

BIOGRAPHICAL SKETCH

NAME: Alyson Ann Kelvin

eRA COMMONS USER NAME: AKELVIN

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Western University, London, Canada	H.B.Sc.	06/2003	Cell Biology
Queen's University, Belfast, UK	Ph.D	12/2007	Molecular Cell Biology and Immunology
SaRD, Sardinia Research and Development SRL	Postdoctoral Fellow	09/2008	Immunology and Virology

A. Personal Statement

I am an energetic early career researcher with the expertise, leadership, as well as collaborative skills that I leverage for leading my own research group. My research program aims to understand current problems in infectious disease by addressing the role of host immunity. Since influenza viruses are constantly emerging and re-emerging, much of my efforts are directed toward these pathogens investigating how to improve influenza vaccines. Within my program, I have discovered unknown mechanisms of disease and developed new animal models for studying problems in specific vulnerable populations such as infants. I can then apply these new models and discovered mechanisms to problems of other emerging and re-emerging disease including Chikungunya Virus, Zika Virus, West Nile and *Borrelia burgdorferi*, the pathogen that causes Lyme Disease.

My work and research papers have been **meaningful** to the scientific community. I have made several key discoveries in the field of viral pathogenesis for emerging and re-emerging viruses. I identified the susceptibility of the breast to influenza virus infection and transmission through breastfeeding. Also, I was the first to identify the host immune mediators that are involved in Chikungunya virus infection and disease longevity. I have also previously headed the development of a smart phone that reported Zika virus cases during the fast-moving outbreak in 2016. Several of my corresponding author manuscripts have been chosen as featured research by journals and media outlets. Notably my research has been featured on the **BBC Radio 4** science show *Naked Scientists* and on the podcast *This Week in Virology*.

The current focus of my research program is understanding the host's molecular mechanisms of influenza imprinting and immune refinement throughout seasonal virus re-emergence. Understanding these mechanisms will be key to the development of the next generation of more efficacious influenza vaccines.

I have published 36 manuscripts where I am last author of corresponding author on 6 publications. My most relevant published studies are listed below:

1. Francis ME, King ML, and **Kelvin AA***. Back to the Future for Influenza Preimmunity—Looking Back at Influenza Virus History to Infer the Outcome of Future Infections. *Viruses* 2019; 11(2), 122; <https://doi.org/10.3390/v11020122>
2. **Kelvin A.A.**, Banner D., Silvi G., Moro M.L., Spataro N., Gaibani P., Cavrini F., Pierro A., Rossini G., Cameron M.J., Bermejo-Martin J.F., Paquette S.G., Xu L., Danesh A., Farooqui A., Borghetto I., Kelvin DJ, Sambri V, and Rubino S. Inflammatory cytokine expression is associated with chikungunya virus resolution and symptom severity. *PLoS NTD*. 2011 Aug;5(8):e1279. PMID:PMC3156690

3. **Kelvin A.A.**, Banner D., Pamplona L., Alencar C., Rubino S., and Heukelbach J. ZIKATracker: A mobile App for reporting cases of ZIKV worldwide. JIDC. 2016 Feb;10(2):113-5
4. Heukelbach J., Alencar C.H., **Kelvin A.A.***, De Oliveira W.K., and Pamplona de Goes C.L. Zika virus outbreak in Brazil. JIDC. 2016;10(2):116-20
5. Paquette S.G., Banner D., Huang S.S., Almansa R., Leon A., Xu L., Bartoszko J., Kelvin D.J., and **Kelvin A.A.** Influenza Transmission in the Mother-Infant Dyad Leads to Severe Disease, Mammary Gland Infection, and Pathogenesis by Regulating Host Responses. PLoS Pathog. 2015. 11, e1005173.
6. **Kelvin A.A.** Outbreak of Chikungunya in the Republic of Congo and the global picture. JIDC. 2011 Jun;5(6):441-4

B. Positions and Honors

Positions and Employment

2008-2010	Scientific Director, Sardinia Research and Development, Sardinia, Italy
2009-2010	Visiting Professor, University of Sassari, Sardinia, Italy
2010-2017	Scientist - Scientific Projects Director, Immune Diagnostics & Research, Toronto, Canada
2018-	Assistant Professor, Department of Pediatrics, Dalhousie University
2018-	Research Scientist, IWK Health Centre

Other Experience and Professional Memberships

Professional Memberships and Committees

2006-2007	Member, Biochemical Society, UK
2012-	Member, American Society for Microbiology
2012-	Member, American Society for Virology
2016-	Member, Canadian Society for Virology
2018-	Member, CIHR College of Reviewers
2018-	Member, Dalhousie Institutional Biosafety Committee
2018-	Member, Dalhousie Medical Research Foundation (DMRF) Scientific Advisory Committee
2019-	Member, Executive Committee of the Canadian Society for Virology

Reviewer and Editorial Experience for Journals

2010-	Associate Editor for the Journal of Infection in Developing Countries, JIDC
2010-	Reviewer for PLOS One
2011-	Reviewer for Virology Journal
2011-	Reviewer for Virus Research
2011-	Reviewer for Clinical Microbiology and Infection
2011-	Reviewer for Pharmaceuticals
2012-	Reviewer for Expert Review of Vaccines
2015-	Reviewer for The Journal of Rheumatology
2017-	Reviewer for PLOS Pathogens
2018-	Reviewer for Viruses

Grant Reviewer Experience

2017	<i>Ad Hoc Reviewer</i> - NIH R21 Grant Scheme - PAR-16-106 “Rapid Assessment of Zika Virus (ZIKV) Complications (R21)” ZAI1 RRS M M3
2018	External Reviewer - PSI Foundation - 2018 grant competition
2019	<i>External Review</i> – Canadian Lung Association - 2018/19 National Grant Peer Review for The Lung Association’s Grant-in-Aid competition.

Honors

1999	Entrance Scholarship, Western University, London, CA
1999-2003	Dean’s Honor List, Western University, London, CA

- 2003 Life Science Award, Department of Immunology, University of Toronto, Toronto, CA
 2003 Ontario Government Studentship in Science and Technology (OGSST), Government of Ontario, CA
- 2003-2006 Faculty of Medicine and Health Sciences PhD Studentship, Queen's University, Belfast, UK
 2003-2006 Faculty of Medicine and Health Sciences Prize, Queen's University, Belfast, UK
 2004-2007 Overseas Research Studentship (ORS), British Government, UK
 2004 Poster Prize, American Society of Biochemistry and Molecular Biology, ASBMB, FASEB Experimental Biology Conference, San Diego, USA
- 2006 Dorothy Price Prize, Immunology Master Class, presented by the Irish Society of Immunology
<http://immunology.nuim.ie/documents/TheDorothyPriceMedal.pdf>
- 2013 Highlighted Article in 'Virology,' the January 2014 'Virology' – Journal – Elsevier
<http://www.virologyhighlights.com/?p=198>
- 2013 Article Chosen for the 'Essential Collection: Virology Editors' Selection 2013' 'Virology'
<http://www.journals.elsevier.com/virology/essential-collections/essential-collection-virology-editors-selection-2013/>
- 2015 Article Chosen as Feature Research by the journal PLOS Pathogens and for Press Release
http://www.eurekalert.org/pub_releases/2015-10/p-rob100115.php

Media Reports

INTERVIEWS

- 2015 **The Naked Scientists. BBC Radio 5.** University of Cambridge. *Flu breast infection*
<http://www.thenakedscientists.com/HTML/science-news/news/1000802/>. 9 October 2015
- 2015 **ALN.** *In Ferrets, Influenza is Spread from Mother to Offspring Through Infected Breast Cells.*
<http://www.alnmag.com/news/2015/10/ferrets-influenza-spread-mother-offspring-through-infected-breast-cells> 30 October 2015
- 2016 **ResearchGate.** *Researchers need Zika data fast. This mobile app could deliver.*
<https://www.researchgate.net/blog/post/researchers-need-zika-data-fast-this-mobile-app-could-deliver>. 4 April 2016
- 2018 **CTV Atlantic.** *Current Flu Situation in Atlantic Canada.* Interviewed by Priya Sam. 17 January 2018
- 2018 **CTV Atlantic.** *The Upcoming Flu Season and Review of Last Flu Season.* Interviewed by Bruce Frisko. 30 September 2018. <https://atlantic.ctvnews.ca/video?clipId=1502886>
- 2019 **CBC Radio – Mainstreet Halifax.** *The current 2019 influenza season and disease severity in children.* Interviewed by Bob Murphy. 3 January 2019
- 2019 **CBC Radio – Mainstreet Halifax.** *Commentary on PEI nurses object to new policy on flu prevention.* Interviewed by Bob Murphy. 23 January 2019
<https://www.cbc.ca/listen/shows/maritime-noon/episode/15665576> minute 2:20
- 2019 **CBC Kids: Measles.** TV Interview on *Measles and Measles virus.* Interviewed by Isabelle MacNeil with Sabrina Fabian. To air 18 March 2019.

PRINT MEDIA COVERAGE

- 2015 This Week In Virology with Vincent Racaniello. *TWiV 363: Eat flu and dyad.*
<http://www.twiv.tv/2015/11/15/twiv-363/>
- 2015 CIDRAP. Center for Infectious Disease Research and Policy. *Ferret study shows live flu viruses in breast tissue, milk.* <http://www.cidrap.umn.edu/news-perspective/2015/10/flu-scan-oct-08-2015>
- 2015 Virology Blog. All about viruses and disease. *Influenza virus in breast milk*
<http://www.virology.ws/2015/11/12/influenza-virus-in-breast-milk/>
- 2015 La Vanguardia. *Constatan en hurones que las mamás también son fuente de contagio de la gripe.* <http://www.lavanguardia.com/vida/20151008/54437989378/constatan-en-hurones-que-las-mamas-tambien-son-fuente-de-contagio-de-la-gripe.html>
- 2015 Medical Express. *Role of breast cell infection in flu transmission between mothers and breast-feeding ferrets.* <http://medicalxpress.com/news/2015-10-role-breast-cell-infection-flu.html>

C. Contribution to Science

1. Age as a risk factor for influenza pathogenesis. Infants, pregnant mothers, and the elderly are more susceptible to developing severe disease following influenza infection. My research program has been focused on investigating how age influences influenza severity to uncover the mechanisms responsible for pathogenesis. Ferrets are the most appropriate animal model for influenza studies. With this in mind, I have developed several ferret models including a newly weaned model, an aged model, and a model of the mother-infant dyad that address this variable. These papers have identified immune mechanisms related to age and development stage. For instance we identified the development of iBALT structures in the lung of young ferrets which may be directly responsible for disease outcome. Importantly, the establishment of these models may now be used as a framework for future studies of age specific influenza prophylactics and therapeutics. These may include the evaluation of vaccines such as the Flumist® the nasal spray influenza vaccine for children and the Fluzone® high dose vaccine developed for elderly patients. Work from the mother-infant dyad infection model has suggests a mechanism of influenza transmission which has not been previously described. These results may have far reaching implications in maternal and infant health and are the foundation of this proposal.

- a. Paquette S.G., Banner D., Huang S.S., Almansa R., Leon A., Xu L., Bartoszko J., Kelvin D.J., & **Kelvin A.A.** Influenza Transmission in the Mother-Infant Dyad Leads to Severe Disease, Mammary Gland Infection, and Pathogenesis by Regulating Host Responses. *PLoS Pathog.* 2015. 11, e1005173. PMID: [PMCID:PMC4598190](https://pubmed.ncbi.nlm.nih.gov/26111110/)
- b. Huang S.S., Banner D., Degousee N., Leon A.J., Xu L., Paquette S.G., Kanagasabai T., Fang Y., Rubino S., Rubin B., Kelvin D.J. & **Kelvin A.A.** Differential pathological and immune responses in newly weaned ferrets are associated with a mild clinical outcome of pandemic 2009 H1N1 infection. *J.Virol.* 2012 Dec;86(24):13187-201. PMID:PMC3503035
- c. Paquette S.G., Huang S.S., Banner D., Xu L., Leon A., **Kelvin A.A.**, & Kelvin D.J. Impaired heterologous immunity in aged ferrets during sequential influenza A H1N1 infection. *Virology* 2014 Sep;464-465:177-83. PMID:PMC4157083

2. Elucidating the molecular mechanisms of influenza infection. The molecular mechanisms which lead to severe disease and possible hospitalization following influenza infection has not been elucidated. I and my colleagues have addressed this problem directly in three published studies utilizing an in vitro primary human respiratory epithelial cell model and knockout mice. Since the initial events following virus infection in the respiratory epithelium are not easily studied, the human primary respiratory epithelial cell model allowed us to dissect the immediate early events as the 2009 H1N1 virus enters the host cell. We found the virus alone directly causes the cell to produce significant amounts of inflammatory signals compared to less severe seasonal flu virus. In other studies using knockout mice of inflammatory mediators (IL-6 and group X secreted phospholipase A₂ (GX PLA2)), we were able to determine that GX PLA2 plays a pathogenic role during influenza infection. These studies are important for the development of biomarker diagnostics and the identification of therapeutic targets during influenza infection. I directed the work and/or was study lead.

- a. Paquette S.G., Banner D., Chi le T.B., Leon A.J., Xu L., Ran L., Huang S.S., Farooqui A., Kelvin D.J., & **Kelvin A.A.** Pandemic H1N1 influenza A directly induces a robust and acute inflammatory gene signature in primary human bronchial epithelial cells downstream of membrane fusion. *Virology* 2014 Jan 5;448:91-103 <http://www.sciencedirect.com/science/article/pii/S0042682213005552>
- b. **Kelvin A.A.**, Degousee N., Banner D., Stefanski E., Leon A.J., Angoulvant D., Paquette S.G., Huang S.S., Danesh_A., Robbins C.S., et al. Lack of group X secreted phospholipase A(2) increases survival following pandemic H1N1 influenza infection. *Virology* 2014 Apr;454-455:78-92. PMID:PMC4106042
- c. Paquette S.G., Banner D., Zhao Z., Fang Y., Huang S.S., Leon A.J., Ng D.C., Almansa R., Martin-Loeches I., Ramirez P., Socias L., Loza A., Blanco J., Sansonetti P., Rello J., Andaluz D., Shum B., Rubino S., de Lejarazu R.O., Tran D., Delogu G., Fadda G., Kraiden S., Rubin B.B., Bermejo-Martin J.F., **Kelvin A.A.**, & Kelvin D.J. Interleukin-6 is a potential biomarker for severe pandemic H1N1 influenza A infection. *PLoS.One.* 2012;7(6):e38214. PMID:PMC3367995

3. USP17/DUB3 regulates RasGTPases and cancer cell proliferation and movement. My Ph.D. research centered on the investigating of the role of the deubiquitinating enzyme USP17/DUB3 in inflammation and cancer. During this time, our group discovered that USP17/DUB3 is able to regulate the GTPase activity of the proto-oncogene Ras and its family members Rho, Rac, and CDC42. Specifically, we reported that USP17/DUB3 regulates the posttranslational modifications responsible for GTPase activation. The Ras superfamily of GTPases are often deregulated in tumors where Ras has been found to be mutated in 30% of all human cancers. We found that by perturbing USP17/DUB3, the proliferation and chemotaxis ability of oncogenic cells were diminished. Since USP17/DUB3 is an acceptable drug target due to its innate protease activity, this finding may lead to future therapeutic strategies targeting USP17/DUB3 in Ras-related cancers. My work contributed to several co-authorships and a US and European Patent.

a. de I, V*, **Kelvin A.A.***, Dunican D.J., McFarlane C., Burrows J.F., Jaworski J., Stevenson N.J., Dib K., Rappoport J.Z., Scott C.J., et al. The deubiquitinating enzyme USP17 is essential for GTPase subcellular localization and cell motility. *Nat. Commun.* 2011;2:259. PMID:PMC3072070

*Co-first author

b. McFarlane C., **Kelvin A.A.**, de I, V., Govender U., Scott C.J., Burrows J.F., & Johnston J.A. The deubiquitinating enzyme USP17 is highly expressed in tumor biopsies, is cell cycle regulated, and is required for G1-S progression. *Cancer Res.* 2010 Apr 15;70(8):3329-39

c. Burrows J.F., **Kelvin A.A.**, McFarlane C., Burden R.E., McGrattan M.J., de I, V.M., Govender U., Quinn D.J., Dib K., Gadina M., Scott C.J., & Johnston J.A. USP17 Regulates Ras Activation and Cell Proliferation by Blocking RCE1 Activity. *J Biol Chem.* 2009 Apr 3;284(14):9587-95. doi: 10.1074/jbc.M807216200. Epub 2009 Feb 2. PMID:[PMC2666611](https://pubmed.ncbi.nlm.nih.gov/19266661/)

d. Patent: Johnston J.A., Burrows J.F., **Kelvin A.A.** DUB3 as a Cancer Therapy Target. Application number: 20090208446. Filed: May 14, 2007. Issued: August 20, 2009. Assignee: THE QUEEN'S UNIVERSITY OF BELFAST

Complete List of Published Work in MyBibliography:

<http://www.ncbi.nlm.nih.gov/sites/myncbi/1-lp8evGj2MA8/bibliography/46564450/public/?sort=date&direction=ascending>.

1. Francis ME, King ML, **Kelvin AA***. Back to the Future for Influenza Preimmunity—Looking Back at Influenza Virus History to Infer the Outcome of Future Infections. *Viruses* 2019; 11(2), 122; <https://doi.org/10.3390/v11020122>

*This manuscript outlines the thesis of my research program on host immune history. This is a review I wrote with my master's student Ms. M. Francis and my trainee Mr. M. King.

2. **Kelvin AA***, Banner D, Pamplona L, Alencar C, Rubino S, Heukelbach J. ZIKATracker: A mobile App for reporting cases of ZIKV worldwide. *Journal of Infection in Developing Countries* 2016 Feb;10(2):113-5
* Wrote this manuscript and designed and executed the app that is described in the text in collaboration with development from mWater.

3. Heukelbach J, Alencar CH, **Kelvin AA***, De Oliveira WK, Pamplona de Goes CL. Zika virus outbreak in Brazil. *Journal of Infection in Developing Countries* 2016;10(2):116-20

* Wrote the Zika history and host responses sections.

4. Farooqui A, Liu W, Kelvin DJ, Zeng T, Liu Y, Zhang L, Khan A, Wu X, Wu R, Wu S, Huang L, Cai Y, **Kelvin AA***, Paquette SG, Hu K, Zheng N, Chen H, Xu S, Lin C, Sun P, Yao Z, Wang J, Ma H, Zhu Z, Lin P, Chen W, Fang X, Bermejo-Martin JF, Leon AJ. Probable Hospital Cluster of H7N9 Influenza Infection. *New England Journal of Medicine* 2016 Feb 11;374(6):596-8

* Participated in study design and data analysis.

5. Farooqui A, Huang L, Wu S, Cai Y, Su M, Lin P, Chen W, Fang X, Zhang L, Liu Y, Zheng T, Paquette SG, Khan A, **Kelvin AA*** and Kelvin DJ. Assessment of antiviral properties of Peramivir against H7N9 avian influenza virus in an experimental mouse model. *Antimicrobial Agents and Chemotherapeutics* 2015 Dec;59(12):7255-64

*Participated in study design and data analysis.

6. Paquette SG, Banner D, Huang SS, Almansa R, Leon A, Xu L, Bartoszko J, Kelvin DJ, and **Kelvin AA***. Influenza Transmission in the Mother-Infant Dyad Leads to Severe Disease, Mammary Gland Infection, and Pathogenesis by Regulating Host Responses. *PLoS Pathogens* 2015 Oct;11(10):e1005173

*Designed the study and experiments. Analyzed the data. Supervised study progress. Wrote the manuscript.

7. Huang SS, Banner D, Paquette SG, Leon AJ, **Kelvin AA***, and Kelvin DJ. Pathogenic influenza B virus in the ferret model establishes lower respiratory tract infection. *Journal of General Virology* 2014 Oct;95(Pt 10):2127-39. PMID:PMC4165929

*Designed the study and experiments. Co-analyzed data and co-wrote the manuscript.

8. **Kelvin AA***, Degousee N, Banner D, Stefanski E, Leomicronn AJ, Angoulvant D, Paquette SG, Huang SS, Danesh A, Robbins CS, Noyan H, Husain M, Lambeau G, Gelb M, Kelvin DJ, and Rubin BB. Lack of group X secreted phospholipase A(2) increases survival following pandemic H1N1 influenza infection. *Virology* 2014 Apr;454-455:78-92. PMID:PMC4106042

*Designed some experiments. Analyzed the data. Wrote the manuscript.

9. Lin Z, Farooqui A, Li G, Wong GK, Mason AL, Banner D, **Kelvin AA***, Kelvin DJ, and Leon AJ. Next-generation sequencing and bioinformatic approaches to detect and analyze influenza virus in ferrets. *Journal of Infection in Developing Countries* 2014;8(4):498-509

*Participated in data analysis and study design.

10. Paquette SG, Banner D, Chi le TB, Leomicronn AJ, Xu L, Ran L, Huang SS, Farooqui A, Kelvin DJ, and **Kelvin AA***. Pandemic H1N1 influenza A directly induces a robust and acute inflammatory gene signature in primary human bronchial epithelial cells downstream of membrane fusion. *Virology* 2014 Jan 5;448:91-103

*Designed the project and experiments. Supervised study progress. Co-analyzed the data and co-wrote the manuscript.

11. Paquette SG, Huang SS, Banner D, Xu L, Leon A, **Kelvin AA***, and Kelvin DJ. Impaired heterologous immunity in aged ferrets during sequential influenza A H1N1 infection. *Virology* 2014 Sep;464-465:177-83. PMID:PMC4157083

*Co-designed the project and experiments. Supervised study progress. Co-analyzed the data and co-wrote the manuscript.

12. Sidahmed AM, Leon AJ, Banner D, **Kelvin AA***, Rowe T, Boudakov I, Degousee N, Rubin BB, and Kelvin DJ. CXCL14 deficiency does not impact the outcome of influenza or Escherichia coli infections in mice. *Journal of Infection in Developing Countries* 2014 Oct;8(10):1301-6

*Co-analyzed the data and co-wrote the manuscript.

13. Huang SS, Lin Z, Banner D, Leon AJ, Paquette SG, Rubin B, Rubino S, Guan Y, Kelvin DJ, and **Kelvin AA***. Immunity toward H1N1 influenza hemagglutinin of historical and contemporary strains suggests protection and vaccine failure. *Scientific Reports* 2013;3:1698. PMID:PMC3633051

*Designed the project and experiments. Supervised study progress. Co-analyzed the data. Wrote the manuscript

14. Leon AJ, Banner D, Xu L, Ran L, Peng Z, Yi K, Chen C, Xu F, Huang J, Zhao Z, Lin Z, Huang SH, Fang Y, **Kelvin AA***, Ross TM, Farooqui A, and Kelvin DJ. Sequencing, annotation, and characterization of the influenza ferret infectome. *Journal of Virology* 2013 Feb;87(4):1957-66. PMID:PMC3571481

*Co-designed the experiments. Participated in data analysis.

15. Zhu H, Wang D, Kelvin DJ, Li L, Zheng Z, Yoon SW, Wong SS, Farooqui A, Wang J, Banner D, Chen R, Zheng R, Zhou J, Zhang Y, Hong W, Dong W, Cai Q, Roehrl MH, Huang SS, **Kelvin AA***, Yao T, Zhou B, Chen X, Leung GM, Poon LL, Webster RG, Webby RJ, Peiris JS, Guan Y, and Shu Y. Infectivity, transmission, and pathology of human-isolated H7N9 influenza virus in ferrets and pigs. *Science* 2013 Jul 12;341(6142):183-6

* Co-analyzed the data.

16. Banner D and **Kelvin AA***. The current state of H5N1 vaccines and the use of the ferret model for influenza therapeutic and prophylactic development. *Journal of Infection in Developing Countries* 2012 Jun;6(6):465-9

*Designed the manuscript. Co-wrote the manuscript.

17. Cameron MJ, **Kelvin AA***, Leon AJ, Cameron CM, Ran L, Xu L, Chu YK, Danesh A, Fang Y, Li Q, Anderson A, Couch RC, Paquette SG, Fomukong NG, Kistner O, Lauchart M, Rowe T, Harrod KS, Jonsson CB, and Kelvin DJ. Lack of innate interferon responses during SARS coronavirus infection in a vaccination and reinfection ferret model. *PLoS One* 2012;7(9):e45842. PMID:PMC3454321

* Participated in study design and data analysis. Co-wrote the manuscript.

18. Fang Y, Banner D, **Kelvin AA***, Huang SS, Paige CJ, Corfe SA, Kane KP, Bleackley RC, Rowe T, Leon AJ, and Kelvin DJ. Seasonal H1N1 influenza virus infection induces cross-protective pandemic H1N1 virus immunity through a CD8-independent, B cell-dependent mechanism. *Journal of Virology* 2012 Feb;86(4):2229-38. PMID:PMC3302411

*Participated in study design and data analysis. Co-wrote the manuscript.

19. Huang SS, Banner D, Degousee N, Leon AJ, Xu L, Paquette SG, Kanagasabai T, Fang Y, Rubino S, Rubin B, Kelvin DJ and **Kelvin AA***. Differential pathological and immune responses in newly weaned ferrets are associated with a mild clinical outcome of pandemic 2009 H1N1 infection. *Journal of Virology* 2012 Dec;86(24):13187-201. PMID:PMC3503035

*Designed the project and experiments. Supervised study progress. Co-analyzed the data and co-wrote the manuscript.

20. **Kelvin AA***, Meloni D, Sansonetti P, Borghetto I, Rowe T, Santangelo R, Pisu D, Cameron CM, Paglietti B, Banner D, Farooqui A, Marongiu P, Santona A, Fadda G, Kelvin DJ, and Rubino S. Influenza monitoring in Sardinia, Italy identifies H3 subtype in Mediterranean wild migratory birds. *Journal of Infection in Developing Countries* 2012;6(11):786-97

*Co-designed the project. Designed the experiments. Supervised study progress. Participated in data generation. Co-analyzed the data and co-wrote the manuscript.

21. Paquette SG, Banner D, Zhao Z, Fang Y, Huang SS, Leomicronn AJ, Ng DC, Almansa R, Martin-Loeches I, Ramirez P, Socias L, Loza A, Blanco J, Sansonetti P, Rello J, Andaluz D, Shum B, Rubino S, de Lejarazu RO, Tran D, Delogu G, Fadda G, Kraiden S, Rubin BB, Bermejo-Martin JF, **Kelvin AA***, and Kelvin DJ. Interleukin-6 is a potential biomarker for severe pandemic H1N1 influenza A infection. *PLoS One* 2012;7(6):e38214. PMID:PMC3367995

* Co-designed the project. Designed the experiments. Supervised study progress. Co-analyzed the data and co-wrote the manuscript.

22. Danesh A, Cameron CM, Leon AJ, Ran L, Xu L, Fang Y, **Kelvin AA***, Rowe T, Chen H, Guan Y, et al. Early gene expression events in ferrets in response to SARS coronavirus infection versus direct interferon-alpha2b stimulation. *Virology* 2011 Jan 5;409(1):102-12

*Participated in study design and data analysis.

23. de I, V[#], **Kelvin AA[#]**, Dunican DJ, McFarlane C, Burrows JF, Jaworski J, Stevenson NJ, Dib K, Rappoport JZ, Scott CJ, et al. The deubiquitinating enzyme USP17 is essential for GTPase subcellular localization and cell motility. *Nature Communications* 2011;2:259. PMID:PMC3072070

#Co-first author

*Wrote the manuscript and designed the experiments. Conducted the experiments and analyzed the data.

24. Huang SS, Banner D, Fang Y, Ng DC, Kanagasabai T, Kelvin DJ, and **Kelvin AA***. Comparative analyses of pandemic H1N1 and seasonal H1N1, H3N2, and influenza B infections depict distinct clinical pictures in ferrets. *PLoS One* 2011;6(11):e27512. PMID:PMC3217968

*Co-designed the project. Designed the experiments. Supervised study progress. Co-analyzed the data and co-wrote the manuscript.

25. **Kelvin AA***. Outbreak of Chikungunya in the Republic of Congo and the global picture. *Journal of Infection in Developing Countries* 2011 Jun;5(6):441-4

*Designed and wrote the manuscript.

26. Kelvin AA*, Banner D, Silvi G, Moro ML, Spataro N, Gaibani P, Cavrini F, Pierro A, Rossini G, Cameron MJ, Bermejo-Martin JF, Paquette SG, Xu L, Danesh A, Farooqui A, Borghetto I, Kelvin DJ, Sambri V, and Rubino S. Inflammatory cytokine expression is associated with chikungunya virus resolution and symptom severity. *PLoS Neglected Tropical Diseases* 2011 Aug;5(8):e1279. PMID:PMC3156690
* Co-designed the project. Designed the experiments. Supervised study progress. Participated in data generation. Co-analyzed the data. Wrote the manuscript.
27. Kelvin AA*. Outbreak of cholera in the Republic of Congo and the Democratic Republic of Congo, and cholera worldwide. *Journal of Infection Developing Countries* 2011 Oct;5(10):688-91
*Designed and wrote the manuscript.
28. McFarlane C, Kelvin AA*, de I, V, Govender U, Scott CJ, Burrows JF, and Johnston JA. The deubiquitinating enzyme USP17 is highly expressed in tumor biopsies, is cell cycle regulated, and is required for G1-S progression. *Cancer Research* 2010 Apr 15;70(8):3329-39
*Designed and conducted key experiments. Analyzed data.
29. Rowe T, Banner D, Farooqui A, Ng DC, Kelvin AA*, Rubino S, Huang SS, Fang Y, and Kelvin DJ. In vivo ribavirin activity against severe pandemic H1N1 Influenza A/Mexico/4108/2009. *Journal of General Virology* 2010 Dec;91(Pt 12):2898-906
*Co-analyzed data. Co-wrote the manuscript.
30. Stevenson NJ, McFarlane C, Ong ST, Nahlik K, Kelvin A*, Addley MR, Long A, Greaves DR, O'Farrelly C, and Johnston JA. Suppressor of cytokine signalling (SOCS) 1 and 3 enhance cell adhesion and inhibit migration towards the chemokine eotaxin/CCL11. *FEBS Letters* 2010 Nov 5;584(21):4469-74
*Designed and conducted key experiments. Analyzed data.
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*Designed and conducted key experiments. Analyzed data. Co-wrote the manuscript.
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*Participated in data analysis and manuscript writing.
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* Participated in data analysis and manuscript writing.
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*Participated in manuscript writing.
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*Conducted experiments. Participated in data analysis.
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D. Research Support

Current Research Support

IWK Establishment Award - *Immune mechanisms of influenza virus imprinting for guiding rational vaccine design*

Role: PI

Status: Awarded April 2019 – March 2022

Infants have suboptimal responses to influenza vaccination leaving them unprotected during the influenza season. The goal of this project is to identify immune signatures that are associated with the development of influenza life-long immunity, i.e. the imprinting response, which can be leveraged for future pediatric vaccine design.

Nova Scotia Health Research Foundation Establishment Grant - *Investigation of the humoral immune response and its influence on virus drift during influenza infection in the preimmune-vaccinated host*

Role: PI

Status: Awarded October 2018 – September 2021

The purpose of this award is to investigate the responses to influenza vaccine in the preimmune host. Focus in this project will be given to the memory B cell and the specificity of antibodies produced toward the influenza virus. Subsequent mutations in the virus will also be analyzed in the lung during infection.

NIH Pilot Project (under UO1 5U01AI111598-03) – *Influenza Imprinting of the Infant Immune System and Mechanisms of Protection in the Infant Ferret Model*

Role: PI

Status: Awarded September 2017 – August 2018

This project aims to understand how the infant immune system is imprinted by seasonal influenza viruses and how the inflicted immunity protects against avian influenza challenge.

NIH UO1 (5U01AI111598-03 Subaward F4302-04) – *Omicron-Based Predictive Modeling of Age-Dependent Outcome to Influenza Infection*

Role: Subaward Director (PI: Elodie Ghedin, NYU)

This project is focused on understanding the mechanisms of age-related disease severity during influenza by using computational biology approaches. My role in the project is project design, experimental design, ferret infections, immunological analysis of infected ferret lung samples, evaluating data, writing reports, and writing manuscripts. I also participate in PI monthly meetings, PI annual NIH symposiums, and grant writing for award extension.

Completed Research Support

2018 **Dalhousie Medical Research Foundation (DMRF) Conference Grant** – *CSV2018, the 2nd Symposium of the Canadian Society for Virology*

Role: Co-Applicant (Principal Applicant – Dr. Craig McCormick)

The purpose of this award is to support the activities of the 2nd Symposium of the Canadian Society for Virology. The Symposium was held June 13-15, 2018 at Dalhousie University in Halifax, Nova Scotia.

2009-2010 Visiting Professorship funding at University of Sassari, Sardinia, Italy