

Russell S. Fraser, BSc, MSc, DVM, PhD

4-43 Queen Street
Guelph, Ontario
N1E 4R5
Canada
rfrase03@uoguelph.ca
mobile: 519-803-0268
rfraser.shinyapps.io/shiny_cv

EDUCATION

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| 2018 | Doctor of Philosophy
Ontario Veterinary College, University of Guelph |
| 2012 – 2014 | Doctor of Veterinary Science (transfer to PhD 2014/05)
Ontario Veterinary College, University of Guelph
<i>Anatomic Pathology</i> |
| 2012 | Master of Science , One Health (with First Class Honours)
Royal (Dick) School of Veterinary Studies, University of Edinburgh |
| 2008 | Doctor of Veterinary Medicine (with distinction)
Ontario Veterinary College, University of Guelph |
| 2004 | Bachelor of Science, Honours (with distinction)
University of Guelph |

TEACHING AND MENTORING EXPERIENCE

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| 2018/02/06 | Guest Lecturer
Gene Expression in Health & Disease, BIOM*6800, University of Guelph <ul style="list-style-type: none">•Lectured in a graduate course on the effects of genetic variation on innate immune resistance to infectious diseases of livestock. |
| 2012 – 2017 | Resident in Anatomic Pathology
Dept. of Pathobiology, Ontario Veterinary College, University of Guelph <ul style="list-style-type: none">•Guided final year DVM students through the process of the postmortem examination of common veterinary species, including interpretation of clinical histories, formation of differential diagnoses, proper necropsy technique, and interpretation of gross and histopathological lesions.•Evaluated seminar presentations by final year DVM students on various topics in veterinary pathology. |
| 2017/10/04 | Guest Lecturer
Agricultural Animal Physiology, ANSC*3080, University of Guelph |

- Presented a 1 hour lecture to approximately 100 undergraduate students emphasizing the role of physiology in the understanding of pathology. Content was delivered through case examples.
- 2017/05/04 **COESP Day: Engaging Your Students**
- Attended a one day conference outlining strategies to implement active learning in both small and large classroom settings.
- 2017/03 **Lecturer**
Mechanisms of Disease, PABI*6104, University of Guelph
- Three hours of lecture in a graduate course on next-generation sequencing technologies, their application to research, and the genetic basis of disease.
 - Included writing and marking exam questions.
- 2017/01 – 2017/04 **Graduate Teaching Assistant**
PATH*3610, University of Guelph
- Handled questions from an undergraduate class of approximately 400 students on the pathologic basis of disease. Duties included monitoring online message boards, invigilating and marking exams.
- 2013 – 2017 **Pathology Mentor (volunteer)**
- Instructed 2nd year DVM members of the OVC Pathology Club and the OTS Fraternity in an after-hours wet-lab.
 - Demonstrated specimens in a pathology wet-lab for DVM students during the 2016 SCVMA conference.
 - Taught the basics of a post-mortem examination to members of the OVC Pathology club who were in their 1st year of the DVM program.
- 2013, 2014, 2016 **Summer Student Supervisor**
Dept. Pathobiology, Ontario Veterinary College, University of Guelph
- Supervised Elizabeth MacMillen (DVM student, 2016), Kristen Dienst (BSc student, 2014), and Kathryn Reynolds (BSc student, 2013) during their summer placements in our lab. Delivered instruction in laboratory and bioinformatic techniques.
 - Included instruction in laboratory techniques, bioinformatics, and the creation of a scientific poster.
- 2014 – 2016 **Graduate Teaching Assistant (grading)**
PATH*3610, University of Guelph
- Graded a portion of the mid-term and final examinations for a class of approximately 500 undergraduate students.
- 2011 **Demonstrator in Histology**
Royal (Dick) School of Veterinary Studies, University of Edinburgh
- Instructed 1st year DVM students in the basic recognition of histological sections.

CLINICAL EXPERIENCE

2012 – Present

Resident in Anatomic Pathology

Ontario Veterinary College, University of Guelph, Ontario

- Performed gross and histopathological postmortem examinations on common domestic species. Ordered ancillary testing when necessary.
- Trimmed and performed histopathological interpretation of biopsy specimens (routine H&E, IHC, and various special stains) from the OVC-VTH.
- Delivered concise and timely pathology reports to clinicians at the OVC-VTH. Communicated when necessary with clinicians before, during, and after the microscopic examination of biopsy specimens.

2009 – 2011

Associate Veterinarian

Animal Health Clinic, Montreal, Québec

- Confidently practiced small animal medicine, including surgery, internal medicine, radiology, critical care and emergency medicine, and cytology.
- Emphasis placed on clear communication skills with clients and staff.
- Worked closely with small animal shelters to help manage and prevent spread of contagious disease.

2010 – 2011

Volunteer Veterinarian

AIDS Community Care Montreal, Montreal, Québec

- Provided veterinary care for low-income, HIV positive members of the ACCM at no cost, taking care to address the specific needs of the immunosuppressed clientele.

2008 – 2009

Associate Veterinarian

Sechelt Animal Hospital, Sechelt, B.C.

- Examined, diagnosed and treated a variety of medical and surgical conditions of dogs and cats, with emphasis on compassionate and high quality care.
- Improved on both routine and emergency soft-tissue surgical skills.
- Provided 24 hour emergency service for the lower Sunshine Coast Regional District.
- Continued developing strong communication skills, both with clients and staff, in order to better provide and direct medical care.

RESEARCH EXPERIENCE

2018 – Present

Post-Doctoral Fellow

Dept. of Pathobiology, University of Guelph

- Responsible for the bioinformatic analysis of a genome-wide association study of ~ 3000 pigs with and without infectious diseases.
- The pipeline accounted for genetic relatedness of animals, and used software such as GEMMA and Plink.

- Oversaw the progress and learning of MSc candidates.
- 2012 – 2018 **Graduate Student (PhD, DVSc)**
 Dept. of Pathobiology, University of Guelph
- Applied next-generation sequencing technologies in the investigation of the genetics of innate immune disease resistance in cattle, horses, and pigs. Discovered and characterized novel and existing sequence variants, used *in silico* tools to predict functional effects, and performed eQTL analysis.
 - Developed strong bioinformatic and data science skills, including the usage of Unix, Perl, Python, R, and various standard bioinformatics software tools (e.g. GATK, Picard, and Samtools).
 - Wrote manuscripts, presented talks and posters at international and local conferences, supervised undergraduate and MSc students.
- 2012 **Graduate Student (MSc)**
 Roslin Institute, University of Edinburgh
- Investigated the pathogenesis of influenza A by examining the molecular mechanisms of host adaptation.
 - Utilized molecular virology laboratory techniques such as site-directed viral mutagenesis, Western blot, PCR, microscopy, cell culture, virus culture and fitness assays, and DNA sequencing.
 - Took an analytical and systematic approach to research problems, looking for patterns, identifying key issues, and seeking solutions.
- 2004 **Undergraduate Research**
 Dept. of Biomedical Sciences, University of Guelph
- Ran several long-duration experiments with live rodents on the cardiovascular effects of the hormone relaxin.
 - Became comfortable with the handling and medicating of small rodents.
 - Gained experience harvesting tissue and preparing and examining histological slides for immunofluorescence.
- 2002 **Summer Student**
 Meakins-Christie Lab, McGill University
- Investigated the effects of CD8⁺γδ T-cells on the late allergic airway response in rats. Performed numerous *in vivo* procedures on rats, including bronchoalveolar lavage, anesthesia, and the collection of physiological data.
 - Performed immunomagnetic cell sorting and maintained cell cultures.

AWARDS, SCHOLARSHIPS, AND FELLOWSHIPS

2018/11/05	CL Davis Foundation Student Scholarship Award (nominated)
2017/04/20	Korean-Canadian Dr. F. Schofield Memorial Scholarship (\$2000)
2016/12/06	2016 ACVP Young Investigator Award (3 rd place) (\$200 USD)
2016 – 2017	Queen Elizabeth II Scholarship in Science & Technology (\$15,000)
2016/05/05	Winner, Oral Presentations (PhD), Swine Research Day (\$200)

2015 – 2016	Ontario Graduate Scholarship (\$15,000)
2014/06/09	Canadian Bioinformatics Workshops Registration Award (\$565)
2014 – 2017	Ontario Veterinary College PhD Fellowship (\$30,000 / annum)
2014/02/07	Winner, Three Minute Thesis Competition, DVSc Category (\$100)
2012 – 2014	Graduate Teaching Assistantship and Bursary (\$4921.67 / annum)
2012 – 2014	Graduate Research Assistantship (\$16,200 / annum)
2012 – 2014	Graduate Service Assistantship (\$11,074 / annum)
2012	Pfizer Prize for Best Student 2011 – 2012 MSc One Health
2012/12	ACVP Resident/Graduate Student Travel Award (\$500 USD)
2012/09	6 th Orthomyxovirus Research Conference Travel Grant (\$500 USD)
2012	Wellcome Trust Science Writing Competition (Shortlisted finalist)
2011	Easter Bush Research Consortium and Pfizer Bursary (£4000 GBP)

PUBLICATIONS

Journal Publications

Fraser, RS, Lumsden, JS, Lillie, BN (2018). Identification of polymorphisms in the bovine collagenous lectins and their association with infectious diseases in cattle. *Immunogenetics* 70:533-46. doi:[10.1007/s00251-018-1061-7](https://doi.org/10.1007/s00251-018-1061-7)

Wills, S, Beaufreres, H, Brisson, B, **Fraser, RS**, Smith, DA (2018). Pancreatitis and systemic coronavirus infection in a ferret (*Mustela putorius furo*). *Comp. Med.* 68:208-11.

Fraser, RS, Arroyo, LG, Meyer, A, Lillie, BN (2018). Identification of genetic variation in equine collagenous lectins using targeted resequencing. *Vet. Immunol. and Immunopathol.* 202:153-63. doi:[10.1016/j.vetimm.2018.07.001](https://doi.org/10.1016/j.vetimm.2018.07.001)

Isogai S, Athiviraham A, **Fraser RS**, Taha R, Hamid Q, Martin J (2007). Interferon- γ -dependent inhibition of late allergic airway responses and eosinophilia by CD8⁺ $\gamma\delta$ T-cells. *Immunology* 122:230-8. doi:[10.1111/j.1365-2567.2007.02632.x](https://doi.org/10.1111/j.1365-2567.2007.02632.x)

Silvertown JD, **Fraser RS**, Poterski RS, Geddes B, Summerlee AJS (2005). Central Effects of Long-Term Relaxin Expression in the Rat. *Ann. N.Y. Acad. Sci.* 1041:1-7. doi:[10.1196/annals.1282.033](https://doi.org/10.1196/annals.1282.033)

Textbook Chapters

Prescott, JF, Menzies, PI, **Fraser, RS**, Clostridial abomasitis. In: Uzal, F, Songer, JG, Popoff, M, Prescott, JF. Clostridial infections of animals. Wiley-Blackwell (2016).

Journal Publications (*in preparation*)

Snyman, HN, **Fraser, RS**, Meyer, A, Hammermueller, JD, Squires, EJ, Caswell, JL, Hayes, MA, Lillie, BN. Constitutive variation in the hepatic innate immunome of healthy pigs. *In preparation for submission to Immunogenetics.*

Fraser, RS, Meyer, A, Snyman, HN, Hayes, MA, Lillie, BN. Identification and frequency of local expression quantitative trait loci in the innate immunome of diseased and healthy pigs. *In preparation for submission to Animal Genetics*.

Kozak, R*, **Fraser, RS***, Majer, A, Biondi, MJ, Stapleton, P, Urfano, C, Antonation, K, Booth, S, Fernando, L, Lillie, BN, Kobinger, G. Dual RNA-Seq to characterize host-response and pathogen in liver cells infected with Crimean-Congo Hemorrhagic Fever Virus. *In preparation for submission to PLoS Neglected Tropical Diseases*.

* These authors contributed equally to this manuscript.

Conference Presentations & Abstracts

Fraser, RS, Cousto, L, Jensen, M, zur Linden, A, Plattner, BL. 360-degree torsion of the gallbladder and quadrate liver lobe in a German shepherd dog. Poster presentation by RS Fraser at the 2017 ACVP and ASCVP Concurrent Annual Meeting, 2017/11/04-2017/11/08, Vancouver, BC, Canada.

Fraser, RS, Snyman, HN, Meyer, A, Hammermueller, JD, Lillie, BN. Combining targeted next-generation sequencing and microarray analysis for cis expression quantitative loci analysis of the porcine innate immunome. Poster presentation by RS Fraser at the 36th International Society for Animal Genetics Conference, 2017/07/16-2017/07/21, Dublin, Ireland.

Fraser, RS, Snyman, HN, Hammermueller, JD, Meyer, A, Lumsden, JS, Arroyo LH, Hayes, MA, Lillie BN. Unravelling the genetics of infectious disease susceptibility in livestock with the use of high throughput technology. Oral presentation by RS Fraser at the 2017 CAHLN Conference, 2017/06/04-2017/06/07, Guelph, Ontario, Canada.

Fraser, RS, Snyman, HN, Hammermueller, JD, Meyer, A, Lumsden, JS, Arroyo LH, Hayes, MA, Lillie BN. Utilization of high-throughput technologies to investigate the pathogenomics of infectious disease susceptibility in livestock. Poster presentation by RS Fraser at the 2016 ACVP and ASCVP Concurrent Annual Meeting, 2016/12/3 - 2016/12/7, New Orleans, Louisiana, U.S.A.

Fraser, RS, Snyman, HN, Meyer, A, Hammermueller, JD, Lillie, BN. Next-generation sequencing driven identification of expression quantitative trait loci in the porcine innate immunome. Oral presentation by RS Fraser at the 2016 Graduate Student Research Symposium, 2016/11/16, Guelph, Ontario, Canada.

Fraser, RS, Meyer, A, Snyman, HN, Hammermueller, JD, Hayes, MA, Lillie, BN. Expression quantitative trait locus analysis of porcine innate immune genes. Poster presentation by RS Fraser at the geXc Toronto 2016 symposia, 2016/10/04, Toronto, Ontario, Canada.

Fraser, RS, Meyer, A, Arroyo, LG, Hammermueller, JD, Lillie, BN. Identification of novel genetic variants in the equine collagenous lectin genes through targeted, next-generation re-sequencing. Oral and poster presentation by RS Fraser at the 35th International Society for Animal Genetics Conference, 2016/07/24 - 2016/07/28, Salt Lake City, Utah, U.S.A.

Fraser, RS, Hammermueller, JD, Lumsden, JS, Hayes, MA, Lillie, BN. Use of targeted next-generation re-sequencing in the identification of polymorphisms in the bovine collagenous lectin gene family. Poster presentation by RS Fraser at the 35th International Society for Animal Genetics Conference, 2016/07/24 - 2016/07/28, Salt Lake City, Utah U.S.A.

Fraser, RS, Snyman HN, Meyer, A, Hammermueller, JD, Lillie, BN. Identification of germline variants in porcine innate immune genes using next-generation sequencing. Oral presentation by RS Fraser at the Swine Research Day, Ontario Veterinary College, 2016/05/04, Guelph, ON, Canada.

Fraser, RS, Hammermueller, JD, Meyer, A, Lillie, BN. Investigating infectious disease susceptibility in horses through targeted next-generation resequencing of the collagenous lectin gene family. Oral presentation by RS Fraser at the Graduate Student Research Symposium, Ontario Veterinary College, 2015/11/18, Guelph, ON, Canada.

Fraser, RS, Meyer, A, Hammermueller, JD, Lillie, BN. Identification of defects in equine innate infectious disease resistance through targeted resequencing of the collagenous lectin gene family. Poster presentation by RS Fraser at the Toronto NGS Symposium, 2015/10/22, Toronto, ON, Canada.

Dienst, KA, **Fraser, RS**, Hammermueller, JD, Lillie, BN. Investigating mechanisms of genetic regulation of pattern recognition receptor mediated innate disease resistance in domestic animals. Poster presentation by K. Dienst at the SLRP Research Session; 2014/08/12; Guelph, ON, Canada.

Reynolds, KE, **Fraser, RS**, Hammermueller, JD, Lillie, BN. Identification and tissue localization of equine and bovine collagenous lectins. Poster presentation by K. Reynolds at the SLRP Research Session; 2013/08/13; Guelph, ON, Canada.

Fraser, RS, Föglein, A, Jagger, BW, Wise, HM, Taubenberger, JK, Digard, P. Influence of charge at residue 627 of PB2 on polymerase function in influenza A. Poster presentation by RS Fraser at the Centre for Public Health and Zoonoses Scientific Symposium; 2013/06/06; Guelph, ON, Canada.

Fraser, RS, Föglein, A, Jagger, BW, Wise, HM, Taubenberger, JK, Digard, P. Influence of charge at residue 627 of PB2 on polymerase function in influenza A. Poster presentation by RS Fraser at the 6th Orthomyxovirus Research Conference; 2012/09/19-22; Montreal, PQ, Canada.

Fraser, RS, Föglein, A, Jagger, BW, Wise, HM, Taubenberger, JK, Digard, P. Influence of charge at residue 627 of PB2 on polymerase function in influenza A. Poster presentation by RS Fraser at the ACVP/ASCP 2012 Annual Meeting; 2012/12/1-5; Seattle, WA, U.S.A.

Non-Peer Reviewed Publications

Pors, J, **Fraser, RS**, Fraser, RS (2017). Duncan McEachern and the One Health movement. The Pharos 80:12-19. Online access: <http://alphaomegaalpha.org/pharos/2017/Summer/2017-3-CompleteIssue.pdf>

Fraser, RS. (2012). The strange future of antibiotics. Wellcome Trust Science Writing Prize. <https://blog.wellcome.ac.uk/2012/11/29/the-strange-future-of-antibiotics/>. Last accessed: 2018-08-22.

INVITED TALKS AND LECTURES

2014/01/24 Invited speaker at the BioMedical Sciences Student Association Leadership Conference

ACADEMIC SERVICE

2018	Responsible, in conjunction with HR, for the hiring of a graduate student for a temporary in-house position.
2015 – 2018	Graduate Student Representative, Dept. of Pathobiology Faculty Meetings
2013 – 2018	Interviewer in the multiple mini interviews for incoming DVM students
2017	Member of the selection committee for Administrative Assistant to the Chair
2013 – 2018	Participated in various capacities (judge, mentor) for the SLRP/CORE program at OVC
2014	Judge, Faculty 3-Minute Thesis Competition
2013	Provided support and expertise for a published case report by E. Denstedt (PMID: 24489399)
2013, 2014, 2016 - 2018	Judge, oral presentations, Graduate Student Research Symposium, OVC
2007 – 2008	CVSA Representative, Information Technology Student Advisory Committee, University of Guelph
2005 – 2008	Technical Director, Central Veterinary Students Association (CSVA)

PROFESSIONAL QUALIFICATIONS

2017/03/16	ACVP, Phase I
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PROFESSIONAL MEMBERSHIPS

2012 – Present	College of Veterinarians of Ontario
2016 – 2017	International Society for Animal Genetics
2009 – 2011	Ordre des Médecins Vétérinaire du Québec
2008 – 2011	International Veterinary Academy of Pain Management
2008 – 2009	College of Veterinarians of British Columbia
2004 – 2008	Canadian Veterinary Medical Association

ADDITIONAL TRAINING

2018	Compute Ontario/Sharcnet Summer School: PLINK and Intro to Machine Learning in Python
2016	Canadian Bioinformatics Workshop: Informatics for RNA-seq Analysis
2014	Canadian Bioinformatics Workshop: Informatics on High-Throughput Sequencing Data

LANGUAGE COMPETENCIES

English: Fluent written and oral

French: Average written and oral

COMMUNITY INVOLVEMENT

2016 – 2017	Active member of the Guelph Coalition for Active Transport
2016 – 2017	Member of a support group for a Syrian refugee family.
2015 – 2017	Scout Leader with the 2 nd Guelph Cubs
2016/05	Volunteer with the Special Olympics
2010 – 2011	Volunteer veterinarian with AIDS Community Care Montreal