World Organisation for Animal Health

John Morris Fairbrother - - CANADA

WOAH Reference Laboratory Reports Activities 2024

This report has been submitted: 28 janvier 2025 20:36

LABORATORY INFORMATION

***Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:**	Escherichia coli
***Address of laboratory:**	3200 Sicotte, Saint-Hyacinthe, Québec, J2S 2M2
***Tel:**	+1-450 773.85.21
***E-mail address:**	john.morris.fairbrother@umontreal.ca
Website:	www.ecl-lab.ca
***Name (including Title) of Head of Laboratory (Responsible Official):**	Maud de Lagarde, DVM, DACVIM, PhD. Assistant Professor
***Name (including Title and Position) of WOAH Reference Expert:**	John Morris Fairbrother, BVsc, PhD. Adjunct Professor
***Which of the following defines your laboratory? Check all that apply:**	Academic institution

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
Direct diagnostic tests		Nationally	Internationally
Conventional PCR for pathogenic E. coli (up to 10 virulence genes)	Yes	5300	0

Whole Genome Sequencing	Yes	230	2

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?

Yes

Type of reagent available	Related diagnostic test	Produced/ provide	Amount supplied nationally (ml, mg)	Amount supplied internationally (ml, mg)	No. of recipient WOAH Member Countries	Country of recipients
E. coli reference strains	Conventional PCR for pathogenic E. coli	produced and provided	19	1	2	BENIN, CANADA,

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.)
Whole genome sequencing (WGS) of E. coli isolates	We are offering rapid WGS testing of E. coli isolates for O:H serotyping, MLST, cgMLST, and detection of virulence genes and prediction of antimicrobial resistance based on the presence of antimicrobial resistance genes and chromosomal point mutations using Illumina Nextera DNA Prep preparation kits and Illumina iSeq100 sequencing platforms and in-house in silico analysis.
Conventional PCR for pathogenic E. coli	We are developing conventional PCR tests for bovine and avian pathogenic E. coli using virulence markers based on our WGS results from strains isolated from diseased or healthy animals.

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?

No

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?

Yes

Name of WOAH Member Country seeking assistance	Date	Which diagnostic test used	No. samples received for provision of diagnostic support	No. samples received for provision of confirmatory diagnoses
FRANCE	2024-05-17	Whole genome sequencing	2	0

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

No

TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

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

Yes

Title of the study	Duration	Purpose of the study	Partners (Institutions)	WOAH Member Countries involved other than your country
Antimicrobial resistance and interrelatedness of extraintestinal pathogenic Escherichia coli in human, poultry, companion animals and environment: a One Health approach	1 year	Characterization of E. coli strains isolated from human urine, animal (birds and dogs) fecal samples and environmental samples in Nigeria	Federal University of Agriculture, Abeokuta (FUNAAB)	NIGERIA
Full characterization of E. coli isolated from ISU-VDL porcine cases from 2015 to 2022 including toxins and serogroups and antimicrobial resistance	3 years	Characterization of E. coli strains isolated from porcine cases in USA	Iowa State University	UNITED STATES OF AMERICA
Genomic characterization and determination of risk factors for the presence of resistant and pathogenic Escherichia coli associated with eggs for consumption in southern Benin	3 years	Characterization of resistant and pathogenic Escherichia coli from eggs in Benin	Université d'Abomey Calavi	BENIN

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

No

TOR6: EPIZOOLOGICAL DATA

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

No

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:
Quarterly and annual reports on surveillance of pathovirotypes and antimicrobial resistance of E. coli in diseased pigs in Québec, Canada.

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:

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Description of a contemporary pathogenic Escherichia coli isolated from pigs with post- weaning diarrhea in the United States from 2010 to 2023. RC Paiva, E Burrough, N Macedo, AP S. P. Silva, M de Lagarde2, JM Fairbrother, P Pineyro, M Almeida. Submitted to Porcine Health Management on December 17th 2024

Corrigendum to "Redefining on-farm practices: The perceived effect of a responsible antimicrobial use regulation on dairy farmers" (J. Dairy Sci. 107:6913-6929). Millar N, Dufour S, Lardé H, Massé J, De Lagarde M, Archambault M, Fairbrother JM, Roy JP, Belloc C, Francoz D, Aenishaenslin C. J Dairy Sci. 2024 Nov;107(11):10041. doi: 10.3168/jds.2024-107-11-10041. PMID: 39521483

Silver and Copper Nanoparticles Hosted by Carboxymethyl Cellulose Reduce the Infective Effects of Enterotoxigenic Escherichia coli:F4 on Porcine Intestinal Enterocyte IPEC-J2. Tchoumi Neree A, Noori F, Azzouz A, Costa M, Fairbrother JM, Mateescu MA, Chorfi Y. Microorganisms. 2024 Oct 7;12(10):2026. doi: 10.3390/microorganisms12102026. PMID: 39458335

Epidemiology, Virulence and Antimicrobial Resistance of Escherichia coli Isolated from Small Brazilian Farms Producers of Raw Milk Fresh Cheese. Ribeiro LF, Rossi GAM, Sato RA, de Souza Pollo A, Cardozo MV, Amaral LAD, Fairbrother JM. Microorganisms. 2024 Aug 22;12(8):1739. doi: 10.3390/microorganisms12081739. PMID: 39203581

Redefining on-farm practices: The perceived effect of a responsible antimicrobial use regulation on dairy farmers. Millar N, Dufour S, Lardé H, Massé J, De Lagarde M, Archambault M, Fairbrother JM, Roy JP, Belloc C, Francoz D, Aenishaenslin C. J Dairy Sci. 2024 Sep;107(9):6913-6929. doi: 10.3168/jds.2024-24667. Epub 2024 May 17. PMID: 38762113

Exploring Extended-Spectrum Beta-Lactamase (ESBL)-Producing Escherichia coli in Food-Producing Animals and Animal-Derived Foods. Ribeiro LF, Nespolo NM, Rossi GAM, Fairbrother JM. Pathogens. 2024 Apr 22;13(4):346. doi: 10.3390/pathogens13040346. PMID: 38668301

Clonal and plasmidic dissemination of critical antimicrobial resistance genes through clinically relevant ExPEC and APEC-like lineages (ST) in the dairy cattle population of Québec, Canada. de Lagarde M, Fairbrother JM, Archambault M, Dufour S, Francoz D, Massé J, Lardé H, Aenishaenslin C, Paradis ME, Terrat Y, Roy JP. Front Microbiol. 2024 Jan 18;14:1304678. doi: 10.3389/fmicb.2023.1304678. eCollection 2023. PMID: 38304859

The Isolation and Characterization of Bacteriophages Infecting Avian Pathogenic Escherichia coli O1, O2 and O78 Strains. Smith KR, Bumunang EW, Schlechte J, Waldner M, Anany H, Walker M, MacLean K, Stanford K, Fairbrother JM, Alexander TW, McAllister TA, Abdul-

Careem MF, Niu YD.
Viruses. 2023 Oct 16;15(10):2095. doi: 10.3390/v15102095. PMID: 37896873

b) International conferences:

0

c) National conferences:

4
Analyse génomique ... et métagénomique de fumier de bovins laitiers avant et après la mise en place du règlement sur l'administration d'antibiotiques de catégorie 1. M de Lagarde, A Thibodeau, D Poulin-Laprade, C Coté, ML Gauthier, JM Fairbrother, M Archambault, S Dufour, D Francoz, J Massé, H Lardé, C Aenishaenslin, ME Paradis, JP Roy. 2024 Annual Meeting Op+Lait Network, Université de Montréal, November 2024 (invited speaker).

Le séquençage au service du diagnostic. M de Lagarde. CERCL 2024 Antimicrobialresistance Week, Faculté de Médecine Vétérinaire, Université de Montréal November 2024 (webinar).

Analyse du résistome des bovins laitiers au Québec avant et après la restriction de l'utilisation des antibiotiques d'importance critique. JA Njakou Youonang, M de Lagarde, JP Roy. Semaine de la Recherche, Faculté de Médecine Vétérinaire, Université de Montréal, March 2024 (poster).

Caractérisation des E. coli résistants aux antibiotiques causant de la mortalité chez les veaux lourds du Québec, M Turcotte, S Buczinski, JM Fairbrother, ML Gauthier, F Beaulac, G Vanier, Y Terrat, M de Lagarde. Semaine de la Recherche, Faculté de Médecine Vétérinaire, Université de Montréal, March 2024 (poster).

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

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Website

www.ecl-lab.ca/en

Reports

-Four 2024 quarterly reports on surveillance of pathovirotypes and antimicrobial resistance of Escherichia coli in diseased pigs, MAPAQ (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec), RAIZO (Réseau d'alerte de d'information zoosanitaire) porcin, Québec, Canada, March, June, September, and December 2024.

-2023 annual report on surveillance of pathovirotypes and antimicrobial resistance of Escherichia coli in diseased pigs, MAPAQ (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec), RAIZO (Réseau d'alerte de d'information zoosanitaire) porcin, Québec, Canada, March 2024.

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

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

Yes

a) Technical visit : 0

b) Seminars : 0

c) Hands-on training courses: 0

d) Internships (>1 month) 4

Type of technical training provided (a, b, c or d)	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
D	FRANCE	1
D	NIGERIA	1
D	BRAZIL	1
D	BENIN	1

TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)	
American Association of Veterinary Laboratory Diagnosticians (AAVLD)		2022.QC-CAN.SV_CERT (2023-02).Final.pdf

19. Is your quality management system accredited?

Yes

Test for which your laboratory is accredited	Accreditation body
Please, see: https://aavld.memberclicks.net/accreditation-requirements-page	American Association of Veterinary Laboratory Diagnosticians (AAVLD)

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

Yes

Our laboratories have a biosafety level 2 status (BSL-2), and we use Standard Operating Procedures following BSL-2 requirements. A biosafety officer from Prevention and Security Department at University of Montreal supports and assists our laboratories for BSL-2 status, licenses, protocols and audits.

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?

Not applicable (only WOAH Reference Laboratory designated for the disease

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

Not applicable (only WOAH Reference Laboratory designated for the disease

25. Did you organise or participate in inter-laboratory proficiency tests with WOAH Reference Laboratories designated for the same pathogen during the past 2 years?

Not applicable (Only WOAH Reference Laboratory designated for the disease)

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?

Not applicable (only WOAH Reference Laboratory designated for the disease

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 during the past 2 years?

Yes

Purpose for inter-laboratory test comparisons1	Role of your reference laboratory (organizer/participant)	No. participating laboratories	Name of the test	WOAH Member Countries
12th External Quality Assessment Scheme for Shiga toxinproducing Escherichia coli (STEC), 2022-2023 Covering the following: • Serotyping (O group and H type) • Virulence gene determination (aaic, aggR, eae, stx1, stx2 and subtyping) • Cluster analysis (WGS derived data) Organized by Statens Serum Institut (SSI).	Participant	26	Conventional PCR, Serotyping, Whole genome sequencing	AUSTRIA, BELGIUM, BULGARIA, CANADA, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, ICELAND, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MONTENEGRO, NORWAY, POLAND, PORTUGAL, ROMANIA, SLOVENIA, SPAIN, SWEDEN, THE NETHERLANDS,
13th External Quality Assessment Scheme for Shiga toxinproducing Escherichia coli (STEC),				AUSTRIA, BELGIUM, BULGARIA, CANADA, CZECH REPUBLIC, DENMARK, ESTONIA,

2023-2024 Covering the following: • Serotyping (O group and H type) • Virulence gene determination (aaic, aggR, eae, stx1, stx2 and subtyping) • Cluster analysis (WGS derived data) Organized by Statens Serum Institut (SSI).	Participant	26	Conventional PCR, Serotyping, Whole genome sequencing	FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, ICELAND, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MONTENEGRO, NORWAY, POLAND, PORTUGAL, ROMANIA, SLOVENIA, SPAIN, SWEDEN, THE NETHERLANDS,

TOR12: EXPERT CONSULTANTS

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

No

29. Additional comments regarding your report:

No