acquired S. Heidelberg PT 29 cases reported consuming chicken meat, specifically whole chicken or chicken pieces/parts^{3,4}. S. Heidelberg PT 29 cases were more likely than the healthy population (70.7%)⁵ to report eating whole chicken or chicken pieces/parts. The proportion of locally-acquired S. Heidelberg PT 29 cases (27.8%)³ reporting eating breaded chicken (chicken nuggets, strips or burgers) was larger than the proportion of the healthy population reporting eating store-bought breaded chicken (16.0%)⁵; however, this difference was not statistically significant.

Figure 4. *Salmonella* Heidelberg phage type distribution among isolates from locally-acquired human cases and chicken products, BC, 2015



a. Locally-acquired human cases (N=34)

b. Chicken products (fresh chicken meat and chicken nuggets) (N=17)

3 Public Health Reporting Data Warehouse (PHRDW). Enteric Mart. British Columbia Centre for Disease Control. Vancouver, British Columbia. <https://bi.phsa.ca/BCCDC/Reports/Forms/updated.aspx>. Accessed 13 May 2016.

4 BCCDC. Salmonellosis Follow-up form. <http://www.bccdc.ca/health-professionals/professional-resources/surveillance-forms>.

5 Centre for Food-borne, Environmental and Zoonotic Infectious Diseases, Public Health Agency of Canada. Foodbook Report. 2015. <http://healthycanadians.gc.ca/publications/eating-nutrition/foodbook-2015/index-eng.php>.

***Salmonella* Infantis**

S. Infantis was the fifth most common serotype, with a total of 40 isolates; 24 from locally-acquired human cases, 11 from animals and five from food (Table 1). Nine (82%) of the animal isolates and four (80%) of the food isolates were from chicken. The overall burden of *S. Infantis* was relatively low, accounting for 3% of human, 3% of fresh chicken meat and 1% of on-farm chicken and environment *Salmonella* isolates. PFGE is conducted routinely for human *S. Infantis* isolates; however neither phage typing nor PFGE are routinely conducted for food and animal *S. Infantis* isolates. As a result, subtypes could not be compared across sectors.

Two human *S. Infantis* outbreaks were investigated in 2015. A cluster of seven human cases with the same PFGE pattern was detected in the spring; however no source was identified. In the fall and winter, twelve human *S. Infantis* cases in BC matched the PFGE patterns involved in a multi-provincial outbreak.⁶ Chicken meat (chicken pieces purchased fresh, then frozen) from the homes of two BC human cases tested positive for *S. Infantis* with outbreak PFGE patterns. Chicken meat was hypothesized as the source of the outbreak, but was not confirmed because insufficient information was available to identify a common source.

⁶ Public Health Agency of Canada. Public Health Notice – Outbreak of *Salmonella* infections under investigation. March 4, 2016. <http://www.phac-aspc.gc.ca/phn-asp/2015/salmonella-infantis-eng.php>.