

# WOAH Reference Laboratory Reports Activities 2023

## Activities in 2023

This report has been submitted : 17 juillet 2024 21:17

### Laboratory Information

<b>Name of disease (or topic) for which you are a designated WOAHO Reference Laboratory:</b>	Salmonellosis
<b>Address of laboratory:</b>	110 Stone Road West, Guelph, ON
<b>Tel.:</b>	+1-519 826.26.48
<b>E-mail address:</b>	gita.arya@inspection.gc.ca
<b>Website:</b>	
<b>Name (including Title) of Head of Laboratory (Responsible Official):</b>	Sara Christianson, Chief, Reference and Diagnostic Services, Division of Enteric Diseases, National Microbiology Laboratory Branch, Public Health Agency of Canada
<b>Name (including Title and Position) of WOAHO Reference Expert:</b>	Dr. Gitanjali Arya, WOAHO Reference Expert, Head of Science Laboratory Services, Ottawa Animal Health Laboratory, Canadian Food Inspection Agency
<b>Which of the following defines your laboratory? Check all that apply:</b>	Governmental

### TOR1: DIAGNOSTIC METHODS

1. Did your laboratory perform diagnostic tests for the specified disease/topic for purposes such as disease diagnosis, screening of animals for export, surveillance, etc.?  
(Not for quality control, proficiency testing or staff training)

Yes

Diagnostic Test	Indicated in WOAHO Manual (Yes/No)	Total number of test performed last year	
		Nationally	Internationally
Indirect diagnostic tests			
None		0	0
Direct diagnostic tests			
Salmonella Serotyping (total)		4212	0
Salmonella serotyping using Whole Genome Sequencing based method SISTR (Salmonella In Silico Typing Resource)		3050	0
Salmonella serotyping using serological phenotypic method		1162	0

### TOR2: REFERENCE MATERIAL

2. Did your laboratory produce or supply imported standard reference reagents officially recognised by WOAHO?

No

3. Did your laboratory supply standard reference reagents (nonWOAHO-approved) and/or other diagnostic reagents to WOAHO Members?

No

4. Did your laboratory produce vaccines?

Not applicable

5. Did your laboratory supply vaccines to WOAHO Members?

Not applicable

### TOR3: NEW PROCEDURES

6. Did your laboratory develop new diagnostic methods for the designated pathogen or disease?

No

7. Did your laboratory validate diagnostic methods according to WOAHS Standards for the designated pathogen or disease?

No

8. Did your laboratory develop new vaccines for the designated pathogen or disease?

No

9. Did your laboratory validate vaccines according to WOAHS Standards for the designated pathogen or disease?

No

## **TOR4: DIAGNOSTIC TESTING FACILITIES**

10. Did your laboratory carry out diagnostic testing for other WOAHS Members?

No

11. Did your laboratory provide expert advice in technical consultancies on the request of an WOAHS Member?

Yes

NAME OF THE WOAHS MEMBER COUNTRY RECEIVING A TECHNICAL CONSULTANCY	PURPOSE	HOW THE ADVICE WAS PROVIDED
UNITED KINGDOM	To reply to a technical question Animal Plant and Health Agency, UK regarding the best practice/s for techniques when testing Salmonella from poultry primary production samples such as fluff, dead in shell, dead on arrival and cull chicks.	EMAIL correspondence after consultation with the local provincial Salmonella isolation laboratory expert and the other WOAHS Salmonella Reference Laboratory Experts was done

## **TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES**

12. Did your laboratory participate in international scientific studies in collaboration with WOAHS Members other than the own?

No

13. In exercising your activities, have you identified any regulatory research needs\* relevant for WOAHS?

No

## **TOR6: EPIZOOLOGICAL DATA**

14. Did your Laboratory collect epidemiological data relevant to international disease control?

Yes

IF THE ANSWER IS YES, PLEASE PROVIDE DETAILS OF THE DATA COLLECTED:

We require our clients to submit following metadata with the Salmonella isolates: Date Collected, Country, province, source, source type and unique sample identification of the sample.

15. Did your laboratory disseminate epidemiological data that had been processed and analysed?

Yes

IF THE ANSWER IS YES, PLEASE PROVIDE DETAILS OF THE DATA COLLECTED:

The Data is disseminated in form of reports, publications, conferences and lectures.

16. What method of dissemination of information is most often used by your laboratory? (Indicate in the appropriate box the number by category and list the details in the box)

a) Articles published in peer-reviewed journals:

14

1. Eagle, Shannon H. C., et al. "Evaluation of Five Commercial DNA Extraction Kits Using Salmonella as a Model for Implementation of Rapid Nanopore Sequencing in Routine Diagnostic Laboratories." *Access Microbiology*, vol. 5, no. 2, Feb. 2023, <https://doi.org/10.1099/acmi.0.000468.v3>.
2. Medrano H, Lee L, Young V, Janecko N, Deckert AE, Gow SP, Reid-Smith RJ, Agunos A. Surveillance of antimicrobial resistance in *Escherichia coli*, *Salmonella*, and *Campylobacter* recovered from laying hens, their environment and products in Canada indicated a stable level of resistance to critically important antimicrobials, in varying time periods between 2007 and 2021. *Int J Food Microbiol*. 2023 Dec 23;412:110541. doi: 10.1016/j.ijfoodmicro.2023.110541. Epub ahead of print. PMID: 38199015.
3. Saab, M. E., Vanier, G., Sudlovenick, E., Powell, A.L., Simonee, J., Desmarais, G., Muckle, C. A., Fairbrother, J. M., & Daoust, P.-Y. (2023). Occurrence and antimicrobial resistance of *Salmonella* species and potentially pathogenic *Escherichia coli* in free-living seals of Canadian Atlantic and eastern Arctic waters. *Zoonoses and Public Health*, 70, 542–554. <https://doi.org/10.1111/zph.13064>
4. Quinn M., Linton NF, Leon-Velarde CG, Chen S. 2023. Application of a CRISPR Sequence-Based Method for a Large-Scale Assessment of *Salmonella* Serovars across Ontario Poultry Production Environments. *Applied and Environmental Microbiology*. 89(3):e0192322. doi: 10.1128/aem.01923-22.
5. Oludairo OO, Kwaga JKP, Kabir J, Abdu PA, Gitanjali A, Perrets A, Cibir V, Lettini AA, and Aiyedun JO (2023) Ecology and epidemiology of *Salmonella* spp. isolated from the environment and the roles played by wild animals in their maintenance, *Int. J. One Health*, 9(1): 1–9. doi: [www.doi.org/10.14202/IJOH.2023.1-9](http://www.doi.org/10.14202/IJOH.2023.1-9).
6. Fonseca M, Heider LC, Stryhn H, McClure JT, Léger D, Rizzo D, Dufour S, Roy JP, Kelton DF, Renaud DL, Barkema HW, Sanchez J. Frequency of isolation and phenotypic antimicrobial resistance of fecal *Salmonella enterica* recovered from dairy cattle in Canada. *J Dairy Sci*. 2023 Oct 18;S0022-0302(23)00760-9. doi: 10.3168/jds.2023-23937. Epub ahead of print. PMID: 37863297.
7. Brenner T, Wang S. Heightened variability observed in resistance and virulence genes across salmonella Kentucky isolates from poultry environments in British Columbia, Canada. *Food Microbiol*. 2023 May;111:104192. doi: 10.1016/j.fm.2022.104192. Epub 2022 Nov 22. PMID: 36681391.
8. Kenmuir E, Knowles D, Hughes G, Battle J, Ghosh K. Evaluating iQ-Check™ real-time PCR to detect *Salmonella* from poultry environmental samples in Fraser Valley, British Columbia, Canada. *Lett Appl Microbiol*. 2023 Feb 16;76(2):ovac057. doi: 10.1093/lambio/ovac057. PMID: 36794882.
9. Robertson J, Schonfeld J, Bessonov K, Bastedo P, Nash JHE. A global survey of *Salmonella* plasmids and their associations with antimicrobial resistance. *Microb Genom*. 2023 May;9(5):mgen001002. doi: 10.1099/mgen.0.001002. PMID: 37200081; PMCID: PMC10272869.
10. Sodagari HR, Shrestha RD, Agunos A, Gow SP, Varga C. Comparison of antimicrobial resistance among *Salmonella enterica* serovars isolated from Canadian turkey flocks, 2013 to 2021. *Poult Sci*. 2023 Jun;102(6):102655. doi: 10.1016/j.psj.2023.102655. Epub 2023 Mar 16. PMID: 37030258; PMCID: PMC10113892.
11. Gao A, Fischer-Jenssen J, Slavic D, Rutherford K, Lippert S, Wilson E, Chen S, Leon-Velarde CG, Martos P. Rapid identification of *Salmonella* serovars Enteritidis and Typhimurium using whole cell matrix assisted laser desorption ionization - Time of flight mass spectrometry (MALDI-TOF MS) coupled with multivariate analysis and artificial intelligence. *J Microbiol Methods*. 2023 Oct;213:106827. doi: 10.1016/j.mimet.2023.106827. Epub 2023 Sep 23. PMID: 37748653.
12. Murray CE, Varga C, Ouckama R, Guerin MT. Temporal Study of *Salmonella enterica* Serovars Isolated from Environmental Samples from Ontario Poultry Breeder Flocks between 2009 and 2018. *Pathogens*. 2023 Feb 8;12(2):278. doi: 10.3390/pathogens12020278. PMID: 36839550; PMCID: PMC9967235.
13. Dougherty B, Forrest RO, Smith CR, Morton V, Sherk LM, Avery B, Kearney A, Christianson S, Nadon C, Thomas MK. Impact of the COVID-19 Pandemic on the Reported Incidence of Select Bacterial Enteric Diseases in Canada, 2020. *Foodborne Pathog Dis*. 2023 Mar;20(3):81-89. doi: 10.1089/fpd.2022.0064. PMID: 36893331; PMCID: PMC9997028.
14. Matt Hurst, Andrea Nesbitt, Stefanie Kadykala, Brendan Dougherty, Juan Carlos Arango-Sabogal, André Ravel. Attributing salmonellosis cases to foodborne, animal contact and waterborne routes using the microbial subtyping approach and exposure weights. *Food Control* 2023 148. Doi: [/doi.org/10.1016/j.foodcont.2023.109636](https://doi.org/10.1016/j.foodcont.2023.109636).

## b) International conferences:

4

1. Agnes Agunos, Hiddecil Medrano, Sheryl P. Gow, Anne E. Deckert, Audrey Charlebois, Richard J. Reid-Smith. Current status of antimicrobial use, *Salmonella*, *Campylobacter* and *E. coli* recovery and antimicrobial resistance in egg layers in Canada. September 4-8, 2023. 22nd World Veterinary Poultry Association Congress. Verona, Italy.
2. Agnes Agunos, Sheryl P. Gow, Anne E. Deckert, Audrey Charlebois, Richard J. Reid-Smith. Poultry industry-wide surveillance of antimicrobial use and antimicrobial resistance; impacts of the antimicrobial use reduction strategy. July 17-18, 2023. International Association for Food Protection. Toronto, Ontario.
3. Gaonkar, P. P., Agunos, A., Gow, S.P., Carson, C. A., Huber, L.. Time trends and forecasting of antimicrobial use and minimum inhibitory concentration for *Salmonella* spp. in chicken production. September 19-21, 2023. International Conference of Spatial Epidemiology, Geostatistics and GIS applied to animal health, public health and food safety (Published in *Veterinaria Italiana* on September 6, 2023). Teramo, Italy.
4. Ruwani Karunarathna, Chao Chun Liu, Dhinesh Periyasamy, David Thiessen, Anatoliy Trokhymchuk, Musangu Ngeleka. Metagenomic assessment of a risk matrix associated with *Salmonella* serovars isolated from chicken egg farms using a third-generation sequencing platform. October 12-16, 2023. American Association of Veterinary Laboratory Diagnosticians annual conference in National Harbor, USA

## c) National conferences:

7

- G. Arya, K. Ziebell, B. Holtslander, I. Yong, A. Kearney, J. Roberston, K. Bessonov, J. Campbell, C. Nadon and S. Christianson. Beyond PulseNet: Implementation and accreditation of WGS for pathogen identification and characterization: SISTR, ECTyper, and the NML Enterics experience. November 13-14, 2023. National Molecular Microbiology Diagnostics User Group Annual Fall Meeting, Toronto, Ontario, Canada.

## d) Other (Provide website address or link to appropriate information):

6

Our laboratory provides timely and reliable reference testing of *Salmonella* from food, water, animals and environment for the Public Health Agency of Canada's national integrated surveillance programs (FoodNet Canada <https://www.canada.ca/en/public-health/services/surveillance/foodnet-canada/overview.html> and CIPARS <https://www.canada.ca/en/public-health/services/surveillance/canadian-integrated-program-antimicrobial-resistance-surveillancecipars.html>) to facilitate source attribution. The data is published in the form of annual reports by FNC and CIPARS.

As part of the National Enteric Surveillance program, our laboratory also provides whole genome sequencing data from Agri-food Salmonella isolates to PulseNet Canada (<https://www.canada.ca/en/public-health/programs/pulsenet-canada.html>) to support outbreak investigation and source attribution. Public Health Notices for active outbreak investigations are posted for public here <https://www.canada.ca/en/public-health/services/public-health-notices.html>

Reports/Fact Sheets:

Government of Canada. 2023. CIPARS 2022 Poultry Industry Report (Antimicrobial use and antimicrobial resistance, biosecurity and health report) – Broiler Chickens.

Government of Canada. 2023. CIPARS 2022 Poultry Industry Report (Antimicrobial use and antimicrobial resistance, biosecurity and health report)– Turkeys.

Government of Canada. 2023. CIPARS 2022 Fact Sheet (Antimicrobial use and antimicrobial resistance, biosecurity and health report) – Layers.

Stakeholder/International and veterinary associations meetings:

CIPARS and FoodNet Canada. ASEAN bilateral meeting. Ottawa, Ontario. June 27-30, 2023.

CIPARS integrated surveillance. One Health Collaboration Meeting. Pan-American Health Organization – Cuba country office. Havana, Cuba. May 12, 2023.

CIPARS experiences in implementing an integrated surveillance program. International Forum on the Surveillance of Antimicrobial Resistance Under a One Health Approach. UN FAO, Lima, Peru. July 18-19, 2023

## TOR7: SCIENTIFIC AND TECHNICAL TRAINING

17. Did your laboratory provide scientific and technical training to laboratory personnel from other WOAHA Members?

No

## TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)	
ISO 17025	Certificate-Quality-Mgmt-system-accreditation-2023	Certificate-Quality-Mgmt-Accreditation-2023.pdf

19. Is your quality management system accredited?

Yes

Test for which your laboratory is accredited	Accreditation body
Serotyping of Salmonella	Standards Council of Canada
Salmonella in silico Typing Resource (SISTR) using Whole Genome Sequencing	Standards Council of Canada

20. Does your laboratory maintain a "biorisk management system" for the pathogen and the disease concerned?

Yes

See Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Chapter 1.1.4

## TOR9: SCIENTIFIC MEETINGS

21. Did your laboratory organise scientific meetings related to the pathogen in question on behalf of WOAHA?

No

22. Did your laboratory participate in scientific meetings related to the pathogen in question on behalf of WOAHA?

No

## TOR10: NETWORK WITH WOAHA REFERENCE LABORATORIES

23. Did your laboratory exchange information with other WOAHA Reference Laboratories designated for the same pathogen or disease?

Yes

24. Do you network (collaborate or share information) with other WOAHA Reference Laboratories designated for the same pathogen?

No

25. Did you organise or participate in inter-laboratory proficiency tests with WOAHA Reference Laboratories designated for the same pathogen?

No

26. Did your laboratory collaborate with other WOAHA Reference Laboratories for the same disease on scientific research projects for the diagnosis or control of the pathogen of interest?

No

## TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

27. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than WOH Reference Laboratories for the same pathogen?

Yes

Purpose for inter-laboratory test comparisons <sup>1</sup>	Role of your reference laboratory (organizer/participant)	No. participating laboratories	Name of the Test	WOAH Member Countries
Inter-Laboratory QA program regarding Salmonella Serotyping with the Laboratoire d'epidemiologie animale du Quebec, MAPAQ, StHyacinthe, Quebec	Participant and organizer	2	Salmonella serotyping using serological phenotypic method	CANADA,
Inter-laboratory QA program regarding Salmonella whole genome sequencing with PulseNet Canada	Participant	10	Salmonella serotyping using Whole Genome Sequencing based method SISTR (Salmonella In Silico Typing Resource)	CANADA,

## TOR12: EXPERT CONSULTANTS

28. Did your laboratory place expert consultants at the disposal of WOH?

No

29. Additional comments regarding your report:

Yes

**TOR3: NEW PROCEDURES**

*"Did your laboratory develop new diagnostic methods for the designated pathogen or disease?"*

*Yes. Long read sequencing and metagenomics techniques for Salmonella are currently in development. "Did your laboratory develop new vaccines for the designated pathogen or disease?"*

*Yes. we are collaborating with in-country partners to develop Salmonella vaccines for poultry*