

WOAH Collaborative Centre Reports Activities 2023

Activities in 2023

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Centre Information

Title of WOA Collaborating Centre	Food-Borne Zoonotic Parasites
Address of WOA Collaborating Centre	Centre for Food-borne and Animal Parasitology, Canadian Food Inspection Agency (CFIA) Saskatoon Laboratory, 116 Veterinary Road, Saskatoon, SK, Canada S7N 2R3
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Name Director of Institute (Responsible Official):	David McKinnon, Director, CFIA Saskatoon Laboratory
Name (including Title and Position) of Head of the Collaborating Centre (WOAH Contact Point):	Brad Scandrett, Head, Centre for Food-borne and Animal Parasitology, CFIA Saskatoon Laboratory
Name of the writer:	Brad Scandrett

TOR1 AND 2: SERVICES PROVIDED

1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by WOA

Category	Title of activity	Scope
Disease control (true)	Ongoing provision of diagnostic services and scientific advice to CFIA Science, Policies and Programs, and Operations Branches	Domestic, import and/or export disease investigations pertaining to food-borne zoonotic parasites, including Cyclospora (non-zoonotic), Cryptosporidium, Toxoplasma, Giardia, Taenia saginata/Cysticercus bovis and Trichinella spp.
Epidemiology, surveillance, risk assessment, (true)	Ongoing provision of scientific advice pertaining to risk analyses for food-borne parasites	Risk management of bovine cysticercosis (Taenia saginata), Echinococcus, Trichinella, Cyclospora, zoonotic coccidia and Giardia
Epidemiology, surveillance, risk assessment (true)	Ongoing monitoring and surveillance for food-borne parasites in animals, animal products and fresh produce for domestic disease control and food safety, and import/export purposes	National Microbiological Monitoring Program for detection of Trichinella in domestic swine via digestion assay; National Microbiological Monitoring Program and targeted surveys for detection of Cyclospora and Giardia contamination of imported fresh produce via qPCR and LAMP assay
	Ongoing internal training and proficiency	Cyclospora, zoonotic coccidia, Giardia, Taenia

Training, capacity building (true)	assessment of CFIA analysts for the detection of food-borne parasites	saginata and Trichinella spp.
Training, capacity building (true)	Ongoing internal capacity building to further enhance expertise in NGS/WGS and bioinformatics for food-borne parasites	Cyclospora and Trichinella spp.
Training, capacity building (true)	Ongoing training and mentoring of PhD candidates (at the University of Saskatchewan, Canada) conducting research studies involving food-borne parasites, via participation on graduate student advisory committees	Trichinella spp. and Toxoplasma
Training, capacity building (true)	Ongoing scientific support, proficiency assessment, and capacity building of industry, academic institute, and territorial authorities analysts to perform artificial digestion assay for Trichinella in pork, horse meat or wildlife, including walrus meat (a food safety concern in northern Canada)	Trichinella spp. from domestic and wildlife sources
Zoonoses (true)	GRDI (Genomics Research and Development Initiative) Shared Priority Projects-Sub-Project Title: Transmission patterns of zoonotic and emerging pathogens in Canada's North related to climate change (https://grdi.canada.ca/en/projects/genomic-adaptation-resilience-climate-change-genarcc-project)	This federal interdepartmental study (2022-2027) entails the use of genomics to monitor ongoing spatial and temporal climate-associated changes in the transmission of established, emerging and novel pathogens in Canada's North and aims to determine the prevalence and molecular characteristics of zoonotic parasites, emerging and novel viruses, and bacteria in Northern country foods, focusing on food safety and security, and the potential risks to human health due to emerging threats
Wildlife (true)	Surveillance of wildlife for Trichinella spp.	Ongoing surveillance of wildlife in proximity to domestic swine production in Canada for Trichinella spp. via digestion assay as per Section 2b, Article 8.17.3, Chapter 8.17 of WOAH Terrestrial Animal Health Code
Diagnosis, biotechnology and laboratory (true)	Ongoing routine diagnosis and monitoring/surveillance of food-borne parasites for domestic disease control, food safety, and import/export purposes	Detection and diagnosis of various food-borne parasites by direct (microscopic examination, digestion assay, PCR) and indirect (serological) methods, including zoonotic coccidia, Cyclospora, Giardia, zoonotic taeniids and Trichinella
Food safety (true)	Development, optimization, standardization, and/or validation of methods to detect and identify food-borne zoonotic parasites	Application of next-generation sequencing methodology in developing streamlined protocols for high-resolution genotyping of Trichinella spp. and Cyclospora spp. to aid epidemiological surveillance and outbreak investigations; Development and validation of molecular detection methods for Cryptosporidium spp. and Toxoplasma gondii in leafy greens and berry fruits

TOR3: HARMONISATION OF STANDARDS

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the main focus area for which you were designated

Proposal title	Scope/Content	Applicable area
Application of next-generation sequencing methodology in developing streamlined protocols for high-resolution genotyping of parasites of public health concern	Ongoing use of genomics and bioinformatics to identify and characterize food-borne parasites, including deep amplicon sequencing of the ITS-1 region to effect high-resolution detection of all Trichinella spp. comprising mixed infections in a muscle tissue sample, and targeted amplicon sequencing for	Laboratory expertise

genotyping Cyclospora		
Development and validation of molecular detection methods for <i>Cryptosporidium</i> spp. and <i>Toxoplasma gondii</i> in leafy greens and berry fruits	Ongoing efforts to develop and validate improved molecular methods for the detection and identification of food-borne protozoan parasites	Laboratory expertise
Development of an international (ISO) standard for the detection of <i>Cyclospora cayetanensis</i> in food	Ongoing participation as member of food-borne parasites working group (ISO/TC34/SC9/WG6) to develop international standard for the detection of <i>Cyclospora cayetanensis</i> in foods	Laboratory expertise
Development of Standard Method Performance Requirements for the Detection, Identification, and Characterization of <i>Cyclospora cayetanensis</i>	Participation as member of AOAC's Analytical International Methods and Standards (AIMS) program working group to develop recommended minimum performance characteristics and analytical requirements for detection, identification and characterization of <i>Cyclospora</i> in foods	Laboratory expertise

3. In exercising your activities, have you identified any regulatory research needs* relevant for WOA?H?

No

4. Did your Collaborating Centre maintain a network with other WOA?H Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?

Yes

Name of WOA?H CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
WOA?H Collaborating Centre for Food-Borne Zoonotic Parasites from the European Region	Maisons-Alfort, France	Europe	Exchange of scientific information on food-borne parasites and proficiency testing (PT) samples (<i>Trichinella</i>) via joint participation in interlaboratory PT, Second meeting (virtual) of the WOA?H Network of Collaborating Centres for Food-borne Zoonotic Parasites (Americas, European and Asia Pacific Regions), and membership in International Commission on Trichinellosis (including joint participation in recent International Conference on Trichinellosis held Aug-Sept 2023)
WOA?H Collaborating Centre for Food-Borne Zoonotic Parasites from the Asia-Pacific Region	Changchun, China	Asia and Pasific	Exchange of scientific information on food-borne parasites, Second meeting (virtual) of the WOA?H Network of Collaborating Centres for Food-borne Zoonotic Parasites (Americas, European and Asia Pacific Regions), and membership in International Commission on Trichinellosis (including joint participation in recent International Conference on Trichinellosis held Aug-Sept 2023)

<p>WOAH Reference Laboratory for Trichinellosis, European Union Reference Laboratory for Parasites (EURLP)</p>	<p>Rome, Italy</p>	<p>Europe</p>	<p>Exchange of scientific advice via shared roles as WOAHA Reference Laboratories for Trichinellosis and membership in the International Commission on Trichinellosis (including joint participation in recent International Conference on Trichinellosis held Aug-Sept 2023)</p>
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TOR4 AND 5: NETWORKING AND COLLABORATION

5. Did your Collaborating Centre maintain a network with other WOAHA Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?

Yes

Name of WOAHA CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
<p>WOAHA Collaborating Centre for Research, Diagnosis and Surveillance of Wildlife Pathogens (Canadian Wildlife Health Cooperative/CWHC)</p>	<p>Saskatoon, Canada</p>	<p>Americas</p>	<p>Exchange of scientific information and collection of wildlife samples (particularly feral wild boar) for ongoing sylvatic Trichinella surveillance</p>
<p>The Canadian Arctic One Health Network. (https://arcticnet.ulaval.ca/project/the-canadian-arctic-one-health-network/)</p>	<p>Canada</p>	<p>Americas</p>	<p>This project (2019-2024) aims to build on an existing network of researchers and community partners to monitor, model, and mitigate One Health threats across the changing Canadian North</p>
<p>Genomic Adaptation and Resilience to Climate Change (Gen ARCC)/ GRDI (Genomics Research and Development Initiative) Shared Priority Projects-Sub-project Title: Transmission patterns of zoonotic and emerging pathogens in Canada's North related to climate change (https://grdi.canada.ca/en/projects/genomic-adaptation-resilience-climate-change-genarcc-project)</p>	<p>Canada</p>	<p>Americas</p>	<p>This federal interdepartmental study (2022-2027) entails the use of genomics to monitor ongoing spatial and temporal climate-associated changes in the transmission of established, emerging and novel pathogens in Canada's North and aims to determine the prevalence and molecular characteristics of zoonotic parasites, emerging and novel viruses, and bacteria in Northern country foods, focusing on food safety and security, and the potential risks to human health due to emerging threats</p>
<p>University of Saskatchewan</p>	<p>Saskatoon, Canada</p>	<p>Americas</p>	<p>Ongoing collaboration with the Dept. of Veterinary Microbiology, Western College of Veterinary Medicine, U of S to further elucidate the biology and ecology of a new species of</p>

Trichinella (T. chanchalensis)
in the North American Arctic

TOR6: EXPERT CONSULTANTS

6. Did your Collaborating Centre place expert consultants at the disposal of WOA?H?

No

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

7. Did your Collaborating Centre provide advice/services to requests from Members in your main focus area?

Yes

Ongoing training and/or proficiency testing assessment of Canadian industry analysts to perform the artificial digestion assay for Trichinella and to facilitate effective oversight of industry labs performing this testing on horse meat or pork to meet requirements for export and domestic food safety (i.e., ready-to-eat products).

Ongoing provision of scientific advice and proficiency testing assessment to Canadian territorial (Nunavik, Nunavut) analysts performing the artificial digestion assay for Trichinella in walrus meat, a food safety concern in the Arctic.

Ongoing provision of Trichinella artificial digestion assay proficiency testing samples and assessment of results to other WOA?H member countries (France, New Zealand).

8. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by WOA?H, to personnel from WOA?H Members?

Yes

a) Technical visit : 0

b) Seminars : 3

c) Hands-on training courses: 2

d) Internships (>1 month) : 2

TYPE OF TECHNICAL TRAINING PROVIDED (A, B, C OR D)	CONTENT	COUNTRY OF ORIGIN OF THE EXPERT(S) PROVIDED WITH TRAINING	NO. PARTICIPANTS FROM THE CORRESPONDING COUNTRY
B	Webinars pertaining to Trichinella biology and detection	Canada (Nunavik candidate analysts)	3
C	Hands-on training provided for the Trichinella digestion method	Canada (industry candidate analysts)	2
D	Ongoing provision of scientific advice and training on Trichinella delivered via participation on PhD candidate's advisory committee	Canada (PhD candidate at University of Saskatchewan)	1
D	Final year of provision of scientific advice on Toxoplasma delivered via participation on PhD candidate's advisory committee	Mexico (graduating PhD candidate at University of Saskatchewan)	1

TOR8: SCIENTIFIC MEETINGS

9. Did your Collaborating Centre organise or participate in the organisation of scientific meetings related to your main focus area on behalf of WOA?H?

Yes

NATIONAL/INTERNATIONAL	TITLE OF EVENT	CO-ORGANISER	DATE (MM/YY)	LOCATION	NO. PARTICIPANTS
International	Second meeting (virtual) of the WOA?H Network of Collaborating Centres for Food-borne Zoonotic Parasites (Americas,	WOA?H Collaborating Centre for Food-borne Parasites from the European Region (ANSES,	2023-12-20	Virtual	25

European and Asia Pacific
Regions)

France)

TOR9: DATA AND INFORMATION DISSEMINATION

10. Publication and dissemination of any information within the remit of the mandate given by WOAHP that may be useful to Members of WOAHP

a) Articles published in peer-reviewed journals:

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Lobanov V.A., Konecni K.A., Scandrett W.B., Jenkins E.J. 2023. Identification of *Trichinella* taxa by ITS-1 amplicon next-generation sequencing with an improved resolution for detecting underrepresented genotypes in mixed natural infections. *Parasites & Vectors*, 16:466. DOI: 10.1186/s13071-023-06035-1.

Martin Cheung, Daisy Yu, Tracy Chan, Navdeep Chahil, Christine Tchao, Michael Slatnik, Shobhit Maruti, Nina Sidhu, Brad Scandrett, Natalie Prystajecy, Muhammad G. Morshed, Catherine A. Hogan. 2023. The Brief Case: an Infectious Hazard of Hunting. *Journal of Clinical Microbiology*, Vol. 61, No. 4. <https://doi.org/10.1128/jcm.00620-22>.

Adrian Hernández-Ortiz, Emilie Bouchard, Louwrens P. Snyman, Batol H. Al-Adhami, Geraldine-G. Gouin, Mikhaela Neelin, Emily J. Jenkins. 2023. *Toxoplasma gondii* and related Sarcocystidae parasites in harvested caribou from Nunavik, Canada. *Int J Parasitol: Parasites and Wildlife*, 246-254.

b) International conferences:

2

Konecni K.A., Scandrett W.B. 2023. Assessment of proficiency testing samples for digestion assay using freeze-tolerant sylvatic *Trichinella* spp. with low infectivity for domestic swine. *International Conference on Trichinellosis (ICT-16) poster*, Belgrade, Serbia, August 30- September 1, 2023.

Lobanov V.A., Konecni K.A., Scandrett W.B., Jenkins E.J. 2023. Identification of *Trichinella* taxa by ITS-1 amplicon next-generation sequencing with higher sensitivity for under-represented species/genotypes in mixed infections. *ICT-16 poster*, Belgrade, Serbia, August 30- September 1, 2023.

c) National conferences:

2

Queiroz, C. Improving *Trichinella* taxa identification capacity using bioinformatics tools. *CFIA R&D Symposium Presentation (virtual)*, November 22, 2023.

Lalonde, L. Lessons learned from development and implementation of a loop-mediated isothermal amplification (LAMP) method for detection of *Giardia* in leafy greens for routine diagnostic use. *CFIA R&D Symposium Presentation (virtual)*, November 29, 2023.

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

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Lalonde, L. Collaboration between CFIA and US FDA to validate and implement a harmonized method for *Cyclospora* surveillance in produce. *US FDA Cyclospora Task Force Seminar (virtual)*, March 29, 2023.

Dixon, B., Guy, R., Scandrett, B. Zoonotic and foodborne parasites of concern in Canada's North. *Genomic Adaptation and Resilience to Climate Change (Gen ARCC) Seminar Series (virtual)*, May 25, 2023.

Lalonde, L. Food-borne parasitology method development, validation, and surveillance activities at the CFIA Saskatoon Laboratory. *CFIA Food Safety Research Seminar (virtual)*, October 24, 2023.

Second meeting (virtual) of the WOAHP Network of Collaborating Centres for Food-borne Zoonotic Parasites (Americas, European and Asia Pacific Regions), held December 20, 2023.

Lalonde, L. Contributed subject matter expertise to CFIA's assessment questionnaire for audit of Guatemala's Ministry of Agriculture (MAGA) food safety control system for fresh fruit and vegetables exported to Canada, March 2024.

Queiroz, C. The application of next generation sequencing and bioinformatics to enhance diagnostics of foodborne parasites. *CFIA Food Safety Research Seminar (virtual)*, March 19, 2024.

Dixon, B., Nasheri, N., Guy, R., Scandrett, B., Lung, O. Transmission patterns of zoonotic and emerging pathogens in Canada's North related to climate change. *Genomic Adaptation and Resilience to Climate Change (GenARCC) Annual Meeting (virtual)*, April 16, 2024.

11. What have you done in the past year to advance your area of focus, e.g. updated technology?

Significant progress has been made in applying next-generation sequencing to genotyping two species of food-borne parasites that are in the scope of our diagnostic and research activities. Thus, a new method for identifying *Trichinella* taxa in larval pools with increased resolution for detecting underrepresented genotypes in mixed natural infections has been developed and validated. A database of the internal transcribed spacer 1 (ITS-1) ribosomal cistron sequences has been established for *Trichinella* taxa identification using this method and continues to be improved by introducing sequences of additional ITS-1 haplotypes for selected taxa as they are generated. Furthermore, considerable efforts have been made to evaluate a new commercial kit method for *Cyclospora* genotyping by NGS. This kit is intended for target-specific amplification, target enrichment and sequencing of over 50 polymorphic loci distributed across the *Cyclospora* genome. This commercial kit is expected to facilitate the

genotyping of Cyclospora in samples of produce contaminated with low oocyst numbers. No other previously published NGS methods for Cyclospora had sufficient specificity, sensitivity or resolution for this sample type.

12. Additional comments regarding your report: