Activity Report
2017-2018

GROUPE DE RECHERCHE EN
ÉPIDÉMIOLOGIE DES ZOONOSES
ET SANTÉ PUBLIQUE

GREZOSP

Université de Montréal

Contents

Cover page layout: Marie-Laure Le Carre
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Presentation of our Research Group

Our 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 one-medicine approach 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

It is with great pleasure and pride that I invite you to read this activity report which presents our research group's various activities and our members' many achievements. This new report fully illustrates all the vitality and the extent of research work led by GREZOSP members with their numerous collaborators.

The GREZOSP is continuously growing on several levels. The number of student members increased by 50% between 2015 and 2017 while the total number of members grew by 17%. The number of projects has increased as well and with them, the variety of health issues studied, the variety of research methods used, the variety of funding sources for these projects as well as the variety and number of collaborations.

Health related issues which are subject of the research led by our members are extensive. Several projects pertain to emerging diseases, especially arboviruses (West Nile Virus, Zika, Chikungunya) and other vector-borne diseases such as Lyme disease and malaria. In our research, disease agent vectors and reservoirs are not forgotten. Rabies is also the subject of projects, whether it is in Southern Québec (from raccoons) or in Northern Québec (from arctic foxes). Regarding the latter, other research on human health issues related to dogs in Nordic villages are also conducted. Health issues related to animal production are studied as well, such as the emergence of Salmonella Dublin in dairy cattle breeding, the risk of avian influenza, Q fever which remains mysterious and other enteric diseases or foodborne illnesses which are still very much present (salmonellosis, campylobacteriosis, listeriosis, infection by Escherichia coli). Impact of global changes, such as climate change, on the epidemiology of zoonotic diseases is the subject of our research as well as the use of animal antimicrobials and antimicrobial resistance.

As for research approach and scientific methods involved, the variety is as extensive, showcasing the breadth of our members' expertise and their numerous collaborators from various academic, scientific, public health or animal health sectors. In fact, the One Health approach - or ecosystem approach to human health - constitutes the general framework of our research. Epidemiologic, statistic or mathematical modeling is routinely used. Geomatics, remote sensing, environmental microbiology, genomics, evaluative research, cost-benefit assessment and intervention research are all examples of methods and tools featured in our research.

We hope this brief and non-comprehensive outline will incite you to read this report! You will discover the commitment of GREZOSP members, individually and through the various committees which organize our group's activities. I can't thank them enough for their enthusiastic energy which is reflected in GREZOSP's growth and the breadth of its outreach.

André Ravel, DMV, M.Sc., Ph.D.

Partnerships

Agreement with the Public Health Agency of Canada

In 2016, the cooperation agreement between the Public Health Agency of Canada (PHAC) and the Université de Montréal was renewed for the years 2015-2020. This agreement enhances 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 significance to Canada. This agreement also allows us to practice our research activities under one roof within the GREZOSP and thus, improve the synergy, performance and efficiency between and within PHAC and the Faculty of Veterinary Medicine (FMV).

Agreement with the Institut national de santé publique du Québec

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 and development of the *Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques* (Observatory). The Observatory's primary mission is to foresee zoonotic disease issues in Québec in order to support risk management and better adapt to climate change. 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

The Canadian Food Inspection Agency (CFIA) and GREZOSP signed a contribution agreement in 2014. The renewal process for another 3-year term was completed in 2017; the current agreement is therefore ending on March 31st, 2020.

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Director of GREZOSP
Université de Montréal

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, FMV

Philippe Berthiaume, PHAC

Catherine Bouchard, PHAC

Philippe Fravalo, FMV

Emily Jenkins, U. Saskatchewan

Patrick Leighton, FMV

Antoinette Ludwig, PHAC

Nicholas Ogden, PHAC

André Ravel, FMV

Erin Rees, PHAC

Patricia Turgeon, PHAC

Jean-Pierre Vaillancourt, FMV

Regular Members

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

Cécile Aenishaenslin, FMV

Guy Beauchamp, FMV

Denise Bélanger, FMV

Michel Bigras-Poulin, FMV

Stéphanie Brazeau, PHAC

Marie-Josée Champagne, PHAC

Sylvie D'Allaire, FMV

Simon Dufour, FMV

Farouk El Allaki, CFIA

John M. Fairbrother, FMV

Caroline Fortin, DSA-MAPAQ

Philippe Gachon, UQAM

Salima Gasmi, PHAC

Rebecca A. Guy, PHAC

Valérie Hongoh, PHAC

Jules Koffi, PHAC

Serge Olivier Kotchi, PHAC

Benoît Lévesque, INSPQ

Samir Mechai, PHAC

Julie Paré, CFIA

Yann Pelcat, PHAC

Manon Racicot, CFIA

Jean-Philippe Rocheleau, FMV

Audrey Simon, FMV

Michelle Tessier, PHAC

Marie-Ève Turcotte, INSPQ

André Vallières, CFIA

Our Members

Associated Members

Levon Abrahamyan, FMV

Ariane Adam-Poupart, INSPQ

Alain Aspirault, MAPAQ

Luc Bergeron, MAPAQ

Lea Berrang-Ford, U. McGill

Diane Boucher, MAPAQ

Sandie Briand, INSPQ

Ann-Marie Cochrane, PHAC

Caroline Côté, IRDA

Geneviève Côté, MAPAQ

Julie David, ANSES (France)

Benjamin Delisle, FMV

Francine Essono

Julie-Hélène Fairbrother, MAPAQ

Cécile Ferrouillet, FMV

Claudia Gagné-Fortin, MAPAQ

Céline Gariépy, DSP Montérégie

Marcelo Gottschalk, FMV

Josée Harel, FMV

Andrée Lafaille, FMV

Louise Lambert, DSP

Marie-Ève Lambert, FMV

Anne Leboeuf, MAPAQ

Marie-Laure Le Carre, PHAC

Annick Marier, MAPAQ

Ariane Massé, MRN

Isabelle McKenzie, MAPAQ

Pascal Michel, PHAC

François Milord, DSP Montérégie

Pascale Nérette, CFIA

Soulyvane Nguon, INSPQ / MAPAQ

Isabelle Picard, MAPAQ

Chantal Proulx, MAPAQ

Fidisoa Rasambainarivo, U. Missouri

Gabriel Rotaru, PHAC

Alain Rousseau, INRS

Our Members

Student Members and Research Projects

Name	Institution	Director	Co-director(s)	Project Title
Postdoctoral Fellows and Researchers				
Denis Haine	Université de Montréal	**Simon Dufour**		1- Biases in longitudinal studies and 2- Evaluation of the costs of bovine mastitis in Canada
Olivia Tardy	Université de Montréal	**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
Doctoral Students				
Agathe Allibert	Université de Montréal	**Patrick Leighton**	**Erin Rees**	Modelling the future of arctic fox rabies in the Canadian Arctic
Nicholas Bachand	University of Saskatchewan	**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	**Emily Jenkins**	**Patrick Leighton**	Toxoplasma gondii distribution in foxes and lynx in Northern Canada
Maud de Lagarde	Université de Montréal	**John M. Fairbrother**	**Julie Arsenault**	Prevalence and risk factors associated with the rectal excretion of multidrug-resistant and ß lactamase producing strains of Escherichia coli (E. coli) in Canada's equine population
Talibé Diallo	Université de Montréal	**André Ravel**	**Cécile Aenishaenslin**	Robustness of multi-criteria decision methods used for establishing priorities in disease surveillance
Ariane Dumas	Université de Montréal	**Patrick Leighton**	**Nicholas H. Ogden**	Fine-scale mapping of Lyme disease's ecology and dynamics
Stefany Ildefonso	Université de Montréal	**André Ravel**	Johanne Saint-Charles	Implementation and assessment of human-dog interface interventions aimed at reducing risks and increasing benefits in Nunavik
Fidèle Kabera	Université de Montréal	**Simon Dufour**	Jean-Philippe Roy	Selective antibiotic treatment by quarter at drying-off based on milk culture at the farm with Petrifilm®
Catarina Krug	Université de Montréal	**Simon Dufour**	Jean-Philippe Roy and Jocelyn Dubuc	Incomplete milking in early lactation to limit negative energy balance and its consequences in dairy cows
Hélène Lardé	Université de Montréal	**Simon Dufour**	David Francoz and Marie Archambault	Evaluation of antimicrobial agent use practices by veterinarians and dairy producers in Québec
Jonathan Massé	Université de Montréal	Marie Archambault	**Simon Dufour** and David Francoz	Antibiotic resistance in dairy cows in Québec
Samir Mechai	Université de Montréal	**Nicholas Ogden**	**Pascal Michel**	Using phylogeographic tools to explore the genetic diversity of Borrelia burgdorferi and the genetics of Lyme disease in Canada

Our Members

Student Members and Research Projects

Name	Institution	Director	Co-director(s)	Project Title
Miarisoa Rindra Rakotoarinia Randriamialy	Université de Montréal	**Antoinette Ludwig**	**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	**Patrick Leighton**	**Nicholas Ogden and Antoinette Ludwig**	Emergence of vector-borne diseases in Québec: the case of Lyme disease and West Nile Virus
Caroline Sauvé	Université de Montréal	**Patrick Leighton**	**Erin Rees** and Amy Turmelle Gilbert	Rabies in small Indian mongooses in the Caribbean: influence of spatial ecology, social behavior and landscape features on disease dynamics, and implications for control and management
Fannie Shedleur-Bourguignon	Université de Montréal	**Philippe Fravalo**		Identifying microbial ecosystem components of pork meat production surfaces associated with the absence of Listeria monocytogenes, towards a surface-oriented ecology
Ludivine Taieb	Université de Montréal	**Antoinette Ludwig** and Dominique Bicout (Univ. Grenoble-Alpes)	Carl A. Gagnon	Mechanisms underlying the re-emergence of West Nile Virus in southern Québec, Canada
Passoret Vounba	Université de Montréal	**John M. Fairbrother**	Rianatou Bada and **Julie Arsenault**	Potential pathogenicity and antimicrobial resistance of Escherichia coli isolated in chickens from farms in Québec, Senegal and Vietnam
Masters Students				
Gabriel Ahui	Université Laval	Nathalie Barrette	**Serge Olivier Kotchi**	Using a geographic information system for characterizing areas at risk for malaria in M'bahiakro, Côte d'Ivoire
Carine Michèle Andela Abessolo	Université de Montréal	**Julie Arsenault**	**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	**Julie Arsenault**	**Farouk El Allaki**	Evaluation of surveillance strategies for bovine tuberculosis in Canada's farmed Cervidae
Selmane Boubendir	Université de Montréal	Sylvain Quessy	Marie-Lou Gaucher and Alexandre Thibodeau	Study of Salmonella contamination of broiler carcasses during various stages of the slaughter process and in the environment of two slaughterhouses in Québec

Our Members

Student Members and Research Projects

Name	Institution	Director	Co-director(s)	Project Title
Gabrielle Claing	Université de Montréal	**Julie Arsenault**	Pascal Dubreuil	Prevalence of the main diseases of honey bees (Apis mellifera) in Québec and impacts on winter mortality
Hélène Déry	Université de Montréal	**Patrick Leighton**	**André Ravel**	Ecology of Nunavik's dog population and an analysis of gastrointestial parasite issues
Gabrielle Dimitri-Masson	Université de Montréal	**Patrick Leighton**	Claire Jardine	Sarolaner treatment of wild rodents: Breaking new ground in the fight against Lyme disease
Lauriane Duplaix	Université de Montréal	**Julie Arsenault**	**Benoit Lévesque and Patricia Turgeon**	Seroprevalence of Coxiella burnetti in the Québec population and impact of environmental factors on infection risks, disease spread and survival
Annie Fréchette	Université de Montréal	**Simon Dufour**	**Caroline Côté** and Gilles Fecteau	Impacts of compost bedding preparation methods on dairy cow health and milk quality
Marie-Christine Frenette	Université de Montréal	**Patrick Leighton**	Nicolas Lecomte (U. Moncton)	Fox-dog interactions in Nordic regions and disease transmission
Géraldine-Guy Gouin	Université de Montréal	**André Ravel**	**Cécile Aenishaenslin**	Reducing the number of health-risking interactions between children and dogs in Kuujjuaq
Camille Guillot	Université de Montréal	**Patrick Leighton**	**Catherine Bouchard**	Validation and optimization of sentinel surveillance as a disease surveillance tool for adults with Lyme disease in Québec
Geneviève Huard	Université de Montréal	**Jean-Pierre Vaillancourt**	Michèle Guérin	Assessment and mitigation of contamination risks: critical knowledge to reduce diseases and increase biosecurity compliance
Stefany Ildefonso	Université de Montréal	**André Ravel**	Ana Riviere-Cinnamond	Spatio-temporal evolution of hantavirus infections in the Americas (1998-2016)
Jérôme Pelletier	Université de Montréal	**Patrick Leighton**	**Catherine Bouchard**	An intervention to reduce the risk of Lyme disease transmission by treating a population of wild mice
Eyaba Tchamdja	Université de Montréal	**Julie Arsenault**	**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, 2017 and April 30, 2018

Title	Researchers	Funding
Evaluating the risk factors influencing the incidence of Lyme Disease in Québec	**Ariane Adam Poupart**, INSPQ ; **Géraldine Gouin, Cécile Aenishaenslin**, FMV ; **Catherine Bouchard**, PHAC ; **Patrick Leighton**, FMV and collaborators	INSPQ -PHAC
Development of bilingual training for independent surveillance of Ixodes scapularis ticks in Canadian parks and raising Lyme disease risk awareness in workers and the general population	**Ariane Adam Poupart**, INSPQ; CNR, **Patrick Leighton** and collaborators, FMV; **Catherine Bouchard**, PHAC	
Using a geographic information system for characterizing areas at risk for malaria in M'bahiakro, Côte d'Ivoire	**Gabriel Ahui**, Nathalie Barrette, U. Laval ; **Serge Olivier Kotchi**, PHAC	U. Laval
Mosquito population density mapping	**Julie Allostry**, U. Sherbrooke; **Antoinette Ludwig, Serge Olivier Kotchi**, PHAC; Richard Fournier, U. Sherbrooke	PHAC
Epidemiological study of the risk of Salmonella Dublin infection in milk-fed and grain-fed calves in Québec: prevalence, diagnostic approach and variation factors	**Julie Arsenault**, FMV ; **Patricia Turgeon**, PHAC ; Ann Letellier, FMV ; **Geneviève Côté**, MAPAQ ; **Philippe Fravalo**, Sébastien Buczinski, FMV ; Rémi Laplante, UPA	Cultivons l'avenir 2 – Programme Innov'Action agroalimentaire
Impact of environmental and weather conditions on the risk of infection with Coxiella burnetii in Québec	**Julie Arsenault**, FMV ; **Patricia Turgeon**, PHAC ; **Benoît Lévesque**, INSPQ ; **Anne Leboeuf, Isabelle Picard**, MAPAQ ; **Jean-Philippe Rocheleau, Lauriane Duplaix**, FMV	PHAC, Fonds du centenaire-Université de Montréal
Epidemiological study of infections caused by antimicrobial resistant Salmonella Dublin, Campylobacter spp and E. coli in milk-fed calves in Québec	**Julie Arsenault**, FMV; **Patricia Turgeon**, PHAC; **Philippe Fravalo**, FMV; **Geneviève Côté**, MAPAQ, **Eyaba Tchamdja**, FMV	Innov'Action (MAPAQ)
Modelling campylobacteriosis risk in Canada through the various environmental and foodborne sources of exposure in a climate change perspective	**Julie Arsenault, Philippe Fravalo, André Ravel**, FMV; **Philippe Gachon**, UQAM ; Amy Greer, University of Guelph ; Rob Deardon, UCalgary	Canadian Institutes of Health Research: Project program, Fall 2017
Scoping review of Chikungunya mathematical modeling	**Philippe Berthiaume**, Mariola Mascarenhas, PHAC ; Jean-Charles Côté, INSPQ	PHAC
Towards informative socio-ecological answers against Lyme disease in Canada	**Catherine Bouchard**, PHAC; **Cécile Aenishaenslin**, U. McGill; **Erin E. Rees, Yann Pelcat, Jules Koffi**, Robbin Lindsay, PHAC; **Patrick Leighton**, FMV	Fonds A-Base

Research Projects

In progress between May 1, 2017 and April 30, 2018

Title	Researchers	Funding
Mosquito-borne diseases mapping in the America	**Stéphanie Brazeau, Serge Olivier Kotchi, Antoinette Ludwig**, PHAC; Cécile Vignolles, CNES; Thibault Cathry, Emmanuel Roux and Nadine Dessay, IRD; Richard Fournier, U. Sherbrooke; Dominique Bicout, Univ. Grenoble Alpes; GeoHealth	
Impact of climate changes on the exposition risk of human population to Coliforms in recreational water	Jonathan Beaudet, U. Sherbrooke; **Stéphanie Brazeau**, PHAC; Yannick Huot, U. Sherbrooke	NSERC-Lakepulse
MALDI-TOF Technology for studying the dynamics of mammary gland infections	**Simon Dufour**, FMV	FCI Leaders John-Evans FEI
NSERC-CREATE in Milk Quality	**Simon Dufour**, Mario Jacques, FMV	NSERC - programme FONCER
Validation of bulk tank milk sampling strategies and identification of risk factors for Salmonella Dublin in dairies	**Simon Dufour**, Olivia Labrecque, FMV ; Luc Bergeron, Geneviève Côté, MAPAQ; Shereen Hassan, Jean Durocher, Valacta; Chantal Fleury, Catherine Lessard, PLQ; Gilles Fecteau, David Francoz, Marie Archambault, **Julie Arsenault, André Ravel**, FMV	NSERC
Impacts of compost bedding preparation methods on its microbial properties, on dairy cow health and milk quality	**Simon Dufour, Philippe Fravalo**, FMV and collaborators	NSERC RDC, FRQNT, CRIBIQ and Novalait inc.
Evaluation of antimicrobial agent use practices by veterinarians and dairy producers in Québec	David Francoz, **Simon Dufour**, FMV	MAPAQ - Innov'Action
Evaluating the validity of a differential somatic cell count test in milk as a quick and affordable tool for the diagnosis of subclinical mastitis	Débora Santschi, U. McGill ; **Simon Dufour**, FMV	Cultivons l'avenir 2 – Programme de développement sectoriel, volet 3
Cost-benefit assessment tool of good breeding practices for the comfort of dairy cows	Elsa Vasseur, U. McGill ; **Simon Dufour**, FMV	MAPAQ - Innov'Action

Research Projects

In progress between May 1, 2017 and April 30, 2018

Title	Researchers	Funding
Prevalence, cause and control of antimicrobial resistance in Québec dairy farms	Marie Archambault, David Francoz, Jean-Philippe Roy, **Simon Dufour, Julie Arsenault, André Ravel**, FMV ; **Soulyvane Nguon**, MAPAQ; Marie-Ève Paradis, AMVPQ	MAPAQ - Innov'Action AgroAlimentaire
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	**Farouk El Allaki**, CFIA	Canadian Food Inspection Agency(CFIA)
Developing strategies to control Escherichia coli diarrhea in pigs	**John M. Fairbrother, Julie Arsenault**, FMV	Cultivons l'avenir 2 – Programme Innov'Action agroalimentaire
Beneficial aspects of intestinal microbiota of pigs and poultry	**Philippe Fravalo**, Ann Letellier, Stéphane Godbout, U. Laval ; Sylvain Quessy, FMV	CRIBIQ
Surveillance of Salmonella in the poultry industry	**Philippe Fravalo**, Ann Letellier, Sylvain Quessy, FMV	RDC NSERC Olymel
Realization and prioritization of Salmonella Dublin spreading risks during beef marketing, towards a best practices guide	**Philippe Fravalo, Cécile Ferrouillet**, FMV	MAPAQ, Cultivons l'avenir 2 / Les éleveurs de bovins du Québec
Evaluating the regulating properties of chicks' digestive flora, in connection with colonization of Salmonella Enteritidis and Campylobacter jejuni in broilers	**Philippe Fravalo**, FMV	Phytosynthèse
Regulating the digestive flora of healthy livestock and impact on their products' microbiology	**Philippe Fravalo**, Sylvain Quessy, FMV	RDC, NSERC, Porcima inc., CCP, Jefo Nutrition Inc., Prevtec Microbia, F. Ménard Inc
Optimizing the control of Salmonella and Campylobacter in poultry products	Ann Letellier, Sylvain Fournaise, Sylvain Quessy, **Philippe Fravalo, Julie Arsenault**, FMV	NSERC
Identification of persistent microbial contamination events in food manufacturing environments	Dominic Lambert, **Philippe Fravalo**, FMV; Burton Blais, Carleton University ; Catherine Carrillo, CFIA	CFIA
Environment, health and welfare in alternative egg production : Phase 1 : Mitigation	Stéphane Godbout, IRDA ; **Philippe Fravalo**, FMV and collaborators	MAPAQ Cultivons l'avenir 2 /

Research Projects

In progress between May 1, 2017 and April 30, 2018

Title	Researchers	Funding
Geographical distribution of Amblyomma americanum in North America under Climate changes	Irina Sagurova, UQAM; **Philippe Gachon**, UQAM; **Antoinette Ludwig, Nicholas H. Ogden**, PHAC	PHAC
Childhood Lyme disease	**Salima Gasmi**, Joanne M. Langley, **Jules Koffi, Nicholas H. Ogden** et collaborateurs, PHAC	PHAC
Developing Lyme disease risk area indicators from passive surveillance data of Ixodes scapularis ticks in Ontario and Manitoba	**Salima Gasmi, Nicholas H. Ogden**, PHAC; **Marion Ripoche, Patrick Leighton**, FMV; Robbin Lindsay, Mark Nelder, **Erin E. Rees, Catherine Bouchard**, Linda Vrbova, Richard Rusk, Curtis Russell, **Yann Pelcat, Samir Mechai, Serge Olivier Kotchi, Jules Koffi**, PHAC	PHAC
Geographical and seasonal distribution of tick species of public health significance other than Ixodes scapularis in Quebec	Karine Thivierge, FMV; **Salima Gasmi, Catherine Bouchard, Nicholas H. Ogden**, PHAC; **Patrick Leighton**, FMV	Université de Montréal, PHAC
EO indicators development for local characterization of Lyme disease risk factors	**Serge Olivier Kotchi, Nicholas H. Ogden, Catherine Bouchard, Erin E. Rees**, PHAC; **Patrick Leighton**, FMV; **Jules Koffi, Yann Pelcat, Stéphanie Brazeau**, PHAC	PHAC
Earth observation early warning indicators of Mosquito-Borne Diseases risk	**Serge Olivier Kotchi, Antoinette Ludwig, Stéphanie Brazeau**, PHAC ; Richard Fournier, U. Sherbrooke; Thibault Catry (IRD, France), **Patrick Leighton**, FMV	PHAC
Ixodes scapularis risk mapping in Eastern Canada	**Serge Olivier Kotchi, Nicholas H. Ogden, Catherine Bouchard, Erin E. Rees**, PHAC; **Patrick Leighton**, FMV; **Jules Koffi, Yann Pelcat, Stéphanie Brazeau**, PHAC	PHAC
Earth observation Indicators Pertaining to Determinates of Health	**Serge Olivier Kotchi, Stéphanie Brazeau**, PHAC; Nathalie Barrette, Alain A. Viau, Frédéric Hubert, U. Laval	PHAC
Emergence of Lyme Disease: eco-epidemiological study in a periurban park	**Patrick Leighton, Ariane Dumas**, FMV; Pierre Drapeau, UQAM; **Catherine Bouchard, Nicholas H. Ogden**, Robbin Lindsay, PHAC	Université de Montréal, UQAM, PHAC
Surveillance and prediction of the emerging risk of Lyme Disease in Québec	**Patrick Leighton**, Camille Guillot, FMV ; **Catherine Bouchard**, PHAC ; **Francois Milord**, DSP Montérégie ; Kate Zinzser, IRSPUM	

Research Projects

In progress between May 1, 2017 and April 30, 2018

Title	Researchers	Funding
Control of raccoon rabies and epidemiology of fox rabies in Quebec	**Patrick Leighton**, FMV	Ministère de la Santé et des Services sociaux (Québec)
Functional landscape connectivity and the dynamics of parasite invasion	**Patrick Leighton**, FMV	NSERC
Modelling the spread of Lyme disease and other vector-borne diseases in Canada	**Patrick Leighton**, FMV	PHAC
Modelling the future of arctic fox rabies dynamics and associated risk management	**Patrick Leighton**, FMV ; **Ariane Massé**, MRN ; **Erin E. Rees**, PHAC; **Philippe Gachon**, UQAM	MITACS
Evaluating a new oral acaricide treatment in small mammals as a local intervention to reduce the risk of Lyme Disease in Quebec	**Patrick Leighton**, FMV ; **Catherine Bouchard**, PHAC; **Jean-Philippe Rocheleau, Cécile Aenishaenslin**, FMV ; **Nicholas H. Ogden** , Robbin Lindsay, PHAC ; Francis Beaudry, FMV and collaborators	Fonds Québécois de la Recherche sur la Nature et les Technologies (FQRNT)
Sarolaner treatment of wild rodents: Breaking new ground in the fight against Lyme disease	**Patrick Leighton**, FMV; **Catherine Bouchard**, PHAC; **Cécile Aenishaenslin**, U. McGill; Christopher Fernandez- Prada, FMV; Claire Jardine, University of Guelph; **Jean-Philippe Rocheleau**, FMV; L. Robbin Lindsay, **Nicholas H. Ogden**, PHAC	Zoetis Investment in Innovation Fund
Wildlife diseases important for human health and food safety in the changing environment of the Eastern Subarctic	**Patrick Leighton**, FMV; **Emily Jenkins**, Craig Stephen, Alvin Gajadhar, University of Saskatchewan; **Philippe Gachon**, UQAM; Stéphane Lair, **André Ravel**, FMV; Francis Lévesque, UQAT ; Dawn Marshall, Whitney H. Memorial University of Newfoundland, **Nicholas H. Ogden**, PHAC	Networks of Centres of Excellence of Canada : ArcticNet, Phase IV
The Arctic Zoonoses Network: a community-centered monitoring network for vector-borne diseases and wildlife zoonoses in a changing Arctic	**Patrick Leighton**, FMV; **Emily Jenkins**, University of Saskatchewan; L. Robbin Lindsay, **Nicholas H. Ogden**, PHAC; Nicolas Lecomte, U. Moncton; **Philippe Gachon**, UQAM	Polar Knowledge Canada (POLAR) Northern Science and Technology
Modeling re-incursion, expansion and control of raccoon rabies in southern Quebec	**Patrick Leighton**, FMV; **Erin E. Rees**, PHAC	Ministère des Forêts, de la Faune et des Parcs

Research Projects

In progress between May 1, 2017 and April 30, 2018

Title	Researchers	Funding
Arctic fox rabies ecology in a changing North	**Patrick Leighton**, FMV; **Erin E. Rees**, PHAC; **Philippe Gachon**, UQAM	OURANOS et MITACS
Integrated surveillance of Lyme Disease in Québec (2018)	**Patrick Leighton**, FMV; Karine Thivierge, U. McGill; Sandie Briand, INSPQ	INSPQ
Balancing Illness and Wellness at the Human-Dog Interface in Northern Canada	Christopher Fernandez-Prada, **Patrick Leighton**, FMV; Francis Lévesque, UQAT; Sherilee Harper, University of Guelph; Thora Martina Herrmann, UdeM; Johanne Saint-Charles, UQAM; **Cécile Aenishaenslin**, U. McGill; **Audrey Simon**, FMV ; Laine Chanteloup, U. Limoges; Ellen Avard, Nunavik Research Center; Marie Rochette and Jean-François Proulx, Direction régionale de santé publique du Nunavik ; Michael Barrett and Elise Rioux-Paquette, Administration régionale Kativik ; Jessica Mitchell, Naskapi Nation of Kawawachikamach	Canadian Institutes of Health Research : Project Program, Fall 2016
The Inuit and their Dogs: Human-Animal Relations in Nunavik and Nunavut Today	Francis Lévesque, UQAT; **Patrick Leighton**, FMV	SSHRC, Insight Development Grant
Invasive mosquito monitoring in southern Québec, Canada: Using surrogate species to assess the risk for Aedes albopictus (Diptera: Culicidae) and Aedes aegypti (Diptera: Culicidae) introduction	**Anne-Marie Lowe**, INSPQ ; **Antoinette Ludwig**, PHAC ; **Patrick Leighton**, FMV ; **Serge Olivier Kotchi**, Robbin Lindsay, Antonia Dibernardo, PHAC ; Karl Forest-Bérard, INSPQ	MOU INSPQ-PHAC
Documenting the presence of Ochlerotatus triseriatus and Oc. japonicus as surrogate species of Aedes albopictus' (Diptera: Culicidae) in the south of the province of Québec, Canada	**Anne-Marie-Lowe**, INSPQ; **Antoinette Ludwig**, PHAC; **Patrick Leighton**, FMV; Karl Forest B., INSPQ; Robbin Lindsay, PHAC	INSPQ
Landuse and Climate changes impact on mosquito borne disease risk in Eastern Ontario	**Antoinette Ludwig**, PHAC; David Lapen (AAFC), **Nicholas H. Ogden**, PHAC; **Patrick Leighton, Rindra Miarisoa Rakatoarinia**, FMV	PHAC / AAFC
Arboviruses seroprevalence in wild bird in the south Nation River region	**Antoinette Ludwig**, PHAC; Greg Mitchell, Scott Wilson, ECCC; **Nicholas H. Ogden**, APSC; Heidi Wood, NML; David Lapen, AAFC	PHAC

Research Projects

In progress between May 1, 2017 and April 30, 2018

Title	Researchers	Funding
Zika opinion survey analysis	**Antoinette Ludwig**, Pia Muchall , Linda Vrbova, Joanne Tataryn, PHAC	PHAC
Genomic characterization and space-time analysis of the distribution of arbovirus in Québec : 2004-2016	Christian Therrien, LSPQ ; **Antoinette Ludwig**, PHAC; Christine Martineau, NRCAN	INSPQ
West Nile virus cases modelling in Canada and the US	Linda Vrbova, **Antoinette Ludwig, Yann Pelcat, Stephanie Brazeau**, PHAC; Tasha Epp, University of Saskatchewan; **Valerie Hongoh**, Hui Zheng, PHAC	PHAC
FQRS Natural and Anthropogenic Climate Change in northern environments: particularities and impacts on the human ecosystem	**Nicholas H. Ogden**, PHAC ; Anne De Vernal, **Philippe Gachon**, UQAM et al.	Québec and Belgium
2016-2019 Rabies Ready: Modelling the future of arctic fox rabies dynamics and associated risk management	**Nicholas H. Ogden**, PHAC ; **Patrick Leighton**, FMV and collaborators	Ouranos
CIHR Assessing ZIKV transmission dynamics and mitigation strategies. A multidisciplinary approach	**Nicholas H. Ogden**, PHAC; Beate Sander, Public Health Ontario	
CIHR Public health risk assessment tools for emerging vector-borne diseases	**Nicholas H. Ogden**, PHAC; Manisha Kulkarni, U. Ottawa	
Polar Knowledge Canada The Arctic Zoonoses Network: a community-centered monitoring network for vector-borne diseases and wildlife zoonoses in a changing Arctic	**Nicholas H. Ogden**, PHAC; **Patrick Leighton**, FMV; **Emily Jenkins**, University of Saskatchewan; and collaborators	
Autochthonous transmission of Chikungunya in Ontario Canada	H. Song, Ziwang Deng, M. Weng, Z. Jin, Huaiping Zhu, York University; **Nicholas H. Ogden, Erin E. Rees**, PHAC	PHAC
Qimuksiq: A Multidisciplinary Network on Dog Related Issues in the Canadian Arctic (Nunavik and Nunavut)	Francis Levesque, UQAT; Ashlee Cunsolo Willox, Cape Breton University ; Sherilee Harper, University of Guelph; Johanne Saint-Charles, UQAM; **André Ravel**, FMV; **Cécile Aenishaenslin**, U. McGill; **Audrey Simon**, FMV	Conseil de recherche en sciences humaines. Programme :Partnership Development Grant
Effectiveness of rabies vaccination during epizootic and enzootic disease phases	**Erin E. Rees**, PHAC; Erica Newton, Bruce A.Pond, Kevin Middel, Ontario Ministry of Natural Resources and Foresty; Rowland R. Tinline, Queen's University; **Denise Bélanger**, FMV	PHAC

Research Projects

In progress between May 1, 2017 and April 30, 2018

Title	Researchers	Funding
Fine-scale risk mapping of Lyme disease	**Erin E. Rees, Catherine Bouchard, Serge Olivier Kotchi, Nicholas H. Ogden**, PHAC; **Patrick Leighton**, FMV	PHAC
Influence of host movement heterogeneity on effectiveness of rabies vaccination	Kent McClure, Amy Gilbert, Richard Chipman, Kim Pepin (Aphis - USDA), **Erin E. Rees**, PHAC	PHAC
Spatial Modeling of Infectious Diseases: Environment and Health	Mahmoud Torabi, University of Manitoba; Charmaine Dean, University of Western Ontario; Rhonda Jean Rosychuk, University of Waterloo, Rob Deardon, University of Calgary; Cindy Xin Feng, University of Saskatchewan; **Erin E. Rees**, PHAC	PHAC
Assessing the risk associated with vector-borne diseases in an emerging context: cases of Lyme Disease and West Nile Virus in Québec	**Marion Ripoche**, FMV ; **Nicholas H. Ogden**, **Antoinette Ludwig**, PHAC ; **Patrick Leighton**, FMV	PHAC-Université de Montréal MOU
Progression of Ixodes scapularis ticks and Borrelia burgdorferi in Québec between 2007 and 2014	**Marion Ripoche**, FMV; **Catherine Bouchard, Antoinette Ludwig, Nicholas H. Ogden**, PHAC; **Patrick Leighton**, FMV and collaborators	Université de Montréal, PHAC
The role of birds in the surveillance dynamics of West Nile Virus in Québec	**Ludivine Taieb**, FMV; **Antoinette Ludwig**, PHAC; Dominique Bicout (Univ. Grenoble-Alpes), Carl A. Gagnon, FMV	PHAC
Modelling the dynamics of vector-borne diseases under climate change to prioritize intervention scenarios	**Olivia Tardy**, FMV; **Catherine Bouchard, Erin E, Rees**, PHAC; **Patrick Leighton**, FMV; **Nicholas H. Ogden**, PHAC and collaborators.	2017-2018 MOU with Université de Montréal (UdeM) – Climate Change Fund
Epidemiological and clinical description of three gastro-intestinal infections of significance in three FoodNet Canada sentinel sites from 2015 to 2016	**Patricia Turgeon, Philippe Berthiaume**, Andrea Nesbitt, Danielle Dumoulin, PHAC	PHAC
Urban determinants of health, mosquito-borne diseases, heat, air quality, vulnerable population	Francois Cavayas, UdeM; Yves Beaudouin, UQAM; Canadian Space Agency, **Geomatics Unit**, PHAC; Ville de Montréal, ECCC	Canadian Space Agency

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

What is the Observatory?

The Observatory provides a structure for partner organizations to network and collaborate by centralizing expertise and more specifically, bringing together disciplines of human, animal and environmental health in order to offer an overview on the issue of zoonotic diseases related to climate change in Québec. 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.

The Institut national de santé publique du Québec (INSPQ) and GREZOSP jointly oversee the Observatory's development and coordination. The co-coordination for the GREZOSP is led by **Audrey Simon**. Several members of GREZOSP are involved in the Observatory as specialists on specific themes: **André Ravel** (EcoHealth approach), **Julie Arsenault** (enteric zoonoses), **Benoît Lévesque** (environmental health) and **Jean-Philippe Rocheleau** (veterinary medicine); or as public policy makers, representing their organization : **Ariane Massé** (MFFP), **Isabelle Picard** (MAPAQ), **Nicholas Ogden** and **Catherine Bouchard** (PHAC), **Farouk El Allaki** (CFIA).

What is the Observatory's mandate?

The general mandate of the Observatory is foreseeing zoonotic disease issues in Québec in order to support risk management and better adapt to climate change. The Observatory's specific mandates are : 1) documenting the evolution of zoonoses in Québec; 2) ensuring scientific surveillance on climate-related infectious diseases; 3) prioritizing needs in surveillance, research and intervention; 4) collaborating on knowledge transfer and continuing education of professionals concerned by these issues and 5) foster networking among the Observatory's collaborators and support the building of a network with the organizations or professionals concerned by these issues.

What are the Observatory's achievements?

- Prioritization of zoonoses for Québec

Confronted with the multitude of zoonotic issues, the Observatory initiated a process to prioritize zoonoses in the context of climate change in order to guide 1) research efforts and 2) surveillance, prevention and control actions in Québec, in order to optimize human and financial resources.

The use of a tool to prioritize zoonoses based on the systematic, rigorous, transparent and replicable Multiple-Criteria Decision-Making (MCDM) method allowed the development of a consensus list of 32 prioritized zoonoses, taking into consideration the multiple issues existing in Québec and representative of the understanding of the Observatory's both sectors of expertise (human health and animal health). From this list, nine primary zoonotic diseases stand out: West Nile Virus, botulism, rabies, salmonellosis, listeriosis, Escherichia coli infection, hantavirus pulmonary syndrome, avian influenza and Lyme disease. This list should be used as an everyday reference tool for decision-makers (prioritizing their actions), researchers or granting bodies (identifying research themes) in the context of adaptation to climate change. The process of prioritizing zoonoses has also led to the development of fact sheets which provide a summary description of the current situation for 12 primary zoonoses in Québec.

- Knowledge Transfer Activities

An overview on the zoonoses prioritized by the Observatory in 2015, which gathers the fact sheets documenting the 12 primary zoonoses in Québec, was the subject of the first report published by the Observatory. The priorization exercise with the help of MCDM was then presented as part of a webinar aimed at health professionals (physicians, nurses, veterinarians, others) and students. The Observatory as well as the prioritizing of zoonoses were also presented during the Association des médecins microbiologistes et infectiologues du Québec's symposium. Two of GREZOSP's members (A. Ravel and A. Simon) presented the ecosystem approach to health during a webinar. Table 1, below, summarizes the knowledge transfer activities between May 2017 and April 2018.

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 between May 2017 and April 2018

Event	Theme	Date
Publications*	*Portrait des zoonoses priorisées par l'Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques en 2015*	September 11 2017
Webinars (in collaboration with CP-EPITER)	Prioritization of zoonosis at the *Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques*	June 29 2017
	Complex public health issues in Québec: benefits of the ecosystem approach to human health?	September 27 2017
Symposiums	AMMIQ Symposium (session) : Emerging infections, climate change, zoonosis	June 16 2017

*All publications are available online on the Observatory's website : https://www.inspq.qc.ca/zoonoses/observatoire.

What are the upcoming projects?

Recently, the Observatory established a 2018-2021 action plan, targeted on the study of the Québec population's vulnerability to zoonoses as a result of climate change. It will ultimately allow foreseeing issues related to zoonoses in Québec, with the purpose of adaptation. Eventually, it will lead to the assessment of the province's adaptability to limit the expected negative impact of climate change on zoonoses.

A workshop organized by the Observatory as part of the *Journées annuelles de santé publique (JASP)* on December 4, 2018 will initiate a first study on the regional vulnerability to zoonoses and the adaptation to climate change in municipalities.

For more information about this workshop and to register, please visit: https://www.inspq.qc.ca/jasp/

To learn more :

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

2013-2020 APCC: PACC2013-2020: http://mddelcc.gouv.qc.ca/changements/plan_action/pacc2020.pdf

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

Publications

Books, brochures, book chapters and reports

Bouchard, C., A.-M. Lowe, A. Simon. *Portrait des zoonoses priorisées 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. Montréal : Institut national de santé publique du Québec (INSPQ) et Université de Montréal (UdeM) (2017) 104 p.

Ebi, K.L., D. Hondula, P. Kinney, A. Monaghan, C.W. Morin, **N.H. Ogden**, M. Springmann. *Health risks of climate variability and change*. In: Handbook of Environmental and Ecological Statistics (2017). Eds: Gelfand A.E., Fuentes M., Hoeting J.A., Smith R.L., Chapman Hall, Boca Raton, FL.

Forest-Bérard, K., **A.-M. Lowe**, A. Irace-Cima, **A. Ludwig, P. Leighton**, R. Trudel. *Évaluation des conditions locales propices à l'établissement potentiel du moustique Aedes albipictus au Québec – Rapport de phase 1*. 17 pages. Juin 2017.

Forest-Bérard, K., **A.-M. Lowe**, A. Irace-Cima, **A. Ludwig, P. Leighton**, R. Trudel. *Évaluation des conditions locales propices à l'établissement potentiel du moustique Aedes albipictus au Québec – Rapport de phase 2*. 44 pages. Septembre 2017.

Forest-Bérard, K., **A.-M. Lowe**, A. Irace-Cima, **A. Ludwig, P. Leighton**, R. Trudel. *Évaluation des conditions locales propices à l'établissement potentiel du moustique Aedes albipictus au Québec – Rapport de phase 3*. 44 pages. Décembre 2017.

Fravalo, P. *Rapport d'étape 18 mois de la Chaire industrielle du NSERC en salubrité des viandes*. 23 pages. Juin 2017.

Fravalo, P. *Rapport final de Développement d'une épreuve diagnostic ELISA basée sur la détection des IgY dans les œufs comme outil d'évaluation de la contamination des troupeaux de poules pondeuses par Salmonella*. 19 pages. Mai 2017.

Publications

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Belage, E., **S. Dufour,** C**.** Bauman, A. Jones-Bitton, D.F. Kelton. *The Canadian National Dairy Study 2015 –Adoption of milking practices in Canadian dairy herds*. Journal of Dairy Science (2017) 100:3839-3849.

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Bernier-Gosselin, V., J. Lovstad, **S. Dufour**, P.R.F. Adkins, J.R. Middleton. *Use of MALDI-TOF to characterize staphylococcal intramammary infections in dairy goats.* Journal of Dairy Science. (Accepté).

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Cheng, A., D. Chen, K. Woodstock, **N.H. Ogden**, X. Wu, J. Wu. *Analyzing the potential risk of climate change on Lyme disease in Eastern Ontario, Canada using time series remotely sensed temperature data and tick population modelling*. Remote Sensing (2017) 9, 609.

Cherifi, T., M. Jacques, S. Quessy, **P. Fravalo.** *Impact of Nutrient Restriction on the Structure of Listeria monocytogenes Biofilm Grown in a Microfluidic System*. Frontiers in Microbiology 17 may 2017. Doi: 10.3389/fmicb.2017.00864.

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Condas, L., J. De Buck, D.B. Nobrega, D.A. Carson, S. Naushad, S. De Vliegher, R.N. Zadoks, J.R. Middleton, **S. Dufour**, J.P. Kastelic, H.W. Barkema. *Prevalence of non-aureus staphylococci isolated from milk samples in Canadian dairy herds*. Journal of Dairy Science. (Sous presse).

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David, J.M., F. Pollari, K.D.M. Pintar, A. Nesbitt, A. Butler, **A. Ravel**. *Do contamination of and exposure to chicken meat and water drive the temporal dynamics of Campylobacter case?* Epidemiology & Infection (2017) 145 (15): 3191-3203. doi.org/10.1017/S0950268817002199.

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Delpont, M., **M. Racicot**, M. Paul, J.-L. Guérin, **J.-P. Vaillancourt**. *L'observance de la biosécurité en élevage avicole*. Le nouveau praticien vétérinaire. (Accepté).

Dufour, S., J. Durocher, J. Dubuc, N. Dendukuri, S. Hassan, S. Buczinski. *Bayesian estimation of sensitivity and specificity of a milk pregnancy-associated glycoprotein-based ELISA and of transrectal ultrasonographic exam for diagnosis of pregnancy at 28 to 45 days following breeding in dairy cows*. Preventive Veterinary Medicine (2017) 140: 122-133.

Ebi, K.L., **N. H. Ogden**, J. C. Semenza, A. Woodward. *Detecting and Attributing Health Burdens to Climate Change*. Environ Health Perspect. (2017) 125(8):085004.

Francoz, D., V. Wellemans, J.P. Dupré, J. P. Roy, F. Labelle, P. Lacasse, **S. Dufour**. *Invited review: A systematic review and qualitative analysis of treatments other than conventional antimicrobials for clinical mastitis in dairy cows*. Journal of Dairy Science (Sous presse).

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Gao, X., Y.R. Cao, **N.H. Ogden**, L. Aubin, H.P. Zhu. *Mixture Markov regression model with application to mosquito surveillance data analysis*. Biometrical Journal 59 (2017) (3):462-477.

Gasmi, S., **N.H. Ogden**, **P.A. Leighton**, **A. Adam-Poupart**, **F. Milord**, L.R. Lindsay, et al. *Practices of Lyme disease diagnosis and treatment by general practitioners in Quebec, 2008–2015*. BMC Fam Pract. (2017) 18(1):65. doi: 10.1186/s12875-017-0636-y.

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Gaucher, M.L., G.G. Perron, **J. Arsenault**, A. Letellier, M. Boulianne, S. Quessy. *Recurring Necrotic Enteritis Outbreaks in Commercial Broiler Chicken Flocks Strongly Influence Toxin Gene Carriage and Species Richness in the Resident Clostridium perfringens Population*. Frontiers in Microbiology (2017) 8, 881 (doi: 10.3389/fmicb.2017.00881).

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McPherson, M., A. García-García, F.J. Cuesta-Valero, H. Belltrami, P. Hansen-Ketchum, D. MacDougall, **N.H. Ogden.** *Expansion of the Lyme disease vector Ixodes scapularis in Canada inferred from CMIP5 climate projections*. Environmental Health Perspectives (2017) 125(5):057008.

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Morin, P.A., J. Dubuc, J.P. Roy, Y. Chorfi, D. Santschi**, S. Dufour**. *Short communication: an observational study investigating inter-observer agreement for variation in time of body condition score in dairy cows*. Journal of Dairy Science (2017) 100:1-5.

Morin, P.A., **C. Krug**, Y. Chorfi, J. Dubuc, P. Lacasse, J.P. Roy, D. Santschi, **S. Dufour**. *Efficacy of an incomplete milking protocol during the early lactation in reducing ketonemia, hyperketonemia, and body condition loss in commercial dairy cows: a randomized controlled trial*. Journal of Dairy Science (Accepté).

Munro, H.J., **N.H. Ogden**, L.R. Lindsay, G.J. Robertson, H. Whitney, A.S. Lang. *Evidence for Borrelia Bavariensis Infections of Ixodes Uriae within Seabird Colonies of the North Atlantic Ocean*. Applied and Environmental Microbiology (2017) PHRS – PED. doi: 10.1128/AEM.01087-17.

Ng, V., A.M. Fazil, **P. Gachon**, G. Deuymes, M. Radojevic, M. Mascarenhas, S. Garasia, M.A. Johansson, **N.H. Ogden**. *Assessment of the Probability of Autochthonous Transmission of Chikungunya Virus in Canada under Recent and Projected Climate Change*. Environ Health Perspect. (2017) 125(6):067001.

Ogden, N.H. *Climate Change and Vector-Borne Diseases of Public Health Significance*. FEMS Microbiol Lett. (2017) Oct 16; 364(19). doi: 10.1093/femsle/fnx186.

Ogden, N.H., P. Abdelmalik, J. Pulliam. *Emerging Infectious Diseases: Prediction and Detection*. Can Commun Dis Rep. (2017) Oct 5; 43(10):206-211.

Rathwell-Deault, D., B. Godard, D. Frank, **A. Ravel**, B. Doizé. *L'euthanasie de convenance des animaux de compagnie : portrait du dilemme au sein de la profession vétérinaire québécoise*. Canadian Veterinary Journal (2017) 58:953–963.

Ravel, A., M. Hurst, N. Petrica, J. David, S.K. Mutschall, K. Pintar, E.N. Taboada, F. Pollari. *Source Attribution of Human Campylobacteriosis based on Comparing Subtypes Defined by Comparative Genomic Fingerprinting*. PLoS One (2017) Aug.24; 12(8): e0183790. https://doi.org/10.1371/journal.pone.0183790.

Rocheleau, J.-P., **J. Arsenault, N.H. Ogden**, L.R. Lindsay, M. Drebot**, P. Michel**. *Characterising areas of potential human exposure to Eastern Equine Encephalitis Virus using serological and clinical data from horses*. Epidemiology and Infection (2017) 145(4), 667-677.

Publications

Published in 2017

Rocheleau, J.-P., **P. Michel**, L.R. Lindsay, M. Drebot, A. Dibernardo, **N.H. Ogden**, A. Fortin, **J. Arsenault**. *Emerging arboviruses in Quebec, Canada: assessing public health risk by serology in humans, horses and pet dogs*. Epidemiology and Infection (2017) 28, 1-9 (doi: 10.1017/S0950268817002205).

Rocheleau, J.-P., **P. Michel**, L.R. Lindsay , M. Drebot, A. Dibernardo, **N.H. Ogden**, A. Fortin, **J. Arsenault**. *Characterizing environmental risk factors for West Nile virus in Quebec, Canada, using clinical data in humans and serology in pet dogs*. Epidemiology and Infection (2017) 145(13):2797-2807 (doi: 10.1017/S0950268817001625).

Rocheleau, J.-P., **P. Michel**, L. R. Lindsay, M. Drebot, A. Dibernardo, **N.H. Ogden**, A. Fortin, **J. Arsenault**. *Emerging Arboviruses in Quebec, Canada: Assessing Public Health Risk by Serology in Humans, Horses and Pet Dogs*. Epidemiololgy and Infection (2017) 145(14):2940-2948.

Thibodeau, A., **P. Fravalo**, A. Perron, S. Laurent-Lewandowski, A. Letellier. *Production and characterization of anti-Campylobacter jejuni IgY derived from egg yolks*. Acta Vet Scand. (2017) Dec 6; 59(1):80 doi: 10.1186/s 13028-017-0346-4.

Trigui, H., K. Lee, A. Thibodeau, S. Lévesque, N. Mendis, **P. Fravalo**, A. Letellier, S.P. Faucher. *Phenotypic and Transcriptomic Responses of Campylobacter jejuni suspended in an Artificial Freshwater medium*. Front Microbiol. (2017) Sep 20; 8:1781. Doi : 10.3389/fmicb.2017.01781.

Turgeon, P., R. Murray, A. Nesbitt. *Hospitalizations associated with salmonellosis among seniors in Canada, 2000-2010*. Epidemiology and Infections (2017) 145:1527-1534.

Vaillancourt, J.-P., M. Delpont, **M. Racicot**, M. Paul, J.-L. Guérin. *Une perspective régionale de la biosécurité*. Le nouveau praticien vétérinaire. (Accepté).

Watts, A.G., S. Saura, C. Jardine, **P.A. Leighton,** L. Werden. M.-J. Fortin. *Host functional connectivity and the invasion potential of Lyme disease.* Landscape Ecology. (Accepté).

Young, I., D. Reimer, J. Greig, R. Meldrum, **P. Turgeon**, L. Waddell. *Explaining Consumer Safe Food Handling Through Behavior-Change Theories: A Systematic Review*. Foodborne Pathogens and Disease (2017) Vol. 14, No. 11 Reviews.

5th Symposium on Veterinary Public Health August 24th 2017

The fifth edition of the Symposium on Veterinary Public Health, organized jointly by the Groupe de recherche en épidémiologie des zoonoses et santé publique (GREZOSP) and the Microprogrammes en santé publique vétérinaire took place on Thursday, August 24, 2017, at the Faculty of Veterinary Medicine.

How do we optimize zoonoses surveillance according to their epidemiological context? How do we develop surveillance systems which are able to detect non endemic or even unknown zoonotic diseases? What is an effective integrated surveillance system?

These current issues were examined during this one-day symposium, which had the following theme: "Zoonoses on the run: How to optimize their surveillance to protect populations". The 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 participate in presentations by three guest speakers : Dr. Cécile Aenishaenslin, post-doctoral researcher at McGill University's Epidemiology, Biostatistics and Occupational Health Department, Dr. Marisa Peyre, epidemiologist at the Agricultural Research Centre for International Development (CIRAD), as well as Dr. Philip Abdelmalik, epidemiologist at the Public Health Agency of Canada.

Left to right: Dr. Philip Abdelmalik, Dr. Michel Carrier, Dr. Marisa Peyre, Dr. Cécile Aenishaenslin, Dr. André Ravel and Patrick Leighton (photo credits: Marc Paré).

Les 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 on our website.

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, Ariane Dumas, Marie-Laure Le Carre, Patrick Leighton, Anne-Marie Lowe, Marion Ripoche, Audrey Simon and Ludivine Taieb.

During the 2017-2018 academic year, the GREZOSP is proud to have featured several guest speakers, including:

- Dre Jan Sargeant, University of Guelph – "Evidence synthesis: More than just systematic reviews"
- Dre Kate Zinszer, ESPUM – "*Le paludisme et l'efficacité des interventions de lutte"*
- Dre Amy Hurford, Memorial University – "*Modélisation mathématique de la rage"*
- Dre Karine Chalvet, UMR EPIA 0346 INRA/VetAgro Sup, VetAgro Sup Campus Vétérinaire de Lyon – "*Relation entre séquence météorologique et activité d'Ixodes ricinus*"

Workshops

Introduction to R Software

Several training sessions on R software were organized by the GREZOSP in January and February 2018 at University of Montreal's Faculty of Veterinary Medicine. The main purpose of this workshop was to familiarize participants with the use of R software, specifically spreadsheet data input for analysis, R language, preliminary exploration of data (basic graphics and summary) and basic statistics.

R is an extremely powerful programming language, however it is not easily accessible because of its interface. It requires learning the language in order to easily process data. This training offered an opportunity to address two main issues confronting users working with R: efficiently inputting data in Excel and mastering the basics of R language. The latter part requires an understanding of the objects used by R and the different ways to manipulate them. Once these concepts are understood, we can explore a dataset (graphically and by summarizing the information), perform simple statistics and automate these manipulations with loops.

The workshop presenters were :

- **Agathe Allibert**, Ph.D. student at the University of Montréal. While working at CIRAD on the Island of Réunion as a statistical study engineer for two years, she provided training on R language and statistical support to the research center's personnel.

- **Caroline Sauvé**, DVM-Ph.D. student at the University of Montréal. While completing a Masters degree in biology at Université Laval in 2014 where she studied ecology and marine mammal behavior, she acquired many skills on R software.

Workshops

Participatory Action Research and Evaluation Tools

A training workshop on participatory action research organized by the GREZOSP took place on March 14-15, 2018 at the University of Montréal's Faculty of Veterinary Medicine.

The workshop's main objective was to provide participants with tools for simple, practical and efficient methods to lead successful face-to-face participatory activities (workshop type) with a non-scientific audience.

The workshop was presented by Jacques M. Chevalier, Chancellor's Professor Emeritus, Carleton University, Ottawa.

From left to right: Talibé Diallo, Hélène Lardé, Fidèle Kabera, Isabelle Lévesque (MAPAQ), Audrey Simon, Stefany Ildefonso, Jacques M. Chevalier, Jean-Philippe Rocheleau and Nestor Baraheberwa (photo credits: Hélène Boucher Rhéaume).

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 fellow or 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 2017-2018 academic year, the Lucie-Dutil Award was presented to Marion Ripoche by the GREZOSP's Scholarships and Awards Selection Committee. Marion is a Ph.D. student under the direction of Patrick Leighton. Her work focuses on the risk associated to the emergence of vector-borne diseases, namely the cases of Lyme disease and West Nile Virus in Québec.

This award highlights the remarkable contribution of Marion to the research group, notably by her substantial commitment to the life of GREZOSP and especially to the student group, her persistence in the organization of journal clubs, sharing her expertise as well as her passion for various scientific subjects and, finally for her kindness and calmness which is evident in the way she listens to others as well as her even and cheerful character making work pleasant and comforting for her colleagues.

Patrick Leighton presenting the Lucie-Dutil Award to Marion Ripoche.

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

Ariane Dumas with some of the participants.

24 heures de science

For the third consecutive year, veterinary public health was very much present at the " 24 heures de science " event on May 12, 2017. **Ariane Dumas, Géraldine-Guy Gouin, Marion Ripoche** and **Ludivine Taieb**, all student members of GREZOSP, presented a kiosk on the main campus of the University of Montréal.

Various games on Lyme disease, West Nile Virus and rabies helped raise awareness of theses issues and teach prevention in young and old alike. Observing ticks and mosquitoes under 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 contribution. The event was organized in collaboration with Prof. Alexis Vallée-Bélisle, Director of the Laboratory of Biosensors & Nanomachines, Canada Research Chair in Bioengineering and Bio-nanotechnology.

Left to right: Géraldine-Guy Gouin, Ariane Dumas, Marion Ripoche and Ludivine Taieb

Students

Student Activities

One Earth – One Health Workshop

Contribution of Earth Observation to Public Health Practices

On June 21, 2017, **Rindra Rakotoarinia, Marion Ripoche** and **Ludivine Taieb**, all student members of GREZOSP, participated in the One Earth – One Health Workshop as part of the Earth Observation Summit 2017 held within the *Cœur des Sciences* premises at the Université du Québec à Montréal.

This workshop allowed researchers from the Earth observation and remote sensing community to seek the potential contribution from EO to address public health issues. The event was organized jointly by the Canadian Space Agency (CSA) and the Public Health Agency of Canada (PHAC) in partnership with several other organizations working in the field.

Stéphanie Brazeau, **Antoinette Ludwig**, **Serge-Olivier Kotchi**, **Nicholas Ogden** and **Yann Pelcat** were among the presenters.

Students

GREZOSP Scholarship Program

GREZOSP Financial Assistance and Recruiting Scholarships

The GREZOSP offers financial assistance and recruiting scholarships through its program intended for students of the Faculty of Veterinary Medicine of the Université de Montréal in order to promote GREZOSP research activities.

To be eligible, students must be enrolled in a masters or doctoral program in veterinary sciences at the Université de Montréal, his or her director must be a research or regular member of GREZOSP and the research project must be within the framework of the GREZOSP's mission and objectives.

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 masters student, and $23,000 annually for a doctoral student.

For the 2017-2018 academic year, seven financial assistance scholarships were awarded for a total amount of $18,500. Congratulations to the recipients **Lauriane Duplaix, Rindra Rakotoarinia, Marion Ripoche, Agathe Allibert, Nestor Baraheberwa**, **Guillaume Larivière-Gauthier** and **Eyaba Tchamdja**.

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.

Scientific Outreach

Aenishaenslin, C., B. Häsler, **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.

Allostry, J., **A. Ludwig**, **S.O. Kotchi**, R. Fournier. *Développement d'un modèle prédictif de l'évolution de la densité des populations de moustiques associées à des maladies zoonotiques vectorielles dans le sud du Québec*. 11e Colloque annuel du Centre d'étude de la forêt, UQAM, Montréal (Canada). Poster. http://www.cef-fr.ca/index.php?n=Colloque.Colloque2017#Affiches

Bachand, N., G. Gilbert, S. Olpinski, **A. Ravel**, C. Stephen, A. Iqbal, M. Ndao, **E. Jenkins**. *Detection and Quantification of Toxoplasma gondii DNA in Tissues of Wildlife Harvested in the Arctic.* 26th International Conference of the World Association for the Advancement of Parasitology, Kuala Lumpur, Malaysia. September 4-7, 2017.

Bouchard, C., C. Aenishaenslin, E.E. Rees, J.K. Koffi, Y. Pelcat, M. Ripoche, F. Milord, L.R. Lindsay, **N.H. Ogden, P.A. Leighton**. *Integrated social-behavioral and ecological risk maps to prioritize local public health responses to Lyme disease*. Annual International Conference of Wildlife Disease Association, San Cristobal, Mexico. July 23-28 2017.

Bouchard, C., C. Aenishaenslin, E.E. Rees, J.K. Koffi, Y. Pelcat, M. Ripoche, F. Milord, L.R. Lindsay, **N.H. Ogden, P.A. Leighton**. *Integrated social-behavioral and ecological risk maps to prioritize local public health responses to Lyme disease*. NML Science Rendez-vous, Winnipeg (Canada), May 2017.

Bouchard, C. *Les tiques au Québec, c'est maintenant une réalité!* Conférence annuelle d'UrbaNature. Ste-Julie, Québec, March 2018.

Catry, T., **S.O. Kotchi**, N. Dessay, **A. Ludwig**, E. Roux, L. Zhichao, **S. Brazeau**. *Climate changes and mosquito-borne diseases in the Americas : Toward dynamical modelling and prediction at local scale using Earth observation*, by, in Earth Observation Summit 2017, June 20-22 2017, Montreal (Canada).

Cherifi, T, C. Carrillo, D. Lambert, L. Miniai, S. Quessy, B. Blais, **P. Fravalo**. *No genomic determinant could explain persistence of some Listeria monocytogenes isolates in slaughterhouse and cutting facility environments*. Fourth International Congress on Pathogens at the Human-Animal Interface (ICOPHAI), Doha, Qatar. November 7-9 2017. Poster.

Scientific Outreach

Cherifi, T, D.K. Neira, F. Pagotto, I. Meniai, S. Quessy, **P. Fravalo**. *A one year study of diversity/evolution of Listeriai monocytogenes strains in slaughterhouses and meat facilities in province of Quebec: genomic characterization of virulence and resistance*. Congress on Pathogens at the Human-Animal Interface (ICOPHAI), Doha, Qatar. November 7-9 2017.

David, J.M., F. Pollari, K.D.M. Pintar, A. Nesbitt, A. Butler, **A. Ravel**. *What drives seasonality of human campylobacteriosis: dynamics of source contamination or of exposure to sources?* 19th International Workshop on Campylobacter, Helicobacter and Related Organisms. Nantes, France, September 10-14 2017. Poster.

Delpont, M, M. Paul, J.-L. Guérin, **J.-P. Vaillancourt**. *A descriptive study of biosecurity practices in foie gras duck farms in the South West of France.* XXth Congress of the World Veterinary Poultry Association, Edinburgh, Scotland, September 8 2017.

Dramé, O., D. Leclair, B. Ouattara, J. Parmley, A. Deckert, **A. Ravel**. *What affects antimicrobial resistance in Campylobacter along the broiler chicken supply chain?* 19th International Workshop on Campylobacter, Helicobacter and Related Organisms, Nantes, France, September 10-14 2017. Poster.

Ferrouillet, C., **M. Racicot**, A. Leroux, M. Cormier, R. Zanabria, **J. Arsenault**, A. Letellier, A. Mackay, A. Tiwari, S. Aklilu, M. Griffiths, R. Holley, T. Gill, S. Charlebois, S. Quessy. *Performance Assessment of the Canadian Food Inspection Agency Establishment-based Risk Assessment Model*. International Association for Food Protection (IAFP) meeting, Tampa, USA, July 12 2017.

Gaucher, M.L., A. Thibodeau, **P. Fravalo**, M. Archambault, **J. Arsenault**, S. Fournaise, A. Letellier, S. Quessy. *The presence of enterotoxigenic Clostridium perfringens on broiler chicken carcasses along critical steps of the slaughter process: an equivalent risk for all abattoirs?* Présentée au Scientific program de l'International Production and Processing Exposition (IPPE), Processing session, Atlanta, U.S.A. January 2018.

Gaucher, M.L., A. Thibodeau, **P. Fravalo**, M. Archambault, **J. Arsenault,** S. Fournaise, A. Letellier, S. Quessy. *The presence of enterotoxigenic Clostridium perfringens on broiler chicken carcasses along critical steps of the slaughter process: an equivalent risk for all abattoirs?* ICOPHAI, Qatar, November 7-9 2017. Poster.

Guérin, J.-L., M. Delpont, M. Paul, L. Robertet, V. Blondel, **J.-P. Vaillancourt**. *Le bilan biosécurité de l'expérience influenza aviaire dans le sud-ouest de la France (2015-2017). Actes du Congrès annuel de l'Association française de médecine vétérinaire porcine,* Rennes, France; pp. 109-113. November 30 - December 1 2017.

Scientific Outreach

Guy, R.A., M. Gosselin-Théberge, **S.O. Kotchi**, S. Marois, P. Cantin, C. Robert, M. Patoine. *Molecular Characterization of Cryptosporidium in Raw Drinking Water from the Saint Lawrence River and tributaries in Southern Quebec, Canada*. VI International Giardia & Cryptosporidium Conference (IGCC), Havana City, Cuba, April 26-28, 2017.

Kotchi, S.O., **S. Brazeau**, **A. Ludwig**. *Assessment of the relationship between the abundance of mosquito-borne diseases' vectors and microclimatic indicators derived from Earth observation images*. The 37th International Symposium on Remote Sensing of Environment (ISRSE 37), Tshwane (Pretoria), South Africa, May 8-12, 2017.

Kotchi, S.O., **A. Ludwig**, **S. Brazeau**. *Assessment of relationship between Earth Observation indicators of climate and habitat and the abundance of mosquito vectors of diseases*. The 37th International Symposium on Remote Sensing of Environment (ISRSE-37), Tshwane, South Africa, May 8-12, 2017.

Lambert, M.E., P. Audet, **J. Arsenault**, **B. Delisle**, **S. D'Allaire**. *An Automated Classification System for PRRS ORF5 Sequences*. 11e Symposium du CRIPA, St-Hyacinthe, Québec, May 15-16 2018. Poster.

Lambert, M.E., P. Audet, **J. Arsenault**, **B. Delisle**, **S. D'Allaire**. *An Automated Classification System for PRRS ORF5 Sequences.* European Symposium of Porcine Health Management (ESPHM), Barcelona, Spain, May 9-11 2018. Poster.

Lambert, M.E., P. Audet, **B. Delisle**, **J. Arsenault**, **S. D'Allaire**. *Surveillance of PRRS virus strains – How new tools can support control initiatives*. 11e Symposium du CRIPA, St-Hyacinthe, Québec, May 15-16 2018. Poster.

Lambert, M.E., P. Audet, **B. Delisle**, **J. Arsenault**, **S. D'Allaire**. *Surveillance of PRRS virus strains – How new tools can support control initiatives*. European Symposium of Porcine Health Management (ESPHM), Barcelona, Spain, May 9-11 2018. Poster.

Lambert, M.E., **B. Delisle**, **J. Arsenault**, P. Audet, Z. Poljak, **S. D'Allaire**. *Diversity of Porcine Reproductive and Respiratory Syndrome (PRRS) virus strains in Canada*. 11e Symposium du CRIPA, St-Hyacinthe, Québec, May 15-16 2018. Poster.

Lambert, M.E., **B. Delisle**, **J. Arsenault**, P. Audet, Z. Poljak, **S. D'Allaire**. *Diversity of Porcine Reproductive and Respiratory Syndrome (PRRS) virus strains in Canada*. European Symposium of Porcine Health Management (ESPHM), Barcelona, Spain, May 9-11 2018. Poster.

Scientific Outreach

Langlais, M., A. Thibodeau, A. Letellier, K. Sary, **P. Fravalo**. *Increase of minimal inhibitory concentration of essential oils and plant extract in presence of complex microbiota*. Animal Nutrition Conference of Canada (ANCC), Québec, Québec, May 10-11 2017. Poster.

Langlais, M., A. Thibodeau, A. Letellier, K. Sary, **P. Fravalo**. *Minimal inhibitory concentration of essential oils and plants extracts modulation in presence of complex microbiota*. 10e Symposium du CRIPA. St-Hyacinthe, Québec, Canada, May 29-30 mai 2017. Poster.

Larivière-Gauthier, G., A. Thibodeau, A. Letellier, É. Yergeau, **P. Fravalo**. *Fecal flora composition of piglets depends on the Salmonella excretion of the sows*. 10e Symposium du CRIPA, St-Hyacinthe, Québec, Canada, May 29-30 2017.

Mascarenhas, M., S. Garasia, L.A. Waddell, J.D. Greig, D. Reimer, T. Corrin, **P. Berthiaume**. *A Scoping Review of Published Literature on Characteristics That Determine Vector Competence for Chikungunya Virus (Chikv) in Aedes Aegypti and Aedes Albopictus Mosquitoes*. Society for Epidemiologic Research Annual Meeting. PHRS – RISK, Presentation at a conference. 2017.

Racicot, M., A. Leroux, R. Zanabria, **J. Arsenault**, G. Paoli, T. Gill, S. Charlebois, A. Letellier, M. Griffiths, R. Holley, S . Quessy. *Overview of the Canadian Food Inspection Agency Establishment-based Risk Assessment model: principles and algorithm*. Society of Risk Analysis-Europe, Lisbon, Portugal, June 19-21, 2017.

Racicot, M., **J.-P. Vaillancourt**. *La biosécurité : évaluation et gestion des risques*. Actes de la Rencontre annuelle des producteurs de volailles et de foie gras de France, Tours, France, 14 pages, April 5 2017.

Racicot, M., A. Leroux, R. Zanabria, M. Cormier, S. Savoie, A. Tiwari, **J. Arsenault**, **C. Ferrouillet**, M.L. Gaucher, A . Letellier, M. Griffiths, R. Holley, T. Gill, S. Charlebois, G. Paoli, A. Mackay, S. Quessy. *The Canadian Food Inspection Agency Establishment-based Risk Assessment model: How to allocate inspection resources to highest-risk areas?* 4th International Congress on Pathogens at the Human-Pathogen Interface (ICOPHAI), Doha, Qatar, November 7-9, 2017.

Rakotoarinia, M.R., M.L. Escudero, **M. Ripoche**, **P. Leighton**, **N.H. Ogden**, **A. Ludwig**. *A bioecological classification of mosquito species in Québec, Canada, in support of mosquito diseases threat management*. NML Sciences Rendez-Vous, Winnipeg (Canada), May 2017. Poster.

Ravel, A., **C. Aenishaenslin**, **G.-G. Gouin**, S. Bastian, **A. Simon**. *A participatory multicriteria decision analysis to mitigate the entangled complex dog-related human health issues in Nunavik*. 13th ArticNet Annual Scientific Meeting, Québec, QC, December 11-15 2017.

Scientific Outreach

Ravel, A., **C. Aenishaenslin**, J. Saint-Charles, F. Lévesque, S. Bastian, **P. Leighton**, **A. Simon**, **D. Bélanger**. *Reducing dog-related human health issues in Nunavik by combining One Health and EcoHealth approaches.* 13th ArticNet Annual Scientific Meeting, Québec, QC, December 11-15 2017. Poster.

Ravel, A., **C. Aenishaenslin**, J. Saint-Charles, F. Lévesque, **G.-G. Gouin**, **A. Simon**. *Complexity of rabies and other health issues at the human-dog-wildlife interface in Nunavik: a great challenge for the One Health concept!* 13th ArticNet Annual Scientific Meeting, Québec, QC, December 11-15 2017.

Ravel, A., R. Finley, A. Nesbitt, F. Polari. *How results of campylobacteriosis case-control/case-case studies vary depending on their design?* 19th International Workshop on Campylobacter, Helicobacter and Related Organisms. Nantes, France September 10-14 2017.

Ripoche, M., **A. Ludwig**, **P. Leighton**, **N.H. Ogden**. *West-Nile virus in Québec: weather conditions as short term predictors of Culex pipiens-restuans and Aedes vexans abundance*. , NML Science Rendez-vous, Winnipeg (Canada), May 2017.

Tardy, O., **A. Allibert**, **A. Simon**, **E. Rees**, S. Lai, D. Berteaux, **P. Leighton**. *Linking large-scale movement strategies of Arctic foxes and epidemiology of rabies: A spatially explicit individual-based approach*. 5th International Conference in Arctic Fox Biology, Université du Québec, Rimouski (QC), Canada, October 12-15, 2017. Poster.

Tardy, O., **A. Allibert**, **A. Simon**, **E. Rees**, S. Lai, D. Berteaux, **P. Leighton**. *A spatially explicit individual-based model for analyzing the interplay between large-scale movement strategies of Arctic foxes and rabies epidemiology under climate change*. Arctic Change 2017, Québec (QC), Canada, December 11-15, 2017. Poster.

Thibodeau, A., **P. Fravalo**. *Campylobacter : ne sous-estimez pas son importance en santé publique!* Rendez-vous agricole AQINAC, 12e édition, Québec, November 15 2017.

Thibodeau, A., **P. Fravalo**. *Studying the chicken caecal microbiota : important variation observed between true biological replicates even in controlled conditions.* 10e Symposium du CRIPA, St-Hyacinthe, Québec, Canada, May 29-30 2017.

Thibodeau, A., **P. Fravalo**. *Studying the chicken caecal microbiota : variations observed between true biological replicates even in controlled conditions.* 2017 Animal Nutrition Conference of Canada, Québec, Québec, May 10-11 2017. Poster.

Scientific Outreach

Thibodeau, A., S. Mustschall, D. Barker, E. Taboada, **P. Fravalo**. *Comparing Campylobacter jejuni isolated from organically and conventionally raised chickens in Québec by whole genome sequencing: nothing special to be signalled.* CHRO 2017, Nantes, France, September 11-14 2017.

Vaillancourt J-P. *Avian Influenza H5N8 : Biosecurity and regional disease control*. Biosecurity: The Thinking Tour. Bergamo, Italy, April10 2018.

Vaillancourt J.-P. *Biosecurity: A Fundamental One Health Concept*. Biosecurity: The Thinking Tour. Université de Milan, Milan, Italy, April 11 2018.

Vaillancourt J.-P. *Disaster Medicine*. Séminaire à l'École nationale vétérinaire de Toulouse, Toulouse, France, October 16 2017.

Vaillancourt J.-P. *Influenza aviaire au Mexique*. Journée de formation de la branche française de la World Poultry Veterinary Association, Ploufragan, France, October 14 2017.

Vaillancourt J-P. *Innovation in poultry medicine*. Biosecurity: The Thinking Tour, Verona, Italy, April 12 2018.

Vaillancourt J.-P. *La gestion du risque et l'observance en biosécurité.* Réunion de la Direction départementale de la protection des populations, Le Gers, France, November 7 2017.

Vaillancourt J.-P. *On-Farm and regional biosecurity in high density poultry areas*. Biosecurity: The Thinking Tour, Verona, Italy, April12 2018.

Vaillancourt J.-P. *The application of on-farm and regional biosecurity in the context of a changing world*. Biosecurity: The Thinking Tour, Université de Padoue, Legnaro, Italy, April 13 2018.

Vaillancourt J.-P., **M. Racicot**, J.-L. Guérin. *La biosécurité : ce qu'en dit la science*. Journée de formation de la direction générale de l'alimentation, Amiens, France, November 4 2017.

Vaillancourt, J.-P., **M. Racicot**. *La biosécurité, ce qu'en dit la science*. Présentation aux vétérinaires du groupe Crystal; Nantes, France, June 27 2017.

Vaillancourt J.-P., G. Le Loc'h, J.-L. Guérin. *Importance of biosecurity in the management of avian chlamydiosis in a veterinary teaching hospital*. 6th Biosecurity Day, Université de Liège, Liège, Belgium, January 30 2018.

Vaillancourt J.-P., **M. Racicot**, G.-P. Martineau. *Les biosécurités : à la ferme, à la région et les défis de l'observance : l'expérience avicole*. Actes du Congrès annuel de l'Association française de médecine vétérinaire porcine, Rennes, France; pp.101-106, November 30 – December 1 2017.

Vaillancourt J.-P., G.-P. Martineau. *Diarrhée épidémique porcine et biosécurité : ce qui fonctionne*. Actes du Congrès annuel de l'Association française de médecine vétérinaire porcine, Rennes, France; pp. 69-71, November 30 - December 1 2017.

Scientific Outreach

André Ravel participated as an expert and mentor to the first Global Flipped Classroom and Hackathon on One Health educational event which took place in Switzerland from July 9-14, 2017. Twelve learners were selected worldwide following their success in a Massive Open Online Course (MOOC), Global Health at the Human-Animal Ecosystem Interface, co-produced by the University of Geneva, Institute Pasteur, University of Montréal and Centre Virchow-Villermé.

Levon Abrahamyan co-organized a workshop in molecular virology at Universidad Javeriana in Bogota, Columbia at the end of May 2017.

Manon Racicot was invited as principal speaker for the session on foodborne zoonoses where she presented her works on biosecurity and the control of Campylobacter in poultry as part of the 4th International Congress on Pathogens at the Human-Animal Interface (ICOPHAI) which was held from November 7-9, 2017 in Qatar. Moreover, Tamazight Cherifi, Ph.D. student under the direction of Philippe Fravalo, made an oral presentation of her works on Listeria monocytogenes.

On February 8, 2018, **Patrick Leighton** was presented with the Vétoquinol Excellence Award for research at the Faculty of Veterinary Medicine's Annual Scholarship and Excellence Award Ceremony.

On March 23, 2018, Ghent University, in Belgium, presented **Marcelo Gottschalk** with a honorary doctorate for his exceptional achievements in veterinary bacteriology. His works on *Streptococcus suis* were highlighted. Dr. Gottschalk has developed a solid expertise on this swine pathogen which has recently developed a zoonotic capacity.

Our Researchers in the Media

- **Patricia Turgeon** and **Luc Bergeron**, Émergence des infections à Salmonella Dublin au Québec et le risque pour la santé publique – Veterinarius, no. 15, vol. 33, no. 5, December 2017, pp. 12-13.
- **Patrick Leighton**, Freiner la maladie de Lyme en traitant des souris, November 13 2017, « Électrons libres », Télé-Québec.
- **Catherine Bouchard,** La tique étoilée fait les manchettes**,** RandoQuébec, Fall 2017, p. 46-47.
- **Catherine Bouchard**, Tiques 101 : les espèces d'importance vétérinaire et médicale à connaître au Québec, Veterinarius, no. 14, vol. 33, no. 4, September 2017, p. 12.
- **Catherine Bouchard**, L'ère des faits alternatifs et la controverse du diagnostic de la maladie de Lyme, Veterinarius, no. 14, vol. 33, no. 4, September 2017, p. 24-25.
- **Catherine Bouchard**, Progression de la tique étoilée et de la tique à pattes noires, July 30 2017**,** « Les années lumière », Radio-Canada.

A New Website

At the beginning of 2018, GREZOSP launched its new website. As a result of the work of our Web Committee, whose members are Catherine Bouchard, Hélène Boucher Rhéaume, Manon Racicot and Ludivine Taieb, you can now follow us on the web at our new address **www.grezosp.com**!

The new website includes an Events section (http://grezosp.com/grezosp/evenements/). Featuring symposiums, doctoral defences, seminars, training sessions and workshops, the calendar is a reference tool for everyone making it is easy to learn more about the GREZOSP's activities.

The news section, ***Nouvelles – Actualités et Médias*** (http://grezosp.com/grezosp/nouvelles/) allows you to keep up to date with our latest developments, awards and scholarships, as well as when our researchers are featured in the media!

Financial Statements

Financial Statements from May 1, 2017 to April 30, 2018

Sources of Funding	
Annual Funding under PHAC Agreement (2017-2018)	$79 500,00
Funding under CFIA Agreement (2017-2018)*	$0,00
Other sources (Workshop and Continuing Education)	$2 117,50
Funding Total	**$81 617,50**
Expenses	
General	
Administrative Salaries	$67 854,69
Office Supplies	$46,70
Travel Expenses	$74,23
Telecommunications	$642,06
Maintenance	$107,17
	$68 724,85
Scientific Committee	
Graduate Student Scholarships and Support	$18 500,00
Lucie-Dutil Award	$633,67
Scientific Workshops	$5 631,52
	$24 765,19
Communication and Web Committees	
GREZOSP Website Redesign	$2 408,33
Printing and Translation of Activity Report	$1 351,68
	$3 760,01
Échanges Committee	
Guest Lecturers (Regular Seminars and Thesis Defence)	$4 218,55
Maintenance and Replacement of Audio Material	$29,17
	$4 247,72
Student Activities	$503,52
GREZOSP Annual Symposium	$6 141,35
Social Committee	$218,60
	$6 863,47
Expenses Total	**$108 361,24**
Balance for the year 2017-2018	**-$26 743,74**
Year-End Balance 2016-2017	$106 693,82
Year-End Balance 2017-2018	**$79 950,08**

*The agreement with CFIA was renewed in November 2017 for a 3-year period; however, the first installment was received after the closing date of the financial statements.

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ET SANTÉ PUBLIQUE

GREZOSP

Université de Montréal