WOAH Reference Laboratory Reports Activities 2022

Activities in 2022

This report has been submitted : 31 mai 2023 23:32

Laboratory Information

Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:	Salmonellosis
Address of laboratory:	110 Stone Road West Guelph, Ontario N1G 3W4 Canada
Tel.:	+15198262640
E-mail address:	gitanjali.arya@phac-aspc.gc.ca
Website:	https://www.canada.ca/en/public-health/programs/national-microbiology- laboratory.html
Name (including Title) of Head of Laboratory (Responsible Official):	Sara Christianson, Chief, Reference and Diagnostic Services, Division of Enteric Diseases, National Microbiology Laboratory Branch, Public Health Agency of Canada
Name (including Title and Position) of WOAH Reference Expert:	Dr. Gitanjali Arya, Head of Guelph Reference Services Unit and the WOAH Reference Laboratory for Salmonellosis, Division of Enteric Diseases, National Microbiology Laboratory Branch, Public Health Agency of Canada
Which of the following defines your laboratory? Check all that apply:	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 WOAH Manual (Yes/No)	Total number of test performed last year	
Indirect diagnostic tests		Nationally	Internationally
0	n/a	0	0
Direct diagnostic tests		Nationally	Internationally

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Salmonella Serotyping (total)	Yes	5394	0
Salmonella in Silico Typing Resource (SISTR) using Whole Genome Sequencing	No	3672	0

TOR2: REFERENCE MATERIAL

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

No

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

No

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOAH Members?

No

TOR3: NEW PROCEDURES

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

Yes

NAME OF THE NEW TEST OR DIAGNOSTIC METHOD DEVELOPED	DESCRIPTION AND REFERENCES (PUBLICATION, WEBSITE, ETC.)
Long read sequencing and metagenomics techniques for Salmonella are currently in development	Clinical Metagenomics is Increasingly Accurate and Affordable to Detect Enteric Bacterial Pathogens in Stool https://pubmed.ncbi.nlm.nih.gov/35208895/

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

No

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

Yes

NAME OF THE NEW VACCINE DEVELOPED	DESCRIPTION AND REFERENCES (PUBLICATION, WEBSITE, ETC.)
	Funding Agency: Results Driven Agriculture Research (RDAR) PI: Dr.
We are collaborating with in-country partners to develop a	Joenel Alcantara Co-Investigators: Drs. Justin Schonfeld, Martin
multicomponent plant-derived vaccine for poultry salmonellosis.	Zuidhof, Wolfgang Koester, Emil Berberov Postal Address: 110 Stone
	Road West, Guelph, N1G 3W4, Ontario, Canada.

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

No

TOR4: DIAGNOSTIC TESTING FACILITIES

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

No

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

NAME OF THE WOAH MEMBER COUNTRY RECEIVING A TECHNICAL CONSULTANCY	PURPOSE	HOW THE ADVICE WAS PROVIDED
TRINIDAD AND TOBAGO	Review manuscripts comprising Salmonella isolates sequenced and analyzed by our laboratory.	EMAIL correspondence
ETHIOPIA	To serotype 60 Salmonella isolates and procedure to ship isolates	EMAIL correspondence
MEXICO	To serotype and/or sequence Salmonella isolates and procedure to ship isolates	EMAIL correspondence

TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

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

No

Yes

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 their 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 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:

15

1. Primeau CA, Bharat A, Janecko N, Carson CA, Mulvey M, Reid-Smith R, McEwen S, McWhirter JE, Parmley EJ. Integrated surveillance of extended-spectrum beta-lactamase (ESBL)-producing Salmonella and Escherichia coli from humans and animal species raised for human consumption in Canada from 2012 to 2017. Epidemiol Infect. 2022 Dec 20;151:e14. doi: 10.1017/S0950268822001509. PMID: 36698196; PMCID: PMC9990382.

2. Glass-Kaastra S, Dougherty B, Nesbitt A, Viswanathan M, Ciampa N, Parker S, Nadon C, MacDonald D, Thomas MK. Estimated Reduction in the Burden of Nontyphoidal Salmonella Illness in Canada Circa 2019. Foodborne Pathog Dis. 2022 Nov;19(11):744-749. doi:

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10.1089/fpd.2022.0045. PMID: 36367549; PMCID: PMC9700335.

3. Hetman BM, Pearl DL, Barker DOR, Robertson J, Nash J, Reid-Smith R, Agunos A, Carrillo C, Topp E, Van Domselaar G, Parmley EJ, Bharat A, Mulvey M, Allen V, Taboada EN. Combining analytical epidemiology and genomic surveillance to identify risk factors associated with the spread of antimicrobial resistance in Salmonella enterica subsp. enterica serovar Heidelberg. Microb Genom. 2022 Nov;8(11):mgen000891

4. Oladapo O.O.; Kwaga J.K.P.; Kabir Junaid; Abdu P.A.; Gitanjali A.; Perrets Ann; Cibin Veronica; Lettini A.A.; Aiyedun J.O.. "A review of the International Organization for Standardization (ISO) guidelines for the detection of Salmonella from faeces". Journal of Applied Veterinary Sciences, 7, 4, 2022, 14-22. doi: 10.21608/javs.2022.146858.1158

5. Bharat A, Mataseje L, Parmley EJ, Avery BP, Cox G, Carson CA, Irwin RJ, Deckert AE, Daignault D, Alexander DC, Allen V, El Bailey S, Bekal S, German GJ, Haldane D, Hoang L, Chui L, Minion J, Zahariadis G, Reid-Smith RJ, Mulvey MR. One Health Genomic Analysis of Extended-Spectrum β-Lactamase–Producing Salmonella enterica, Canada, 2012–2016. Emerg Infect Dis. 2022 Jul;28(7):1410-1420. doi: 10.3201/eid2807.211528. PMID: 35731173; PMCID: PMC9239887.

6. Nadin-Davis S, Pope L, Devenish J, Allain R, Ogunremi D. Evaluation of the use of CRISPR loci for discrimination of Salmonella enterica subsp. enterica serovar Enteritidis strains recovered in Canada and comparison with other subtyping methods. AIMS Microbiol. 2022 Jul 15;8(3):300-317. doi: 10.3934/microbiol.2022022. PMID: 36317002; PMCID: PMC9576496.

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. 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 Mar 16;102(6):102655. doi: 10.1016/j.psj.2023.102655. Epub ahead of print. PMID: 37030258; PMCID: PMC10113892.

9. Bharat A, Petkau A, Avery BP, Chen JC, Folster JP, Carson CA, Kearney A, Nadon C, Mabon P, Thiessen J, Alexander DC, Allen V, El Bailey S, Bekal S, German GJ, Haldane D, Hoang L, Chui L, Minion J, Zahariadis G, Domselaar GV, Reid-Smith RJ, Mulvey MR. Correlation between Phenotypic and In Silico Detection of Antimicrobial Resistance in Salmonella enterica in Canada Using Staramr. Microorganisms. 2022 Jan 26; 10(2):292.

10. Plotogea A, M Taylor, A Parayno, M Sillje, J Stone, R Byrnes, O Bitzikos, T Redford, S Waters, E Fraser, L Hoang, E Zabek, L Tschetter, K Ziebell, YL Chan, E Galanis, Outbreak Team Members Human Salmonella enteritidis illness outbreak associated with exposure to live mice in British Columbia, Canada, 2018–2019. Zoonoses and Public Health, 69(7):856-863.

11. Vogt NA, Hetman BM, Vogt AA, Pearl DL, Reid-Smith RJ, Parmley EJ, Kadykalo S, Janecko N, Bharat A, Mulvey MR, Ziebell K, Robertson J, Nash J, Allen V, Majury A, Ricker N, Bondo KJ, Allen SE, Jardine CM. Rural Raccoons (Procyon lotor) Not Likely to Be a Major Driver of Antimicrobial Resistant Human Salmonella Cases in Southern Ontario, Canada: A One Health Epidemiological Assessment Using WholeGenome Sequence Data. Front Vet Sci. 2022 Feb 25;9:840416.

Reports/Fact Sheets:

• Government of Canada. 2022. CIPARS 2021 Poultry Industry Report (Antimicrobial use and antimicrobial resistance, biosecurity and health report) – Broiler Chickens.

• Government of Canada. 2022. CIPARS 2021 Poultry Industry Report (Antimicrobial use and antimicrobial resistance, biosecurity and health report) – Turkeys.

• Government of Canada. 2022. CIPARS 2021 Fact Sheet (Antimicrobial use and antimicrobial resistance, biosecurity and health report) – Layers.

• Government of Canada. 2022. CIPARS 2021 Fact Sheet (Antimicrobial resistance) – Broiler breeders.

b) International conferences:

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Invited Lectures:

1. Salmonella plasmid population dynamics. Medizinische Fakultät Münster, University of Münster, Germany. (April 2022; James Robertson)

2. Pathogen genomic surveillance in Canada: foodborne disease as a model framework. Africa CDC Pathogen Genomics Initiative Series on Genomic Surveillance. Addis Ababa, Ethiopia (August 2022; Celine Nadon)

3. State of Play in Canada. G7 Technical Meeting on Collaborative Surveillance. Berlin, Germany. (October 2022; Celine Nadon)

4. PulseNet Canada Operations. Meeting of the PulseNet Latin America & Caribbean Regional Network. Brasilia, Brazil. (November 2022;

Ashley Kearney)

5. PulseNet International survey on genomics

implementation in middle and low-income countries. Meeting of the PulseNet Latin America & Caribbean Regional Network. Brasilia, Brazil. (November 2022; Ashley Kearney).

6. Gaonkar, P. Agunos A, Carson CA, Gow, SG, Huber, L. Time trends in antimicrobial use and minimum inhibitory concentrations for Salmonella, Campylobacter and E. coli in pig, chickens, and turkey production in Canada. August 7-12, 2022. 16th International Symposium of Veterinary Epidemiology and Economics. Halifax, Nova Scotia.

7. Huber L, Agunos A, Gow SG, Carson CA, Van Boeckel T. Reduction in antimicrobial use and resistance to Salmonella, Campylobacter, and Escherichia coli in broiler chickens, Canada. 2013-2019. August 7-12, 2022. 16th International Symposium of Veterinary Epidemiology and Economics. Halifax, Nova Scotia.

International Conference Abstracts:

1. Bekal Sadjia, Yousfi Khadidja, Usongo Valentine, Berry Chrystal, Moineau Sylvain, Tremblay M. Denise, Ogunremi Dele, Mottawea Walid, Doualla-Bell Florence, Bernaquez Isabelle, Fournier Eric, Bharat Amrita, Mulvey Michael, Levesque Roger C., Goodridge Lawrence, Nadon Celine. A One Health genomic surveillance approach for Salmonella spp. in Québec, Canada. International Symposium Salmonella and Salmonellosis. June 2022, St. Malo, France.

2. Shiona Glass-Kaastra, Brendan Dougherty, Andrea Nesbitt, Mythri Viswanathan, Nadia Ciampa, Stephen Parker, Celine Nadon, Diane MacDonald, and Kate Thomas. Reduction in the Burden of non-typhoidal Salmonella Illness post Whole Genome Sequencing Implementation and Collective Public Health Action on Frozen Raw Breaded Chicken Products in Canada. International Association for Food Protection July 31, Pittsburg USA.

c) National conferences:

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Local and National Lectures:

1. Genomics and Bioinformatics in Public Health Microbiology. Bioinformatics Graduate Program, University of Guelph (February 2022; Justin Schonfeld & Kyrylo Bessonov)

2. Genomics and Bioinformatics in Public Health Microbiology. University of Toronto, Molecular Clinical Microbiology & Infectious Diseases, Toronto, ON. (January 2022; Justin Schonfeld)

3. Molecular approaches to Salmonella surveillance in humans and animals. Canadian Animal Health Laboratory Network Annual Meeting, Whistler, BC. (May 2022; Ashley Kearney).

4. Agunos, A. Current Status of Antimicrobial Use, Antimicrobial Resistance and Flock Health in Canadian Poultry. April 3-6, 2022. 71st Western Poultry Disease Conference. Vancouver, British Columbia.

https://aaap.memberclicks.net/assets/WPDC/WPDC_2022_Proceedings.pdf.

Stakeholder and veterinary associations meeting:

• Agunos, A. Trends in antimicrobial use and resistance in poultry in Canada (2020-2021), Western Association of Poultry Veterinarians, Banff, Alberta.

• CIPARS Meeting for Poultry Industry. October 19th 2022 (virtual).

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

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SISTR (Salmonella In Silico Typing Resource), a whole genome sequencing based Salmonella serotyping method was developed in-house at National Microbiology Laboratory. This method is now on our Scope of Accreditation (ISO 17025) and is being used routinely in our laboratory. Worldwide, SISTR tool has been downloaded 35,394 times. More information is available on these weblinks:

1) https://anaconda.org/bioconda/sistr_cmd

2) https://github.com/phac-nml/sistr_cmd

GitHub - phac-nml/sistr_cmd: SISTR (Salmonella In Silico Typing Resource) command-line tool

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.

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

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

TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)	
ISO 17025	PDF	Certificate-Accreditation-2022.pdf
NML@Guelph ISO 17025	PDF	2022-06-15.NML Guelph ISO 17025 Scope.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 WOAH?

No

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

No

TOR10: NETWORK WITH WOAH REFERENCE LABORATORIES

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

24. Are you a member of a network of WOAH Reference Laboratories designated for the same pathogen?

No

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

No

26. Did your laboratory collaborate with other WOAH 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 WOAH Reference Laboratories for the same pathogen?

Yes			
Purpose for inter-laboratory test comparisons1	Role of your reference laboratory (organizer/participant)	No. participating laboratories	Region(s) of participating WOAH Member Countries
Inter-Laboratory QA program regarding Salmonella Serotyping with the Laboratoire d'epidemiosurveillance animale du Quebec, MAPAQ, StHyacinthe, Quebec	Participant and organizer	2	America
Inter-laboratory QA program regarding Salmonella whole genome sequencing with PulseNet Canada	Participant	10	America

TOR12: EXPERT CONSULTANTS

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

Yes

KIND OF CONSULTANCY	Location	SUBJECT (FACULTATIVE)
Revision of the Chapter on Salmonellosis in the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals	EMAIL correspondence among the OIE member countries Expert	To update the Chapter on Salmonellosis with regards to the progress in the fields of diagnostics and vaccines for Salmonella since the last edition of OIE Terrestrial Manual from 2016

29. Additional comments regarding your report:

No