World Organisation for Animal Health

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WOAH Collaborative Centre Reports Activities 2024

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CENTRE INFORMATION

***Title of WOAH Collaborating Centre**	Food-Borne Zoonotic Parasites
***Address of WOAH 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):**	Laura Lalonde, Head, Centre for Food-borne and Animal Parasitology, CFIA Saskatoon Laboratory
***Name of the writer:**	Laura Lalonde

TOR 1 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 WOAH

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, Cryptosporidium, Toxoplasma, and Giardia
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, coordination and teaching at the Veterinary Parasitology curriculum of University of Saskatchewan and supervising and training undergraduate students working on summer research projects. Teaching and mentoring of graduate and undergraduate students of University of Calgary via teaching at the Doctor of Veterinary Medicine parasitology and clinical skills curriculum and participating in graduate student committee undergoing research projects on molecular diagnostics and molecular epidemiology in parasitology.	Trichinella and food-borne protozoa
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/genomicadaptation-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.
		Ongoing surveillance of wildlife in proximity to domestic swine production in Canada for

Wildlife (true)	Surveillance of wildlife for Trichinella spp.	Trichinella spp. via digestion assay as per Section 2b, Article 8.17.3, Chapter 8.17 of WOAH Terrestrial Animal Health Code, as well as northern food safety surveillance to determine host and distribution ranges of Trichinella chanchalensis and other Trichinella spp in the northern territories of US and Canada.
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
Epidemiology, surveillance, risk assessment (true)	Ongoing monitoring and surveillance for foodborne 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
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
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 in foods. 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

TOR 3: HARMONISATION OF STANDARDS

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the main fucus 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 genotyping Cyclospora in foods, as well as DNA metabarcoding of foodborne protozoa using Nanopore sequencing.	Laboratory Expertise
Development, validation and implementation of molecular detection methods for Cryptosporidium spp. and Toxoplasma gondii 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 Cyclospora cayetanenesis in food	Ongoing participation as member of food-borne parasites working group (ISO/TC34/SC9/WG6) to develop international standard for the detection of Cyclospora cayetanensis in foods	Laboratory Expertise
Development of Standard Method Performance Requirements for the Detection, Identification, and Characterization of Cyclospora cayetanensis	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 Cyclospora in foods	Laboratory Expertise

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

No

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

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Yes

Name of WOAH CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
WOAH Collaborating Centre for Food-Borne Zoonotic Parasites from the European Region	Maisons-Alfort, France	Europa	Exchange of scientific information on food-borne parasites and proficiency testing (PT) samples (Trichinella) via joint participation in interlaboratory PT
US FDA Center for Food Safety and Applied Nutrition	College Park, Maryland, USA	América	Participation in interlaboratory comparison study to validate the qPCR method for detection of Cyclospora in fresh produce which is under development as the ISO standard method.
WOAH Reference Laboratory for Trichinellosis, European Union Reference Laboratory for Parasites (EURLP)	Rome, Italy	Europa	Exchange of scientific advice via shared roles as WOAH Reference Laboratories for Trichinellosis and membership in the International Commission on Trichinellosis

TOR 4 AND 5: NETWORKING AND COLLABORATION

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

Yes

Name of WOAH CC/RL/other organisation(s)	Location	Region of networking Centre	
WOAH Collaborating Centre for Research, Diagnosis and Surveillance of Wildlife Pathogens (Canadian Wildlife Health Cooperative/CWHC)	Saskatoon, Canada	Americas	Exchange of s collection of wildl wild boar) for o s
The Canadian Arctic One Health Network			The Canadian A

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(https://arcticnet.ulaval.ca/project/thecanadian-arctic-one-health-network/)	Canada	Americas	(https://arcticnet.u arctic-on
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/genomicadaptation-resilience-climate-change- genarcc-project)	Canada	Americas	This federal interde entails the use of g spatial and tem changes in the t emerging and n North and aims to molecular charact emerging and n Northern count safety and securi human health
University of Saskatchewan	Saskatoon, Canada	Americas	Ongoing collal Veterinary Micro Veterinary Medici the biology and Trichinella (T. c An
Public Health Agency of Canada	Ottawa, Canada	Americas	Development of N Cyclospora in

TOR 6: EXPERT CONSULTANTS

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

No

TOR 7: 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 WOAH member countries (France). Provision of scientific advice and sharing of expertise on methods for detection of food-borne parasites to members as requested (virtually/by-email).

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

Yes

a) Technical visit : 0

b) Seminars : 1

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 (Industry candidate analysts)	18
C	Hands-on training provided for the Trichinella digestion method	Canada (industry candidate analysts)	8
D	Ongoing provision of scientific advice and training on Trichinella delivered via participation on PhD candidate's advisory committee, as well as training and supervision of an undergraduate student on bioinformatics and molecular diagnostics of foodborne protozoa	Canada (PhD candidate at University of Saskatchewan), DVM undergraduate student of University of Saskatchewan	2

TOR 8: 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 WOAH?

No

TOR 9: DATA AND INFORMATION DISSEMINATION

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

a) Articles published in peer-reviewed journals:

0

b) International conferences:

1

Queiroz, C., Lobanov, V., Konecsni, K., Scandrett, B. Applying DNA metabarcoding and bioinformatic tools to enhance identification of parasites of One Health relevance. American Association of Veterinary Parasitology, Atlanta, GA, 27-30 July, 2024

c) National conferences:
1
Queiroz, C., Lobanov, V., Lalonde, L., Scandrett, B. The application of next generation DNA sequencing and bioinformatics to improve detection of parasites of human and animal health relevance. Canadian Animal Health Laboratorian Network, Ottawa, 2-5 June, 2024.

d) Other (Provide website address or link to appropriate information):
1
Demetrick, R., Queiroz, C. Primer design for a molecular diagnostics approach for detection of foodborne protozoa. Undergraduate Research day at University of Saskatchewan, August 2024.

11. What have you done in the past year to advance your area of focus, e.g. updated technology?
Significant progress continues to be 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 progress has been made to demonstrate suitability of a new commercial kit for Cyclospora genotyping in foods 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 enables 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: