

Activity Report

2016-2017



GROUPE DE RECHERCHE EN
ÉPIDÉMIOLOGIE DES ZOONOSES
ET SANTÉ PUBLIQUE



Université 
de Montréal

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Presentation of our Research Group



Mission

The primary mission of the GREZOSP is to provide a research and scientific activity infrastructure that is recognized, impartial and responsive to the multiple realities associated with public health issues related to the human-animal-environment interactions. The conceptual framework considers public health as a single healthcare concerning humans, animals as well as the environment, thus constituting a complex dynamic system.

Objectives

The objectives of the group's activities are:

- Provide a meeting place as well as a reflection and structured work platform for researchers and professionals whose main interest includes elements of the GREZOSP's mission;
- Contribute to the advancement of knowledge on epidemiology and public health by studying zoonotic disease agents in animal reservoirs, the environment and in human populations by the development and use of quantitative and qualitative measures;
- Recruit and mentor graduate students and postdoctoral fellows and researchers as well as contribute to the training of researchers and professionals working in the public health sector;
- Promote the impact of the group according to the GREZOSP's main research themes;
- Encourage the cooperation between the group's members and colleagues of academic, governmental and institutional affiliations at the regional, national and international levels.

Research Themes

The work of GREZOSP members is structured within the following main research themes:

- Role and impact of the agro-environment on zoonotic disease epidemiology
- Wildlife zoonoses
- Structures and methods for surveillance
- Development of decision support tools for public health use

These themes are approached using the following methodology:

- Mathematical modeling
- Geomatics, spatial analysis and tele-epidemiology
- Environmental microbiology
- Epidemiological methods

Message from the Director



As GREZOSP's new Director, I am pleased and proud to present this annual report outlining the various activities of our research group and the many accomplishments of its members.

As you will see, GREZOSP is as vital and dynamic as ever, with its numerous seminars and workshops, an annual symposium, various student activities, and the numerous scientific publications, oral presentations and collaborations of its members. The strong involvement of GREZOSP and some of its members in the Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques testifies to this dynamism. GREZOSP's vitality is the fruit of the continued commitment of its members, both individually and through the different committees that structure its group life. I can only thank these members for their enthusiastic participation and work alongside them to foster this wonderful vitality.

This report highlights how GREZOSP is a meeting place for many different disciplines and actors, applying the principles of interdisciplinarity and multi-actor collaboration that are key elements of the "OneHealth" and ecosystem approaches to health so dear to GREZOSP. The result is a research group of impressive diversity: in collaborators, who represent a range of disciplines and organizations, both academic and governmental; in the background of our graduate students; in funding sources for our research projects; and in the partnerships themselves.

This vitality and diversity enriches the research carried out by GREZOSP in epidemiology, zoonoses and public health. It enables research on a wide range of health issues, from specific vector-borne diseases like Lyme disease to broader health issues like antibiotic resistance and adaptation to climate change, not to mention a host of other issues in between, such as human health problems linked to dogs in Northern villages, and zoonoses associated with fauna (e.g. rabies) and animal production (e.g. Salmonella, Listeria and Campylobacter). It also enables a range of methodological approaches thanks to the numerous disciplines represented in GREZOSP.

Besides welcoming a new Director, this year saw a change in coordinator with the arrival of Hélène Boucher-Rhéaume, and elections to renew the Board of Directors, Scientific Committee and Executive Committee. Finally, in spring 2017, GREZOSP began a strategic planning process to orient the Group's rapid development over the next few years.

A handwritten signature in blue ink, appearing to read 'André Ravel'.

André Ravel, DMV, M.Sc, Ph.D.

Partnerships



Agreement with the Public Health Agency of Canada

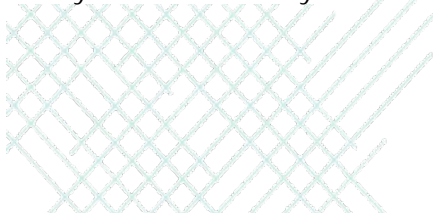
Since 2016, the cooperation agreement between the Public Health Agency of Canada and the Université de Montréal was renewed for the years 2015-2020. This agreement will enhance the scientific and research capabilities in the field of epidemiology, zoonotic diseases and public health in a context of cooperation for the purpose of preventing and controlling zoonotic diseases of importance to Canada. The renewal of this agreement will allow the pursuit of our research activities under one roof within the GREZOSP and improve the synergy, performance and efficiency between and within the Agency and the Faculty of Veterinary Medicine.

Agreement with the Institut national de santé publique du Québec

Under the framework of the *Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques* (Observatory), a collaboration agreement between the Institut national de santé publique du Québec (INSPQ) and the Faculty of Veterinary Medicine through GREZOSP was signed to ensure the joint coordination of the Observatory's development and coordination. The co-coordinators are Anne-Marie Lowe for the INSPQ and Audrey Simon for GREZOSP. A number of GREZOSP members contribute to the Observatory as either members with scientific expertise – André Ravel (EcoHealth approach), Julie Arsenault (enteric zoonoses), Benoît Lévesque (environmental health) and Jean-Philippe Rocheleau (veterinary medicine) – or as public policy members – Ariane Massé (MFFP); Isabelle Picard (MAPAQ); Nicholas Ogden, Catherine Bouchard and Antoinette Ludwig (PHAC); and Farouk El Allaki (CFIA).

Agreement with the Canadian Food Inspection Agency

GREZOSP also has a contribution agreement with the Canadian Food Inspection Agency. The current agreement ends March 31, 2017, and the process for renewing this agreement for 3 years is underway.



Administration and Committees



Board of Directors

President

Michel Carrier
Université de Montréal

Members

Michel Bigras-Poulin
Université de Montréal

Philippe Berthiaume
Public Health Agency of Canada

Nicholas H. Ogden
Public Health Agency of Canada

André Ravel
Directeur du GREZOSP
Université de Montréal

Executive Committee

Jules K. Koffi
Public Health Agency of Canada

André Ravel
Directeur du GREZOSP
Université de Montréal

Jean-Philippe Rocheleau
Université de Montréal

Scientific Committee

Julie Arsenault
Université de Montréal

Catherine Bouchard
Public Health Agency of Canada

Farouk El Allaki
Canadian Food Inspection Agency

Philippe Fravalo
Université de Montréal

André Ravel
Directeur du GREZOSP
Université de Montréal

Ludivine Taieb, représentante étudiante
Université de Montréal

Communications Committee

Hélène Boucher Rhéaume
Université de Montréal

Marie-Josée Champagne
Public Health Agency of Canada

Liliane Fortin
Université de Montréal

Marie-Laure Le Carre
Public Health Agency of Canada

André Ravel
Directeur du GREZOSP
Université de Montréal

Administration and Committees



Scholarships and Awards Selection Committee

Denise Bélanger
Université de Montréal

Michel Bigras-Poulin
Université de Montréal

Julie Paré
Canadian Food Inspection Agency

Échanges Committee

Ariane Adam-Poupart
Institut national de santé publique du Québec

Catherine Bouchard
Public Health Agency of Canada

Hélène Boucher Rhéaume
Université de Montréal

Liliane Fortin
Université de Montréal

Marie-Laure Le Carre
Public Health Agency of Canada

Patrick Leighton
Université de Montréal

Marion Ripoche
Université de Montréal

Audrey Simon
Université de Montréal

Ludivine Taieb
Université de Montréal

Symposium Committee

Cécile Aenishaenslin
McGill University

Catherine Bouchard
Public Health Agency of Canada

Hélène Boucher Rhéaume
Université de Montréal

Liliane Fortin
Université de Montréal

Kathleen Laberge
Public Health Agency of Canada

Patrick Leighton
Université de Montréal

François Milord
Centre intégré de santé et de services
sociaux de la Montérégie-Centre / Direction
de santé publique

Erin Rees
Public Health Agency of Canada

Marion Ripoche
Université de Montréal

Audrey Simon
Université de Montréal

Patricia Turgeon
Public Health Agency of Canada

Administration and Committees



Web Committee

Catherine Bouchard
Public Health Agency of Canada

Hélène Boucher Rhéaume
Université de Montréal

Frédérique Dubé
Institut de recherche en santé publique

Liliane Fortin
Université de Montréal

Manon Racicot
Canadian Food Inspection Agency

André Ravel
Directeur du GREZOSP
Université de Montréal

Ludivine Taieb
Université de Montréal

Social Committee

Hélène Boucher Rhéaume
Université de Montréal

Liliane Fortin
Université de Montréal

Marie-Laure Le Carre
Public Health Agency of Canada

Patricia Turgeon
Public Health Agency of Canada

Our members



Research Members

Research Member: professor, university researcher or career scientist performing most of their research activities within the GREZOSP

Julie Arsenault
Université de Montréal

Emily Jenkins
University of Saskatchewan

André Ravel
Université de Montréal

Philippe Berthiaume
Public Health Agency of Canada

Patrick Leighton
Université de Montréal

Erin Rees
Public Health Agency of Canada

Catherine Bouchard
Public Health Agency of Canada

Antoinette Ludwig
Public Health Agency of Canada

Patricia Turgeon
Public Health Agency of Canada

Philippe Fravalo
Université de Montréal

Nicholas Ogden
Public Health Agency of Canada

Jean-Pierre Vaillancourt
Université de Montréal

Regular Members

Regular Member: professor, university researcher, career scientist or public health professional allowing part of their time and resources to the group's projects

Cécile Aenishaenslin
McGill University

Farouk El Allaki
Canadian Food Inspection Agency

Julie Paré
Canadian Food Inspection Agency

Guy Beauchamp
Université de Montréal

John M. Fairbrother
Reference Laboratory for ECL
Université de Montréal

Yann Pelcat
Public Health Agency of Canada

Denise Bélanger
Université de Montréal

Philippe Gachon
Université du Québec à Montréal

Manon Racicot
Canadian Food Inspection Agency

Michel Bigras-Poulin
Université de Montréal

Salima Gasmi
Public Health Agency of Canada

Jean-Philippe Rocheleau
Université de Montréal

Stéphanie Brazeau
Public Health Agency of Canada

Rebecca A. Guy
Public Health Agency of Canada

Audrey Simon
Université de Montréal

Marie-Josée Champagne
Public Health Agency of Canada

Jules Konan Koffi
Public Health Agency of Canada

Michelle Tessier
Public Health Agency of Canada

Sylvie D'Allaire
Université de Montréal

Serge Olivier Kotchi
Public Health Agency of Canada

Marie-Ève Turcotte
Institut national de santé publique du Québec

Simon Dufour
Université de Montréal

Benoît Lévesque
Institut national de santé publique du Québec

André Vallières
Canadian Food Inspection Agency

Our Members



Associated Members

Ariane Adam-Poupart
Institut national de santé
publique du Québec

Luc Bergeron
Ministère de l'Agriculture, des
Pêcheries et de l'Alimentation
du Québec

Lea Berrang-Ford
McGill University

Diane Boucher
Ministère de l'Agriculture, des
Pêcheries et de l'Alimentation
du Québec

Ann-Marie Cochrane
Public Health Agency of
Canada

Caroline Côté
Institut de recherche et de
développement en
agroenvironnement

Geneviève Côté
Ministère de l'Agriculture, des
Pêcheries et de l'Alimentation
du Québec

Danielle Daignault
Public Health Agency of
Canada

Julie David
Agence nationale de sécurité
sanitaire de l'alimentation, de
l'environnement et du travail
(France)

Benjamin Delisle
Université de Montréal

Julie-Hélène Fairbrother
Ministère de l'Agriculture, des
Pêcheries et de l'Alimentation
du Québec – LEAQ

Cécile Ferrouillet
Université de Montréal

Claudia Gagné-Fortin
Ministère de l'Agriculture, des
Pêcheries et de l'Alimentation
du Québec

Marcelo Gottschalk
Université de Montréal

Josée Harel
Université de Montréal

Andrée Lafaille
Université de Montréal

Louise Lambert
Direction de la santé publique

Marie-Ève Lambert
Université de Montréal

Anne Leboeuf
Ministère de l'Agriculture, des
Pêcheries et de l'Alimentation
du Québec

Marie-Laure Le Carre
Public Health Agency of
Canada

Ariane Massé
Ministère des ressources
naturelles

Pascal Michel
Public Health Agency of
Canada

François Milord
Direction de santé publique
Montréal

Pascale Nérette
Canadian Food Inspection
Agency

Soulyvane Nguon
Institut national de santé
publique du Québec / Ministère
de l'Agriculture, des Pêcheries
et de l'Alimentation du Québec

Isabelle Picard
Ministère de l'Agriculture, des
Pêcheries et de l'Alimentation
du Québec

Gabriel Rotaru
Public Health Agency of
Canada

Alain Rousseau
Institut national de la recherche
scientifique

Sébastien Simard
Ministère de l'Agriculture, des
Pêcheries et de l'Alimentation
du Québec

Our Members



Student Members and Research Projects

Postdoctoral Fellows and Researchers

Denis Haine

Université de Montréal

Director: **Simon Dufour**

1- Biases in longitudinal studies and 2- Evaluation of the costs of bovine mastitis in Canada

Audrey Simon

Université de Montréal

Director: **Patrick Leighton**

Veterinary public health in the Eastern Canada Subarctic and the impact of environmental changes

Olivia Tardy

Université de Montréal

Director: **Patrick Leighton**

Vector-host-pathogen interactions and landscape heterogeneity: the development of modelling approaches to explore ecological mechanisms affecting the risk of transmission and propagation of vector-transmitted diseases and rabies in North America



Our Members



Doctoral Students

Nicholas Bachand

University of Saskatchewan

Director: **Emily Jenkins**

Evaluation of the risk of Toxoplasmosis through the consumption of infected wildlife in the Canadian Arctic using a One-Health approach

Émilie Bouchard

University of Saskatchewan

Director: **Emily Jenkins**

Co-director: **Patrick Leighton**

Toxoplasma gondii distribution in foxes and lynx in Northern Canada

Katie Clow

University of Guelph

Director: Claire Jardine

Co-director: **Nicholas Ogden**

Understanding the influence of biotic and abiotic factors in Lyme disease ecology to predict the future distribution of endemic risk areas in Ontario, Canada

Francine Essono

Université de Sherbrooke

Director: Richard Fournier

Co-director: **Pascal Michel**

Probabilistic modeling of microbial contamination of recreational waters: benefits of remote sensing, GIS and Weight of evidence method

Maud de Lagarde

Université de Montréal

Director: **John M. Fairbrother**

Co-director: **Julie Arsenault**

Prevalence and risk factors associated with the rectal excretion of multidrug-resistant and β -lactamase producing strains of Escherichia coli (E. coli) in Canada's equine population

Our Members



Talibé Diallo

Université de Montréal

Director: **André Ravel**

Robustness of multi-criteria decision methods used for establishing priorities in disease surveillance

Blanaid Donnelly

McGill University

Director: **Léa Berrang-Ford**

Co-director: **Pascal Michel**

Livestock livelihoods and indigenous health vulnerability to climate change in Kanungu District, Uganda

Valerie Hongoh

Université de Montréal

Director: **Pascal Michel**

Co-director: Pierre Gosselin

Adapting vulnerable populations to health impacts linked to climate sensitive infectious diseases

Catarina Krug

Université de Montréal

Director: **Simon Dufour**

Co-directors: Jean-Philippe Roy and Jocelyn Dubuc

Incomplete milking in early lactation to limit negative energy balance and its consequences in dairy cow

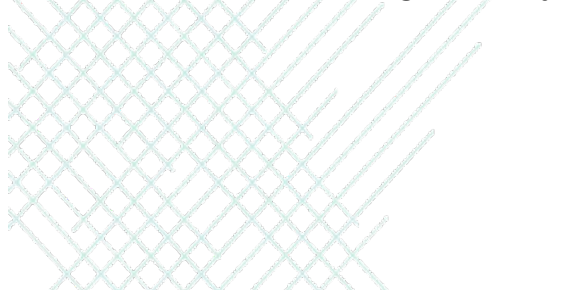
Hélène Lardé

Université de Montréal

Director: **Simon Dufour**

Co-directors: David Francoz and Marie Archambault

Evaluation of antimicrobial agent use by veterinarians and dairy cattle producers in Québec



Our Members



Samir Mechai

Université de Montréal

Director: **Nicholas Ogden**

Co-director: **Pascal Michel**

Phylogeographic analysis reveals a complex population structure of Borrelia burgdorferi in southern Canada

Hannah Munro

Memorial University of Newfoundland

Director: Andrew S. Lang

Co-directors: Hugh Whitney and **Nicholas Ogden**

Biogeography of Borrelia garinii in Newfoundland and Labrador

Miarisoa Rindra Rakotoarinia Randriamialy

Université de Montréal

Director: **Antoinette Ludwig**

Co-directors: **Patrick Leighton** and **Nicholas Ogden**

Global environmental changes in Québec and Ontario, and their impact on risk of exposure to mosquito-borne zoonotic diseases

Marion Ripoche

Université de Montréal

Director: **Patrick Leighton**

Co-directors: **Nicholas Ogden** and **Antoinette Ludwig**

Emergence of vector-borne diseases in Québec: the case of Lyme disease and West Nile Virus

Ludivine Taieb

Université de Montréal

Director: **Antoinette Ludwig**

Co-directors: Dominique Bicout (Grenoble) and Carl A. Gagnon

Mechanisms underlying the re-emergence of West Nile Virus in southern Québec, Canada

Passoret Vounba

Université de Montréal

Director: **John M. Fairbrother**

Co-directors: Rianatou B. Alambedji and **Julie Arsenault**

Potential pathogenicity and antimicrobial resistance of Escherichia coli isolated in chickens from farms in Québec, Senegal and Vietnam

Our Members



Masters Students

Carine Michèle Andela Abessolo

Université de Montréal

Director: **Julie Arsenault**

Co-directors: **Patricia Turgeon** and **Philippe Fravalo**

Public health risk for Salmonella Dublin infection in milk-fed and grain-fed calves in Québec

Nestor Baraheberwa

Université de Montréal

Director: **Julie Arsenault**

Co-director: **Farouk El Allaki**

Evaluation of surveillance strategies for bovine tuberculosis in Canada's farmed Cervidae

Hakima Boujja Miljour

Université de Montréal

Director: **Patrick Leighton**

Co-director: **Guy Beauchamp**

Vigilance during foraging by urban house sparrows

Hélène Déry

Université de Montréal

Director: **Patrick Leighton**

Co-director: **André Ravel**

Ecology of Nunavik's dog population and an analysis of gastrointestinal parasite issues

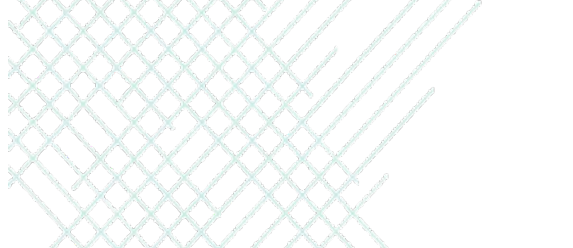
Ariane Dumas

Université de Montréal

Director: **Patrick Leighton**

Co-director: **Nicholas H. Ogden**

Determinants of the spatial distribution of the tick Ixodes scapularis in a semi-urban park



Our Members



Marie-Christine Frenette
Université de Montréal
Director: **Patrick Leighton**
Co-director: Nicolas Lecomte (U. Moncton)
Fox-dog interactions in nordic regions and disease transmission

Géraldine-Guy Gouin
Université de Montréal
Director: **André Ravel**
Co-director: **Cécile Aenishaenslin**
Reduction in the number of health-risking interactions between children and dogs in Kuujuaq

Geneviève Huard
Université de Montréal
Director: **Jean-Pierre Vaillancourt**
Co-director: Michèle Guérin
Assessment and mitigation of contamination risks: critical knowledge to reduce diseases and increase biosecurity compliance

Jonathan Massé
Université de Montréal
Director: Marie Archambault
Co-directors: **Simon Dufour** and David Francoz
Prevalence, cause and control of antibiotic resistance in Québec dairy farms

Jérôme Pelletier (DMV-Maîtrise)
Université de Montréal
Director: **Patrick Leighton**
Co-director: **Catherine Bouchard**
An intervention to reduce the risk of Lyme disease transmission by treating a population of wild mice

Eyaba Tchamdja
Université de Montréal
Director: **Julie Arsenault**
Co-director: **Patricia Turgeon**
Public health risks associated with infections caused by antimicrobial-resistant Salmonella Dublin, Campylobacter spp and Escherichia coli in Québec milk-fed calves

Research Projects

(in progress between May 1, 2016 and April 30, 2017)



Title	Researchers	Funding
Qimuqsiq: A Multidisciplinary Network on Dog Related Issues in the Canadian Arctic (Nunavik and Nunavut)	Francis Lévesque*, UQAT; Cécile Aenishaenslin , Patrick Leighton , Audrey Simon , André Ravel , FMV; Sherilee Harper, Guelph University; Ashlee Cunsolo Willox, Cape Breton University	Social Sciences and Humanities Research Council. Program: Partnership Development Grant
Epidemiology study of risk factors for <i>Salmonella Dublin</i> infection in Québec grain- and milk-fed calves: prevalence, diagnostic approaches and contributors to variation	Julie Arsenault , FMV; Patricia Turgeon , PHAC ; Philippe Fravallo , Sébastien Buczinski, Ann Letellier, FMV; Geneviève Côté, MAPAQ; Rémi Laplante, UPA	MAPAQ Programme Innov' Action
Sensitivity analysis of the bovine tuberculosis surveillance system for Canada's farmed Cervidae	Julie Arsenault , FMV; Farouk El Allaki , CFIA	Canadian Food Inspection Agency
Paratuberculosis in Québec dairy goat herds: current situation and proposed diagnostic approaches for surveillance and control	Julie Arsenault , FMV; Stéphanie Béliveau, Anne Leboeuf, MAPAQ; Olivia Labrecque, Sébastien Buczinski, Gilles Fecteau, Yvan L'Homme, FMV	Programme d'appui à l'implantation de systèmes de salubrité alimentaire, biosécurité, traçabilité et santé et bien-être des animaux, MAPAQ
Integrated social-behavioral and ecological risk maps to prioritize local public health responses to Lyme disease	Catherine Bouchard , PHAC; Cécile Aenishaenslin , FMV; Erin E. Rees , Jules K. Koffi , Yann Pelcat , PHAC; Marion Ripoche , FMV; François Milord , DSP Montérégie; Robbin Lindsay, Nicholas H. Ogden , PHAC; Patrick Leighton , FMV	Carried out without funding
Prevalence, cause and control of antibiotic resistance on Québec dairy cow farms	Marie Archambault, David Francoz, Jean-Philippe Roy, Simon Dufour , Julie Arsenault , André Ravel , FMV; Soulyvane Nguon , MAPAQ; Marie-Ève Paradis, AMVPQ	MAPAQ Programme Innov' Action AgroAlimentaire

Research Projects

(in progress between May 1, 2016 and April 30, 2017)

Title	Researchers	Funding
Effects of preparation methods for bedding made from recycled manure solids on microbial properties, dairy cow health and milk quality	Simon Dufour, Philippe Fravallo , FMV; Denis Roy, U. Laval	NSERC RDC, FRQNT, CRIBIQ and Novalait inc.
Sampling strategies for controlling classification bias in longitudinal studies of udder health	Simon Dufour, Denis Haine , FMV; Ian Dohoo, Henrik Stryhn, UPEI; Daniel Scholl, South Dakota State University	NSERC Discovery Grant
NSERC Industrial Research Chair in Meat Safety <u>RENEWAL</u>	Ann Letellier, Philippe Fravallo , Sylvain Quessy, FMV	NSERC and Partners: - Porcima inc. - CCP - Jefe Nutrition Inc. - Pretec Microbia - F. Ménard Inc.
Biofilm formation by <i>Listeria monocytogenes</i> in microfluidic conditions and screening for anti-biofilm agents	Philippe Fravallo , Mario Jacques, FMV; François Malouin, U. Sherbrooke	Regroupement Stratégique FRQNT, CRIPA
Environment, health and animal welfare in alternative egg production systems – Phase 1: Mitigation	Stéphane Godbout, IRDA; Philippe Fravallo , FMV; Dany Cinq Mars, Michel Lefrançois, U. Laval; Luc Belzile, Caroline Côté , IRDA; Caroline Duchaine, U. Laval	MAPAQ Cultivons l'avenir 2
Development of tools for the diagnosis and control of <i>Salmonella Dublin</i> contamination in dairy farms	Philippe Fravallo, Cécile Ferrouillet , FMV	MAPAQ Cultivons l'avenir 2/ Les producteurs de lait du Québec

Research Projects

(in progress between May 1, 2016 and April 30, 2017)



Title	Researchers	Funding
Positively influencing the gut microbiota of pigs and fowl	Philippe Fravallo , Ann Letellier, FMV; Stéphane Godbout, U. Laval; Sylvain Quessy, FMV	CRIBIQ
Identification and hierarchical classification of <i>Salmonella</i> <i>Dublin</i> propagation risk at market age for bovines: toward a good practices guide	Philippe Fravallo , Cécile Ferouillet , FMV	MAPAQ Cultivons l'avenir 2 / Les éleveurs de bovins du Québec
Salmonella surveillance in the poultry sector	Ann Letellier, Philippe Fravallo , Julie Arsenault , Sylvain Quessy, FMV	RDC NSERC Olymel
Culling of dairy cows in Québec	Denis Haine , Jocelyn Dubuc, Julie Arsenault , FMV	Agriculture and Agri-Food Canada
Modelling past, current and future dynamics of arctic fox rabies	Patrick Leighton , Erin Rees , Audrey Simon , Denise Bélanger , FMV; Philippe Gachon , UQAM; Travis Logan, Ouranos; Ariane Massé , MFFP; Dawn Marshall, Hugh Whitney, Memorial University of Newfoundland; Susan Nadin-Davis, Christine Fehlner-Gardiner, CFIA; Nicholas Ogden , PHAC; Emily Jenkins , University of Saskatchewan; Dominique Berteaux, UQAR; Nicolas Lecomte, Université de Moncton; Anne-Marie Lowe, Benoit Lévesque , INSPQ; Catherine Bouchard , PHAC; Stas Olpinski, Barrie Ford, Makivik; Manon Simard, Elise Rioux-Paquette, KRG; Isabelle Picard , MAPAQ	Ouranos
Functional landscape connectivity and the dynamics of parasite invasion	Patrick Leighton , Olivia Tardy FMV; Catherine Bouchard , Nicholas Ogden , Erin Rees , PHAC	NSERC
Local conditions that favour the establishment of the mosquito <i>Aedes albopictus</i>	Patrick Leighton , FMV; Antoinette Ludwig , PHAC; Alejandra Irace-Cima, Anne-Marie Lowe, Richard Trudel, INSPQ	PHAC

Research Projects

(in progress between May 1, 2016 and April 30, 2017)

Title	Researchers	Funding
Wildlife diseases important for human health and food safety in the changing environment of the Eastern Subarctic	Patrick Leighton , Stéphane Lair, André Ravel , Audrey Simon , FMV; Emily Jenkins , Alvin Gajadhar, Craig Stephen, University of Saskatchewan; Philippe Gachon , UQAM; Nicolas Lecomte, Université de Moncton; Francis Lévesque, UQAT; Dawn Marshall, Hugh Whitney, Memorial University of Newfoundland; Nicholas Ogden , PHAC	Network of Centres of Excellence: ArcticNet
Rabies in small Indian mongooses in the Caribbean: influence of spatial ecology, social behavior and landscape features on disease dynamics and persistence	Patrick Leighton , Caroline Sauvé , FMV; Erin Rees , PHAC; Amy Gilbert, Are Berensten, USDA	NSERC; United States Department of Agriculture (USDA)
Use of passive surveillance data for ticks to identify zones and risk levels for Lyme disease in Québec	Patrick Leighton , Marion Ripoche , FMV; Catherine Bouchard , Salima Gasmi , Jules Koffi , Nicholas Ogden , PHAC; Ariane Adam-Poupard , François Milord , Najwa Ouhoumane, Karine Thivierge, INSPQ	MI-PACC, INSPQ
Risk factors that impact the incidence of Lyme disease cases in Québec	Patrick Leighton , Cécile Aenishaenslin , Géraldine Gouin , Roxane Pelletier , FMV; Catherine Bouchard , Robbin Lindsay, PHAC; Ariane Adam-Poupard , François Milord , Karine Thivierge, INSPQ	PHAC
Geographic and seasonal distribution of medically important species of ticks other than <i>Ixodes scapularis</i> in Québec	Patrick Leighton , FMV; Ariane Adam-Poupard , François Milord , Karine Thivierge, INSPQ; Salima Gasmi , Catherine Bouchard , Nicholas Ogden , Jules Konan Koffi , PHAC	MI-PACC, INSPQ

Research Projects

(in progress between May 1, 2016 and April 30, 2017)



Title	Researchers	Funding
Evaluation of a new oral acaricide for micromammals for local use to reduce Lyme disease transmission risk in Québec	Jérôme Pelletier , Patrick Leighton , FMV; Catherine Bouchard , PHAC; Jean-Philippe Rocheleau , FMV; Nicholas Ogden , PHAC; Cécile Aenishaenslin , FMV	INSPQ
Conducting an epidemiological methodology comparison between case-control and case-case approach to enteric disease risk factor identification	André Ravel , FMV	FoodNet Canada, Public Health Agency of Canada
Costs of AI disease freedom surveillance and disease outbreak control in domestic poultry in Canada, from 2008-2015, and development of a framework for assessing its economic value	André Ravel , FMV	Canadian Food Inspection Agency
Research and action to ensure Inuit health and well-being at the Inuit-dog-environment interface	André Ravel , Cécile Aenishaenslin , Denise Bélanger , Patrick Leighton , Audrey Simon , FMV; Francis Lévesque, UQAT; Jean-François Proulx, Direction régionale de santé publique du Nunavik; Johanne Saint-Charles, UQAM	Institut Écologie et Environnement – INEE LABEX DRIIHM; programme : Observatoire Homme Milieu Nunavik 2016 et 2017
Arboviral infections in Québec: a multi-species comparison of the environmental determinants of risk from a public health perspective	Jean-Philippe Rocheleau , Julie Arsenault , FMV	Carried out without funding

OBSERVATOIRE multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques



At the creation of the *Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques* (Observatory), a collaboration agreement was signed between the Institut national de santé publique du Québec (INSPQ) and the Faculty of Veterinary Medicine via GREZOSP. This agreement lays down the framework for the joint overseeing of the Observatory's development and coordination. The co-coordinators are Anne-Marie Lowe for the INSPQ and **Audrey Simon** for GREZOSP. A number of GREZOSP members are involved in the Observatory in the role of collaborators on specific themes, including **André Ravel** (EcoHealth approach); **Julie Arsenault** (enteric zoonoses); **Benoît Lévesque** (environmental health); **Jean-Philippe Rocheleau** (veterinary medicine); **Ariane Massé** (public policy making); **Isabelle Picard** (public policy making); and **Nicholas Ogden**, **Catherine Bouchard** and **Antoinette Ludwig** (public policy making).

What is the Observatory?

The Observatory provides support to address the 30 priorities set forth in Québec's 2013-2020 Action Plan on Climate Change: "Québec in Action: Greener by 2020", more commonly known as "2013-2020 CCAP". These priorities are funded by the Government of Québec's Green Fund.

The Observatory provides a structure for partner organizations to network and collaborate by centralizing expertise and bringing together disciplines of human, animal and environmental health. The Observatory's primary mission is to foster the collaboration of scientists and public policy makers working on issues at the animal-human-environment interface in the context of adaptation to climate change.

Observatory's mandate:

- document the evolution of zoonoses in Québec;
- produce scientific evidence to inform surveillance;
- prioritize needs in surveillance, research and intervention;
- collaborate on knowledge transfer and the continuing education of professionals concerned by these issues;
- foster networking among the Observatory's collaborators and support the building of a network with organizations and professionals concerned by these issues.

OBSERVATOIRE multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques



The Observatory's members come from the spheres of public policy making and scientific expertise. The sphere of scientific expertise includes human and animal health, and environmental sciences (Figure 1).

The Observatory's coordination is shared between the *Direction des risques biologiques et de la santé au travail* (DRBST) at the INSPQ, and the Faculty of Veterinary Medicine at the Université de Montréal via GREZOSP.

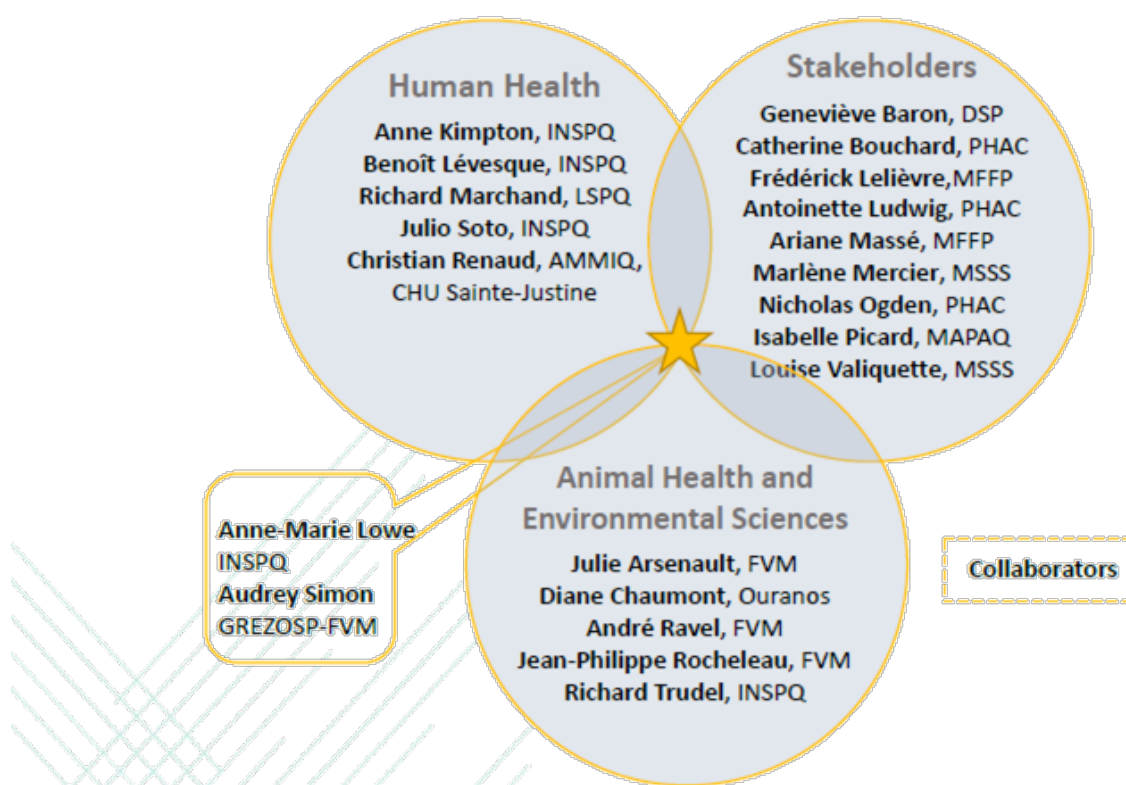


Figure 1: Structure and membership of the Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques based on spheres of expertise (as of August 15, 2017).

For more information, please visit: <https://www.inspq.qc.ca/zoonoses/observatoire>.

OBSERVATOIRE multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques

Research, publications and knowledge transfer activities of the Observatory

At the heart of the Observatory and central to its mandate is knowledge transfer and networking. The Observatory is involved in two main types of knowledge transfer:

- Workshops and conferences to improve competencies (Table 1);
- Producing bulletins that summarize scientific evidence (Figure 2). Intended for those working in public health, these bulletins present the results of relevant research on all types of zoonoses, whether transmitted by animals, food, ticks, mosquitos, etc.

In 2015, the Observatory published a report on the most important zoonoses to prioritize (*Portrait des zoonoses priorisées en 2015*). This was the result of an exercise to prioritize zoonoses in terms of research, surveillance and intervention in the context of adaptation to climate change.



Figure 2: Bulletins issued by the Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques.

OBSERVATOIRE multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques



Table 1: Activities of the Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques (2015-2017). All of these publications are available online at the Observatory's website: <https://www.inspq.qc.ca/zoonoses/observatoire>.

Event	Theme	Date
Webinars (in collaboration with CP-EPITER)	<i>Mapping of Lyme disease risk</i>	November 11, 2015
	<i>Veterinary public health in northern Québec: adaptation strategies in a context of profound change</i>	April 20, 2016
	<i>Emergent arboviruses in Québec: integrated analysis of human and animal data to evaluate risk and distribution</i>	June 9, 2016
	<i>Enteric zoonoses and climate change</i>	September 28, 2016
	<i>Prioritization of zoonoses at the Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques</i>	June 29, 2017
	<i>Complex public health issues in Québec: are health ecosystem approaches useful?</i>	September 27, 2017
Annual Public Health Days (1/2-day workshops)	<i>Zoonoses and climate change</i>	December 8, 2015
	<i>2016: The human-animal-environment interface: integrated approaches to combatting emergent zoonoses</i>	November 22, 2016
Adaptation Canada 2016 Symposium (joint session with PHAC)	<i>Risks associated with zoonoses and vector transmission caused by climate change: impacts and adaptation strategies to protect the health of Canadians</i>	April 14, 2016
CAVEPM 2016 (poster)	<i>A provincial observatory in motion: coping with climate change and zoonoses</i>	May 16-17, 2016
AMMIQ Symposium (session)	<i>Emergent infections: climate change and zoonoses</i>	June 16, 2017
Training workshop for Observatory members	<i>Introduction to multi-criteria decision making in the context of developing a tool for prioritizing zoonoses in Québec</i>	November 14-15, 2016

OBSERVATOIRE multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques



Prioritization of zoonoses by the Observatory

In 2015, the Observatory initiated a process to prioritize zoonoses in the context of climate change. The first step involved soliciting the opinion of the Observatory's expert members, who came up with a list of the twelve zoonoses. The results were presented in a report that summarizes current knowledge on these zoonoses in the form of fact sheets with a standard format that simplifies access to this information for users (Figure 3).

The compilation of these fact sheets highlighted gaps in our knowledge and understanding of issues. These fact sheets are important because they document, in a comprehensive way, the current situation of these zoonoses in Québec based on a OneHealth approach. This report will shortly be available on the Observatory's website.

Continuing this work and with the goal of producing a more rigorous, transparent, systematic and multi-partite prioritization of zoonoses in Québec, the Observatory then embarked on the development of a Multiple-Criteria Decision-Making (MCDM) tool. On November 14-15, 2016, Observatory members participated in a 2-day workshop organized by GREZOSP to learn about developing a MCDM tool for prioritizing zoonoses in Québec in the context of adaptation to climate change. Work on developing this tool continued in the first quarter of 2017.

Cécile Aenishaenslin and **Valerie Hongoh**, GREZOSP members, lead this exercise and shared their methodological expertise.

OBSERVATOIRE multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques

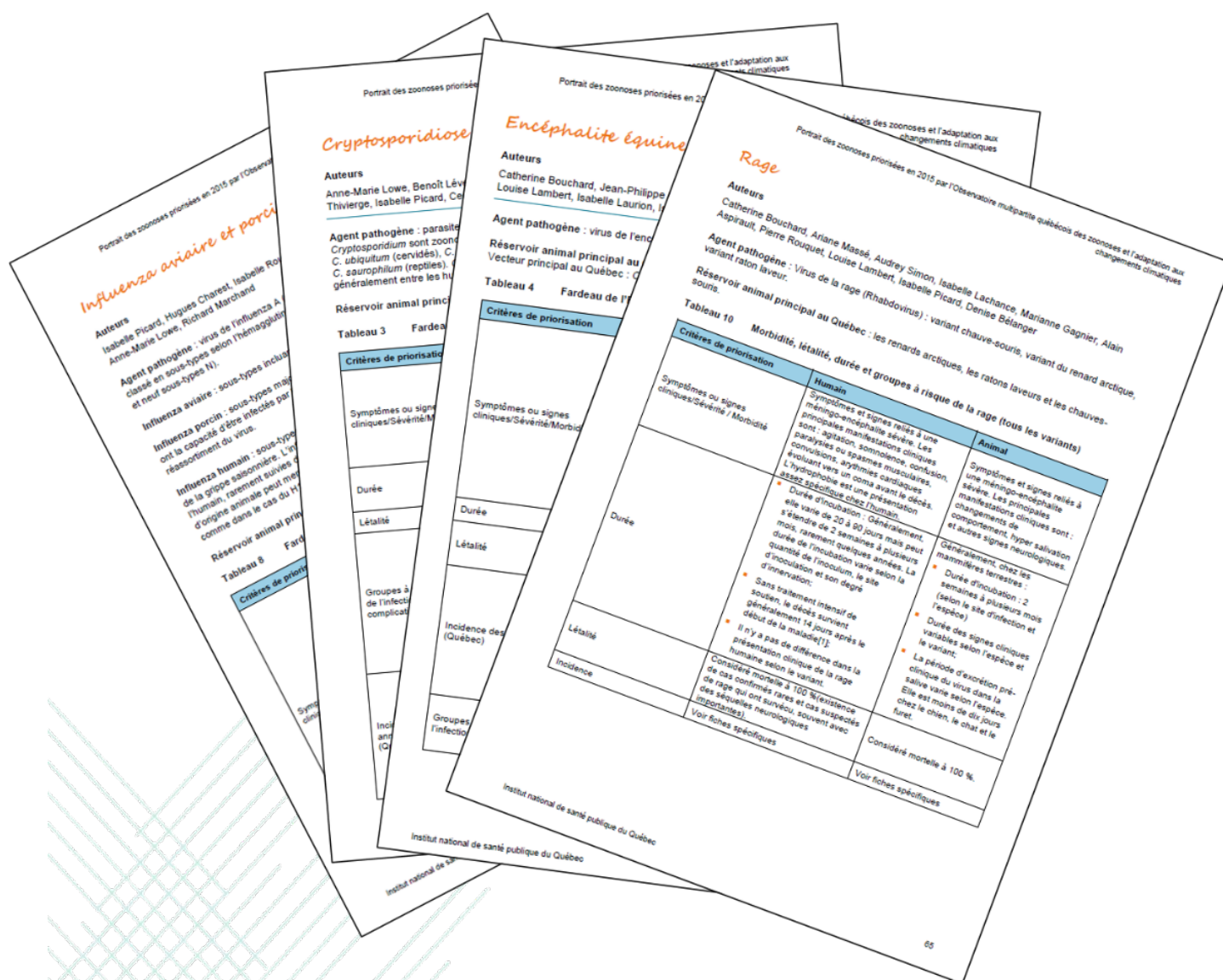


Figure 3: Fact sheets for zoonotic diseases prioritized by the Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques (extracts from: Portrait des zoonoses prioritisées en 2015 par l'Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques).

OBSERVATOIRE multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques

Analyzing the Observatory's collaborative network

One of the Observatory's specific mandates is networking, in particular, networking between its members. A social network analysis is now being used to study the evolution of the Observatory's collaborative network over time. Figure 4 presents a mapping of the collaborative relationships that existed at the time of the Observatory's founding in 2015. In order to track changes over time, this analysis will be repeated à posteriori.

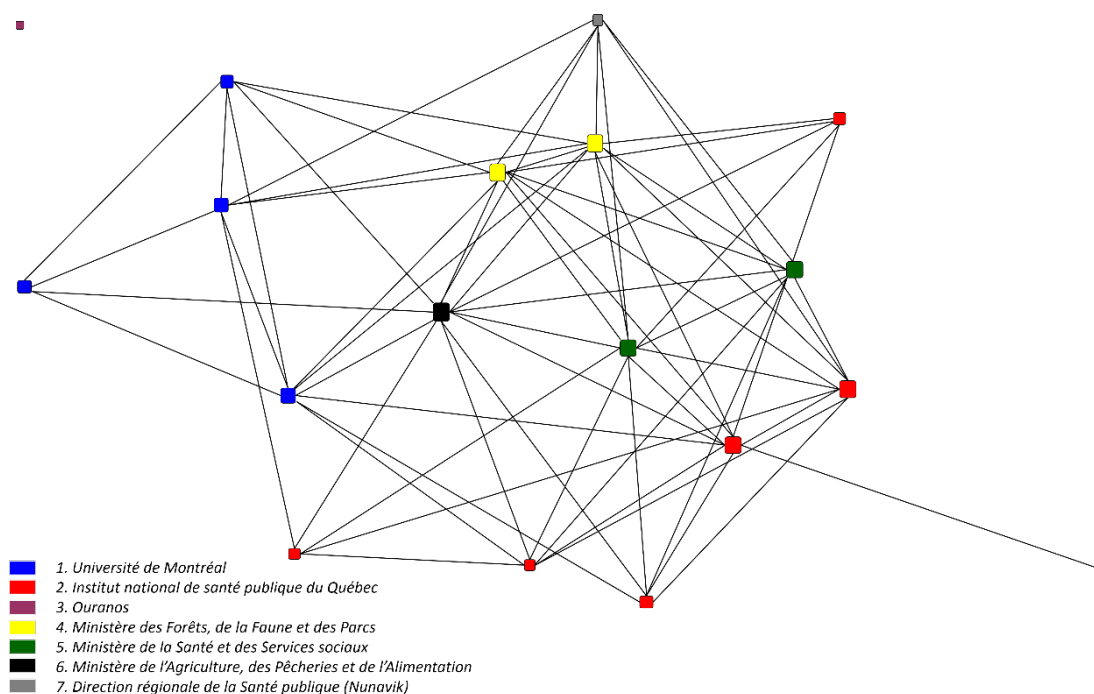


Figure 4: Collaborative relationships between members of the Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques at its founding in November 2015.

To learn more:

Observatory's website: <https://www.inspq.qc.ca/zoonoses/observatoire>

2013-2020 APCC: <http://www.mddelcc.gouv.qc.ca/changementsclimatiques/pacc2020.htm>

Québec's Green Fund: <http://www.mddelcc.gouv.qc.ca/ministere/fonds-vert/index.htm>

Publications

Between May 1, 2016 to April 30, 2017



Books, brochures, book chapters and reports

Bouchard, C., A.-M. Lowe, I. Picard, A. Ravel, P. Rouquet, J.-P. Rocheleau. *The role of animals in the emergence of zoonotic arboviruses of public health interest in Québec.* Bulletin of the Observatoire québécois multipartite sur les zoonoses et l'adaptation aux changements climatiques. 2016, 2(1). Institut National de la Santé Publique du Québec.

<https://www.inspq.qc.ca/bulletin-de-l-observatoire-multipartite-quebecois-sur-les-zoonoses-et-l-adaptation-aux-changements-climatiques/v1-n2>.

Ferrouillet, C., P. Fravallo. *Final report: Development of tools for the diagnosis and control of Salmonella Dublin contamination in dairy cattle farms.* 34 pages. October 2016.

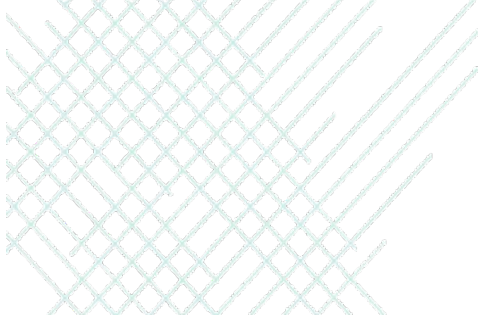
Ferrouillet, C., P. Fravallo. *Preventing and managing Salmonella Dublin on farms.* Le producteur de lait québécois, p 26-28. April 2017.

Fravallo, P. *Final report: Hog slaughter and cutting processes that favour Listeria monocytogenes.* 34 pages. July 2016.

Ravel, A., C. Aenishaenslin. *EcoHealth project on health issues linked to dogs in Inuit communities.* In Current State of Knowledge on Arctic Fox Rabies and Intervention Strategies to Protect the Human Population. Institut National de la Santé Publique du Québec. February 2017.
<https://www.inspq.qc.ca/publications/2220>.

Simon, A. *Epidemiology of the Arctic fox strain of rabies.* In Current State of Knowledge on Arctic Fox Rabies and Intervention Strategies to Protect the Human Population. Institut National de la Santé Publique du Québec. February 2017. <https://www.inspq.qc.ca/publications/2220>.

Simon, A., D. Belanger, D. Berteaux, K. Hueffer, E. Rees, P.A. Leighton. *Ecology of rabies in the Arctic fox (Vulpes lagopus).* In D. Gregory, Tinline, R. (Ed.), Taking the Bite out of Rabies. Accepted (in press).



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Aenishaenslin, C., C. Bouchard, J.K. Koffi, Y. Pelcat, N.H. Ogden. *Exposure and preventive behaviours toward ticks and Lyme disease in Canada: results from a first national survey.* Ticks and Tick-borne Diseases 8 (2017) 112–118.

Arango-Sabogal, J.C., O. Labrecque, **J. Paré, J.-H. Fairbrother**, J.-P. Roy, V. Wellemans, G. Fecteau. *Evaluation of a PCR assay on overgrown environmental samples cultured for Mycobacterium avium subsp. paratuberculosis.* J Vet Diagn Invest. Nov;28(6):638-645. Epub 2016 Oct 3.

Arango-Sabogal, J.C., **G. Côté, J. Paré**, O. Labrecque, J.-P. Roy, S. Buczinski, E. Doré, J.-H. Fairbrother, N. Bissonnette, V. Wellemans, G. Fecteau. *Detection of Mycobacterium avium subspecies paratuberculosis in tie-stall dairy herds using a standardized environmental sampling technique and targeted pooled samples.* Can J Vet Res. (2016) Jul;80(3):175-82.

Boujja-Miljour, H., P. A. Leighton, G. Beauchamp. *Spread of false alarms in foraging flocks of house sparrows.* Ethology (2017) 123: 526-531.

Brazeau, S., S.-O. Kotchi, A. Ludwig, P. Turgeon, Y. Pelcat, G. Aube, N.H. Ogden. *Tele-epidemiology and public health in the Canadian context.* Proc. 'Living Planet Symposium 2016', Prague, Czech Republic, 9-13 May 2016 (ESA ST-740, August 2016).

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Gasmi, S., N.H. Ogden, P.A. Leighton, L.R. Lindsay, K. Thivierge. *Analysis of the human population bitten by Ixodes scapularis ticks in Quebec, Canada: Increasing risk of Lyme disease.* Ticks and Tick-borne Diseases 7 (2016) 1075-1081. <http://dx.doi.org/10.1016/j.ttbdis.2016.09.006>.

Gasmi, S., N.H. Ogden, P.A. Leighton, A. Adam-Poupart, F. Milord, L.R. Lindsay, S. Barkati, K. Thivierge. *Practice of Lyme disease diagnosis and treatment by general practitioners in Quebec, 2008-2015.* BMC Family Practice (2017) 18:65. DOI: 10.1186/s12875-017-0636-y.

Hongoh, V., P. Michel, P. Gosselin, K. Samoura, A. Ravel, C. Campagna, H.D. Cissé, J.- P. Waaub. *Multi-Stakeholder Decision Aid for Improved Prioritization of the Public Health Impact of Climate Sensitive Infectious Diseases.* Int. J. Environ. Res. Public Health (2016) 13(4), 419. doi:10.3390/ijerph13040419.

Publications

Articles published between May 1, 2016 and April 30, 2017



Hongoh, V., C. Campagna, M. Panic, O. Samuel, P. Gosselin, J.-P. Waaub, K. Samoura, **A. Ravel**, **P. Michel**. *Assessing Interventions to Manage West Nile Virus Using Multi-Criteria Decision Analysis with Risk Scenarios*. PLoS ONE 2016, 11(8): e0160651. doi:10.1371/journal.pone.0160651.

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Lachapelle, V., A. Letellier, **P. Fravalo**, J. Brassard, Y. L'Homme. *Dynamics of virus distribution in a defined swine production network using enteric viruses as molecular markers*. Appl Environ microbiol. (2017) Feb 1;83(4). pii: e03187-16. doi:10.1128/AEM.03187-16. Print 2017 Feb 15.

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Pintar, K., K. Thomas, T. Christidis, A. Otten, A. Nesbitt, B. Marshall, P. Pollari, M. Hurst, **A. Ravel**. *A Comparative Exposure Assessment of Campylobacter in Ontario, Canada*. Risk Analysis (2016) doi:10.1111/risa.12653.

Ravel, A., K. Pintar, A. Nesbitt, F. Pollari. *Non food-related risk factors of campylobacteriosis in Canada: a matched case-control study*. BMC Public Health (2016) 16:1016 DOI: 10.1186/s12889-016-3679-4.

Ravel, A. *La contribution vétérinaire à la sécurité alimentaire : changeante et fondamentale!* Le Veterinarius Plus (2016) 32(5): 9-12.

Rocheleau, J.-P., **J. Arsenault**, **N.H. Ogden**, L.R. Lindsay, M. Drebot, **P. Michel**. *Characterizing areas of potential human exposure to eastern equine encephalitis virus using serological and clinical data from horses*. Epidemiol Infect (2016) 1-11.

Thibodeau, A., A. Letellier, E. Yergeau, G. Larivière-Gauthier, **P. Fravalo**. *Lack of evidence that selenium-yeast improves chicken health and modulates the caecal microbiota in the context of colonization by Campylobacter jejuni*. Frontiers in Microbiology (2016). 17 mars 2016. Doi:10.3389/fmicb.2017.00451.

Publications

Articles published between May 1, 2016 and April 30, 2017

Simon, A. *Faire face aux zoonoses au Nunavik : des défis dans une région en plein changement.* Le Veterinarius Plus (2016) 32(4) : 8-9.

Gabriele-Rivet, V., **J. Koffi, Y. Pelcat, J. Arsenault,** A. Cheng, L. Lindsay, T. Lysyk, K. Rochon, **N.H. Ogden.** *A risk model for the Lyme disease vector Ixodes scapularis (Acari: Ixodidae) in the Prairie Provinces of Canada.* Journal of Medical Entomology (2017) 54(4) 862-868.

Ogden, N, J. Arsenault, S. Mechai, T. Hatchette, R. Lindsay. *Antibody responses to Borrelia burgdorferi detected by Western blot vary geographically in Canada.* PLoS One (2017) 12(2), e0171731.

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Young, I., D. Reimer, J. Greig, **P. Turgeon,** R. Meldrum, L. Waddell. *Psychosocial and health-status determinants of safe food handling among consumers: A systematic review and meta-analysis.* Food Control 78 (2017) 401-411. <http://dx.doi.org/10.1016/j.foodcont.2017.03.013>.

4th Symposium on Veterinary Public Health

August 25, 2016



The fourth edition of the Symposium on Veterinary Public Health, jointly organized by GREZOSP and the *Microprogrammes en santé publique vétérinaire*, took place on Thursday August 25, 2016 at the Faculty of Veterinary Medicine, Université de Montréal. The theme was: “*World health at the animal-human-environment interface: global issues and local impacts*”.

It is time to take a new perspective on public health issues – one that looks beyond borders and takes into account the increasing and ever more complex interactions between countries. At the animal-human-environment interface, how do global health issues impact public health decisions at the local level, and how can veterinary public health position itself in this context? Participants at the Symposium gained insights on a variety of themes, such as the vulnerability of world health to emergent viruses, strategies for the prevention and control of such viruses, and public policies that favour health in a context of development. The 1-day symposium was open to everyone with the purpose of encouraging networking between practitioners, researchers and students.

More than one hundred participants had the opportunity to explore such issues, participating in presentations by **Dr. Gary Kobinger**, full professor in the Department of Microbiology, Immunology and Infectious Diseases (Faculty of Medicine) and Director of the Infectious Diseases Research Centre at Université Laval; **Dr. Susan Cork**, professor and head of the Department of Ecosystem & Public Health, Faculty of Veterinary Medicine, University of Calgary; and **Dr. Marie Munoz-Bertrand**, public health advisor for *Direction régionale de santé publique de Montréal*.

SANTÉ PUBLIQUE VÉTÉRINAIRE
COLLOQUE 4^e EDITION

DR GARY KOBINGER
Professeur titulaire au département de microbiologie-immunologie-et-infectiologie
Faculté de médecine
Directeur du Centre de recherche en maladies infectieuses de l'Université Laval

DR SUSAN CORK
Professeure et directrice du département de santé des écosystèmes et santé publique
Faculté de médecine vétérinaire
Université de Calgary

DR MARIE MUNOZ-BERTRAND
Médecin-conseil
Direction régionale de santé publique de Montréal

SANTÉ MONDIALE À L'INTERFACE ANIMAL - HOMME - ENVIRONNEMENT : ENJEUX GLOBAUX ET IMPACTS LOCAUX

Jeudi, le 25 août 2016
FACULTÉ DE MÉDECINE VÉTÉRINAIRE

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GREZOSP
GROUPE DE RECHERCHE EN ÉPIDÉMIOLOGIE DES ZOONOSES ET SANTÉ PUBLIQUE

Université de Montréal

Échanges du GREZOSP



The *Échanges du GREZOSP* are weekly meetings taking place at the Agora of the Pavillon de santé publique vétérinaire. The discussion activities include presentations by GREZOSP members or guest speakers as well as journal club sessions (review and discussion of an article suggested by a member). The calendar for the *Échanges du GREZOSP* is available online and accessible to all members via our website's home page.

For GREZOSP, this weekly series of talks are an important vehicle for disseminating knowledge and showcasing the Group's work. To ensure the meetings are dynamic and useful, good organization is essential. This involves drawing up a schedule and inviting GREZOSP members and guest speakers to give seminars/presentations and propose articles for the journal club. A committee was therefore formed to ensure a rich and varied program, with members Ariane Adam-Poupart, Catherine Bouchard, Hélène Boucher Rhéaume, Liliane Fortin, Marie-Laure Le Carre, Patrick Leighton, Marion Ripoché, Audrey Simon and Ludivine Taieb.

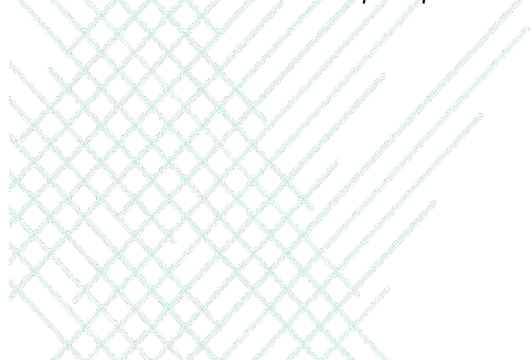
During the 2016-2017 academic year, GREZOSP was proud to welcome many invited speakers, including:

- Suzanne Bruneau, INSPQ Nunavik Research Centre – *Research responding to the needs of Inuit*;
- Barrie Ford, Société Makivik – *Problématiques liées à la recherche en santé des Autochtones et aspects éthiques : exemple de l'enquête santé 2017*;
- Anne-Marie Lowe and **Ariane Adam-Poupart**, INSPQ – *Stratégies d'intervention en santé publique sur les zoonoses transmises par les vecteurs*;
- Colette Gaulin, INSPQ and **Patricia Turgeon**, PHAC – *Webinar of the Observatory : Les zoonoses entériques dans la perspective des changements climatiques*;
- **Louise Lambert**, Direction de la santé publique Montérégie – *Une vision historique de la rage vulpine au Québec*;
- David Pearl, University of Guelph – *Starlings and their role in the movement of zoonotic pathogens and antimicrobial resistant organisms through agricultural landscapes - making inferences from epidemiological, spatial, and molecular data*;

Échanges du GREZOSP



- David Lapen, Agriculture and Agri-Food Canada – *Untangling the impact of agriculture on surface water quality*;
- Christopher Fernandez-Prada, Department of Pathology, Université de Montréal – *Les parasites qui gouvernent le monde dans l'ombre : la problématique des maladies tropicales négligées*;
- Karine Thivierge, INSPQ – *Amélioration des outils de diagnostic de la cryptosporidiose : vers une meilleure détection des cas humains*;
- Bruno Chomel, University of California – *Bartonella: from cats to bats*;
- Mary Hayden and Andy Monaghan, National Center for Atmospheric Research – *Risk Factors for Aedes-borne viruses in North America*;
- Claire Jardine, University of Guelph – *Investigating the role of wildlife in the ecology of multi-host pathogens*;
- Pierre Drapeau, Department of Biological Sciences, Université du Québec à Montréal – *Le Centre d'étude de la forêt : champs d'étude, expertises et perspectives*;
- Steven Hoffmann, Institute of Population and Public Health, Canadian Institutes of Health Research – *Parce que c'est 2017 : pourquoi ne pouvons-nous plus prendre une approche cloisonnée en santé publique?*;
- **Pascal Michel**, Public Health Agency of Canada – *Enjeux et priorités concernant la science au Canada - perspective de l'Agence de la santé publique du Canada*.



Workshop



Introduction to Qualitative Methods for Epidemiological Research

This workshop was organized by GREZOSP and held on June 2-3, 2016 at the Faculty of Veterinary Medicine, Université de Montréal.

The main objective of this workshop was to explore how qualitative research methods can expand research possibilities in veterinary epidemiology. More specifically, the objectives were to:

1. Understand the potential role of qualitative methods in epidemiological studies.
2. Learn about the main qualitative research methods:
Practice a chosen interview method; learn about the thematic analysis process.
3. Understand how journals evaluate the quality and rigour of qualitative research, and what criteria they use to evaluate rigour based on the scientific paradigm:
Understand the meaning of criteria used to evaluate rigour: credibility, theoretical generalization, quota sampling, positionality, inter-subjectivity and triangulation.
Understand the implications when writing an introduction, methods, results and discussion for a scientific article.
4. Learn about different mixed method research designs that integrate quantitative and qualitative methods.

The workshop was led by Dr. Danielle Groleau, Ph.D., associate professor in the Division of Social and Transcultural Psychiatry, McGill University; experienced researcher in the Culture and Mental Health Research Unit at the Jewish General Hospital; editor of the Qualitative Methods Section for the scientific journal *Transcultural Psychiatry* (Sage Publications); and FRQ-S Research Scholar.

Students



Lucie-Dutil Award

The Lucie-Dutil Award was created in memory of Dr. Lucie Dutil (1965-2011), a highly valued colleague and friend. This award aims to support a M.Sc. or Ph.D. student, or a postdoctoral researcher, member of the GREZOSP, in acknowledgement of their remarkable contribution to our research group through their human qualities, in particular, their ability to listen, commit and respect others.

For the 2016-2017 academic year, the Lucie-Dutil Award was presented to **Jean-Philippe Rocheleau** by the *ad hoc* committee appointed by the GREZOSP's Scientific Committee.

Jean-Philippe completed his doctoral studies in December 2016 at the Faculty of Veterinary Medicine, Université de Montréal. His work centred on identifying the environmental characteristics associated with arbovirus exposure risk in Québec.

This award highlights the remarkable contributions of Jean-Philippe to the life of GREZOSP, in particular to student life; his involvement with the Scientific Committee over several years; his great openness of spirit and acceptance of others; and his wonderful music making as guitarist/violonist/singer in the band *Pandémonium*, which was formed in memory of Lucie and continues to liven up our social activities.



Jean-Philippe Rocheleau and André Ravel



Dr Lucie-Dutil (1965-2011) obtained her diploma at Faculty of Veterinary Medicine of the Université de Montréal in 1988. She completed her academic training with a residency in livestock medicine and surgery. After a few years of veterinary practice in the Bois-Francs region, she returned to the Faculty of Veterinary Medicine to complete her Masters in epidemiology (1991-1994) and work as a project manager in research and development for goat and beef cattle. In September 2002, Lucie took the position of epidemiologist and chief analyst for Public Health Agency of Canada's Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS). Her contribution to the implementation and development of CIPARS during the following years was exceptional.

Students

Student Activities

24 heures de science

The topic of veterinary public health was very much present at the event “24 heures de science” on May 6, 2016. **Catarina Krug, Ludivine Taieb, Marion Ripoche, Mathilde Mercat, Talibe Diallo and Valerie Hongoh**, all student members of GREZOSP, organized a kiosk on the main campus of Université de Montréal. The various games on Lyme disease and rabies helped raise awareness of these diseases and teach prevention in young and old alike. Observing ticks and mosquitos under the microscope was particularly popular with the public.



Congratulations to the entire team for this great exercise in popularizing science! Thanks also to **Julie Légaré and Samir Mechai** for their contributions. The event was carried out in collaboration with Dr. Alexis Vallée-Bélisle, Director of the Laboratory of Biosensors & Nanomachines and Canadian Research Chair in Bioengineering & Bionanotechnology.

“Meet a Researcher” Workshops

The goal of these workshops is to bring together researchers and students; researchers share their expertise, students learn, and both get to know each other. The researcher chooses the theme of the workshop based on their interests, activities, reflections, etc.

- **Farouk El Allaki and André Vallières** (October 24, 2016): CFIA and surveillance.
- **Stephanie Brazeau, Julie Légaré, Yann Pelcat and Serge-Olivier Gotchi** (March 16, 2017): Geomatics.
- **Kathleen Laberge** (April 24, 2017): The Field Epidemiology Program.

Students



GREZOSP Scholarship Program

GREZOSP Financial Assistance Scholarships

The Research Group on Epidemiology of Zoonoses and Public Health (GREZOSP) offers scholarships for masters and doctoral students through its program intended for students of the Faculty of Veterinary Medicine of the Université de Montréal under the supervision of a GREZOSP research member and with the aim of promoting GREZOSP's activities.

To be eligible, a student must be enrolled in a full-time Master's or Doctorate in veterinary science at the Faculty of Veterinary Medicine of the Université de Montréal, its research director must be a researcher or regular member of GREZOSP and the project of research must fit within the mission and objectives of GREZOSP.

The purpose of these financial assistance scholarships, of a maximum amount of \$6,000, is to allow students to reach an amount of funding equal to \$20,000 annually for a Master's student, and \$23,000 annually for a Doctoral student.

Four financial assistance scholarships were awarded in 2016-2017, for a total amount of \$18,650. Congratulations to the recipients: **Nestor Baraheberwa, Ariane Dumas, Eyaba Tchamdja** and **Ludivine Taieb**.

GREZOSP Conference Scholarships

These scholarships aim to support a Master's or Doctoral student in order to encourage them to present the results of their research project through an oral presentation at a scientific meeting or symposium.

The amount awarded will cover transportation, lodging and registration fees up to an amount of \$2,000 upon presentation of supporting documents.

Four conference scholarships were awarded in 2016-2017, for a total amount of \$4,647. Congratulations to the recipients: **Maud de Lagarde, Samir Mechai, Marion Ripoche** and **Ludivine Taieb**.

Scientific Outreach

Presentations given between May 1, 2016 to April 30, 2017

Aenishaenslin, C., B. Häslér, **A. Ravel**, J. Zinsstag, J. Parmley, D. Buckeridge. *One Health Surveillance and Antimicrobial Resistance: How Does Integration of Animal and Human Components Impact the Effectiveness and Economic Efficiency of Surveillance Systems?* 3rd International Conference on Animal Health Surveillance, Rotau, New Zealand. April 30–May 4, 2017 (poster).

Aenishaenslin, C., P. Michel, L. Gern, **A. Ravel**, V. Hongoh, J.-P. Waaub, **D. Bélanger**. *Multicriteria decision analysis as a participatory and transdisciplinary tool to evaluate Lyme disease preventive interventions*. Canadian Association of Veterinary Epidemiology and Preventive Medicine Conference, Guelph, Ontario, May 16-17, 2016 (poster).

Bachand, N., B. Dixon, **A. Ravel**, P. Leighton, S. Olpinski, G. Gilbert, C. Stephen, M. Ndao, A. Iqbal, **E. Jenkins**. *Toxoplasma gondii* epidemiology in wildlife of Nunavik, Northeastern Canada. 12th ArticNet Annual Scientific Meeting, Winnipeg, MB, December 5-9, 2016 (poster).

Bouchard, C., C. Aenishaenslin, E.E. Rees, J.K. Koffi, Y. Pelcat, M. Ripoche, F. Milord, R. Lindsay, N.H. Ogden, P. Leighton. *Integrated social-behavioural and ecological risk maps to prioritize local public health responses to Lyme disease*. Canadian Association of Veterinary Epidemiology and Preventive Medicine Conference, Guelph, Ontario, May 16-17, 2016.

Bouchard, C., A.-M. Lowe, J. Arsenault, H. Charest, D. Chaumont, A. Kimpton, F. Lelièvre, B. Lévesque, **A. Massé**, M. Mercier, I. Picard, P. Picard, **A. Ravel**, C. Renaud, J.-P. Rocheleau, J. Soto, R. Trudel, L. Valiquette. *A provincial observatory in motion: coping with climate change and zoonoses*. Canadian Association of Veterinary Epidemiology and Preventive Medicine Conference, Guelph, Ontario, May 16-17, 2016.

Cherifi, T., M. Jacques, S. Quessy, **P. Fravallo**. *Effect of starvation on architecture and production of Listeria monocytogenes biofilm studied in dynamic conditions*. 9th Symposium of CRIPA. May 25-26, 2016, St-Hyacinthe, Canada (oral presentation).

Cherifi, T., M. Jacques, S. Quessy, **P. Fravallo**. *Starvation and its effect on the architecture and biofilm formation by Listeria monocytogenes*. ISOPOL –EMBO conference: problems of listeriosis. Paris, France. June 14-17, 2016 (poster).

Déry, H., C. Aenishaenslin, E. Avard, **D. Bélanger**, L. Callaghan, B. Ford, M.-C. Frenette, **E. Jenkins**, **A. Ravel**, **A. Simon**, P. Leighton. *Spatiotemporal Activity Patterns And Demographics Of Dog Population In Kuujuaq, Nunavik*. 41^e Congrès annuel de la Société Québécoise pour l'Étude Biologique du Comportement, Rimouski, Québec, November 4-6, 2016 (poster).

Scientific Outreach

Presentations given between May 1, 2016 to April 30, 2017



Déry, H., C. Aenishaenslin, E. Avard, D. Bélanger, L. Callaghan, B. Ford, M.-C. Frenette, E. Jenkins, A. Ravel, A. Simon and P. Leighton. *Gastrointestinal parasitism of dogs in Kuujuaq, Nunavik: documenting zoonotic disease risk for dogs and people.* ArcticNet 12th Annual Scientific Meeting, Winnipeg, MB, December 5-9, 2016 (poster).

Dumas, A., C. Bouchard, N. H. Ogden, P. A. Leighton. *Déterminants de la distribution spatiale de la tique Ixodes scapularis dans un parc périurbain.* 41^e Congrès annuel de la Société Québécoise pour l'Étude Biologique du Comportement, Rimouski, Québec, November 4-6, 2016 (poster).

Frenette, M.-C., E. Avard, D. Bélanger, D. Berteaux, H. Déry, B. Ford, E. Jenkins, N. Lecomte, A. Massé, A. Simon, S. Suppa, P. Leighton. *Contact between wildlife, domestic animals and people in Arctic communities: implications for disease transmission.* ArcticNet 12th Annual Scientific Meeting, Winnipeg, MB, December 5-9, 2016 (poster).

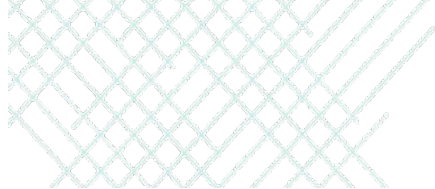
Haine, D., I. Dohoo, D. Scholl, S. Dufour. *Sampling strategies to control misclassification bias in longitudinal udder health studies.* Annual Conference of the Society for Veterinary Epidemiology and Preventive Medicine, Inverness, United Kingdom, March 29-31, 2017.

Haine, D., R. Cue, A. Sewalem, K. Wade, R. Lacroix, D. Lefebvre, J. Rushton, J. Arsenault, É. Bouchard, J. Dubuc. *Culling perspectives from dairy producers, veterinarians, DHI and feed mill advisors: a Q-methodology study.* Inaugural Meeting of the International Society for Economics and Social Sciences of Animal Health, Aviemore, United Kingdom, March 27-28, 2017 (poster).

Haine, D., H. Delgado, R. Cue, A. Sewalem, K. Wade, R. Lacroix, D. Lefebvre, J. Arsenault, É. Bouchard, J. Dubuc. *Marginal structural Cox model to determine clinical mastitis effect on Québec dairy cow culling risk.* Canadian Association of Veterinary Epidemiology and Preventive Medicine Conference, Guelph, Ontario, May 16-17, 2016.

Hongoh, V., P. Michel, C. Campagna, M. Panic, O. Samuel, P. Gosselin, A. Ravel, J.-P. Waaub, K. Samoura. *Towards the synchronization of expert and general public concerns with regards to prevention and control strategies for West Nile virus.* Annual Conference of the Canadian Public Health Association: "Public Health 2017", Toronto, Ontario, June 13-16, 2016 (poster).

Jenkins, E., R. Sharma, E. Bouchard, N. Bachand, P. Leighton, A. Ravel, A. Simon, L. Tukai. *Needs for analyzing food safety risk for toxoplasmosis in wildlife harvested in Canada's North.* 12th ArcticNet Annual Scientific Meeting, Winnipeg, Manitoba, December 5-9, 2016 (poster).



Scientific Outreach

Presentations given between May 1, 2016 to April 30, 2017

Leighton, P. *Projets de recherche récents en lien avec la rage du renard arctique au Québec : un tour d'horizon.* Atelier sur la rage du renard arctique : État des connaissances et stratégies d'intervention pour protéger la population : enjeux actuels et perspectives futures. Faculty of Veterinary Medicine, Université de Montréal, Saint-Hyacinthe, Québec, May 31, 2016.

Pollari, P, M. Hurst, **Ravel, A.** *FoodNet Canada: Canadian Integrated Enteric Disease Surveillance System.* International Conference on Diseases in Nature Communicable to Man, Guelph, Ontario, August 9, 2016.

Ravel, A., M. Hurst, E. Taboada, S. Mutschall, J. David, K.D.M. Pintar, P. Pollari. *Combining exposure assessment, Bayesian model, and molecular data to quantify the sources of human campylobacteriosis.* Canadian Association of Veterinary Epidemiology and Preventive Medicine Conference, Guelph, Ontario, May 16-17, 2016.

Ravel, A. *Dogs not on the lead: practices, perception, and risks to Inuit.* 20th Biennial Inuit Studies Conference, St-John's, Newfoundland and Labrador, October 9, 2016.

Ravel, A., C. Aenishaenslin, J. Saint-Charles, F. Lévesque, S. Bastian, A. Simon, P. Leighton, D. Bélanger. *Promoting dog and reducing dog-related human health issues in Nunavik by combining One Health and EcoHealth approaches.* 4th International One Health Congress & 6th Biennial Congress of the International Association for Ecology & Health, Melbourne, Australia, December 3-7, 2016.

Ravel, A., M. Hurst, N. Petrica, J. David, S.K. Mutschall, K. Pintar, E.N. Taboada, F. Pollari. *Une seule santé appliquée à Campylobacter : quelles relations entretiennent les Campylobacter animaux et humains?* 7^e Colloque international francophone de microbiologie animale, Liège, Belgium, March 26-27, 2017.

Rhouma, M., **P. Fravallo.** *Rôle de la médecine vétérinaire dans le concept « One Health », application à la gestion de l'antibiorésistance.* 1^{er} Congrès de l'École Nationale de Médecine Vétérinaire de Sidi Thabet, École Nationale de Médecine Vétérinaire de Sidi Thabet, Tunisia. Pages C19-C20, March 23-24, 2017 (oral presentation).

Shedleur-Bourguignon, F., **P. Fravallo.** *La détection de Listeria monocytogenes sur des surfaces de salle de découpe dans un abattoir porcin en cours de production varie selon les pièces de viande travaillées.* Journée de la recherche. Faculty of Veterinary Medicine, Université de Montréal, Saint-Hyacinthe, March 10, 2017 (poster).

Taieb, L., D.J. Bicout, **P. Berthiaume, C.A. Gagnon, A. Ludwig.** *A conceptual scheme of the environmental transmission pathways of West Nile Virus in the Ontario/Quebec region.* WDA (Wildlife Disease Association) Ithaca, New York, July 31–August 5, 2016 (poster).

Scientific Outreach

Presentations given between May 1, 2016 to April 30, 2017



Thibodeau A., S. Mutschall, D. Barker, E. Taboada, **P. Fravallo**. *Comparing Québec Campylobacter jejuni from organically and conventionally raised chickens by whole genome sequencing*. CHRO 2011. International workshop on Campylobacter, Helicobacter & related organisms. September 11-14, 2017 (oral presentation).

Rocheleau, J.-P. *Arbovirus émergents au Québec : distribution et facteurs de risque*. Congrès Vétérinaire québécois, Québec, Canada, October 2016 (oral presentation).

Simon, A. *Épidémiologie de la rage, variant du virus du renard arctique*. Atelier sur la rage du renard arctique : État des connaissances et stratégies d'intervention pour protéger la population: enjeux actuels et perspectives futures. Faculty of Veterinary Medicine, Université de Montréal, Saint-Hyacinthe, Québec, May 31, 2016.

Simon, A., E. Rees, C. Bouchard, D. Bélanger, A. Hurford, E. Jenkins, N. Lecomte, H. Whitney, P. Leighton. *Dynamics and persistence of rabies in the Canadian Arctic*. WDA conference, Ithaca, NY, USA, July 31–August 5, 2016.

Simon, A., C. Bouchard, G. Beauchamp, P. Lauzier, C. Fehlner-Gardiner, E. Jenkins, D. Bélanger, P. Leighton. *Spatio-temporal occurrence of rabies outbreaks across Canadian Arctic, 1953-2014: from disease surveillance to ecological mechanisms*. WDA conference, Ithaca, New York, USA, July 31–August 5, 2016.

Simon, A., E. Avard, D. Belanger, D. Berteaux, M. Brisson, B. Dixon, C. Fehlner-Gardiner, P. Gachon, A. Gajadhar, J. Houle, E. Jenkins, P. Kasudluak, S. Lair, N. Lecomte, P.A. Leighton, M. Lemire, B. Lévesque, F. Lévesque, D. Marshall, A. Massé, S. Nadin-Davis, N.H Ogden, S. Olpinski, I. Picard, A. Ravel, E. Rees, M. Simard, C. Stephen, H. Whitney. *Wildlife diseases important for human health and food safety in the changing environment of the Eastern Canadian Subarctic*. WDA conference, Ithaca, New York, USA, July 31–August 5, 2016 (poster).

Tardy, O., C. Bouchard, N. H. Ogden, P. Leighton. *Climate change and tick-host-pathogen interactions: towards a general conceptual model to explore the ecological mechanisms underlying the tick-borne disease spread*. 41^e Congrès annuel de la Société Québécoise pour l'Étude Biologique du Comportement, Rimouski, Québec, Canada, November 4-6, 2016 (poster).

Tardy, O., C. Bouchard, E. Rees, N. H. Ogden, P. Leighton. *Modélisation de la propagation de maladies transmises par des tiques dans un contexte d'adaptation aux changements climatiques*. Journée de la recherche of the Faculty of Veterinary Medicine, Université de Montréal, Saint-Hyacinthe, Québec, Canada, March 10, 2017 (poster).

Scientific Outreach



Congratulations to **Jean-Philippe Rocheleau** for his doctoral thesis “Environmental characteristics related to arbovirus exposure risk in Québec”, Université de Montréal, 2016.

Congratulations to **Maud de Lagarde** for obtaining the status of Diplomate from the American College of Veterinary Internal Medicine. Dr. de Lagarde is pursuing doctoral studies on antibiotic resistance under **Dr. John Fairbrother** (supervisor) and **Dr. Julie Arsenault** (co-supervisor).

Serge Olivier Kotchi was awarded Best Ph.D. Thesis for 2016 by the Canadian Remote Sensing Society for his thesis “Remote sensing-based uncertainty estimation and assessment of agrometeorological indicators to support the fight against crop pests”.

As part of *Forum technologique Novalait 2016*, master’s student **Pierre-Alexandre Morin** was awarded 2nd prize for his poster.

Catarina Krug, doctoral candidate, presented her research project in the form of a poster and also orally for “My Thesis in 180 Seconds”.

Jean-Pierre Vaillancourt was invited to give a lecture on biosecurity at the *Journées de la recherche avicole* in Tours, France on April 5, 2016. He outlined various concerns related to the popular new phenomenon of urban chicken farming. His primary consideration was the well-being of chickens, although he also highlighted the potential for metabolic diseases and attracting undesirable animals. For more details, see [the article in Journal Métro](#).

Jean-Pierre Vaillancourt was invited to give a talk on the avian influenza epidemic in southeast France at the Research Day of the Poultry Industry Council, held on May 4, 2016 in Guelph.

At the CAVEPM 2016 Conference, held on May 16-17, 2016, **Catherine Bouchard** and **Marion Ripoche** both gave oral presentations on Lyme disease, entitled respectively “Integration of social and environmental vulnerabilities to prioritize and adapt local response against Lyme disease in Canada” and “Spatial heterogeneity in *Ixodes scapularis* distribution within the Lyme disease emergence zone in southern Canada”. **Marion Ripoche**, a doctoral candidate, received a student award for her excellent presentation.

Scientific Outreach



Denise Bélanger organized a workshop entitled “Arctic Fox Rabies” in collaboration with Québec’s Ministère de la Santé et des Services sociaux and the Institut national de santé publique du Québec. It was held at the Faculty of Veterinary Medicine on May 31, 2016. A special thanks to Patrick Leighton for technical assistance (online conference), Audrey Simon for her synthesis of presentations, and Cécile Seyer for organizational support.

Jean-Pierre Vaillancourt co-lead a workshop on biosecurity and the diagnosis/control of avian influenza in veterinary labs, held on August 23-27, 2016 in Accra, Ghana.

André Ravel, thanks to funding from the Direction of International Affairs, Université de Montréal, spent one week at Oniris (*École vétérinaire et agro-alimentaire*) in Nantes, France. He took part in discussions around structures, methods and teaching challenges in veterinary public health (VPH). Oniris offers a program similar to our *Microprogrammes* and master’s program with a VPH option. Common interests and potential collaborations were identified during this mission.

Jean-Pierre Vaillancourt gave a course in population medicine at the *École nationale vétérinaire* (ENVT) in Toulouse, France on November 28, 2016. He was at ENVT as a member of the new Chair in Biosecurity created following the outbreak of a highly pathogenic strain of avian influenza that has been affecting southwest France since November 2015. He had the opportunity to investigate the first two cases of H5N8 recently reported on French commercial farms.

André Ravel participated in the joint 4th International One Health Congress / 6th Biennial Conference of the International Association for Ecology and Health, held in Melbourne, Australia on December 3-7, 2016. He presented a poster on the EcoHealth project aimed at reducing dog-related human health problems in Nunavik. For the third consecutive year, Dr. Ravel and the multidisciplinary team received funding from DRIHM LabEx (Device for Interdisciplinary Research on Human-Environments Interactions) through the *Observatoire Homme-Milieu du Nunavik*.

Jean-Pierre Vaillancourt was received by the *Académie Nationale de Médecine de France* at its formal sitting on December 20, 2016, after being elected “Foreign Corresponding Member” on June 21, 2016.

Catherine Bouchard participated in the show “Les années lumières” on Radio-Canada, where she discussed a tick that can make people allergic to meat (broadcast April 2, 2017). <http://ici.radio-canada.ca/premiere/emissions/les-annees-lumiere/segments/chronique/20182/allergie-viande-tique>.

Financial Statements



Financial Statements from May 1, 2016 to April 30, 2017

Sources of Funding

Balance for Previous Financial Year (2015-2016)	123 143 \$
Annual Funding under PHAC Agreement (2016-2017)	80 500 \$
Funding under CFIA Agreement (2016-2017)	18 638 \$
Other Sources (Workshop and Continuing Education)	691 \$
Funding Total	222 972 \$

Expenses

Administrative Salaries	73 657 \$
Graduate Student Scholarships and Support	23 297 \$
Activities and Student Meetings	1 267 \$
Lucie-Dutil Award	634 \$
Scientific Workshop and <i>Journées du GREZOSP</i>	4 705 \$
GREZOSP Annual Symposium	5 810 \$
Travel Expenses	-
Reception and Representation	977 \$
Web Site Updates	938 \$
Telecommunications	533 \$
Office Supplies and Fees	1 163 \$
Printing and Reprography Costs	1 395 \$
Maintenance and Renovation	1 902 \$
Expenses Total	116 278 \$

To Contact Us:

Research Group on Epidemiology of Zoonoses
and Public Health (GREZOSP)

Telephone: 450-773-8521, ext. 8386

Email: grezosp@umontreal.ca

Web Site: <http://www.medvet.umontreal.ca/grezosp>

Postal Address:

3200, rue Sicotte
Saint-Hyacinthe, Québec
J2S 2M2

Office Address:

3190, rue Sicotte
Saint-Hyacinthe, Québec
J2S 2M1

GRUPE DE RECHERCHE EN
ÉPIDÉMIOLOGIE DES ZOONOSES
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