# BIOGRAPHICAL SKETCH

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NAME: McCormick, Craig

eRA COMMONS USER NAME: CRAIGMCCORMICK

POSITION TITLE: Professor

EDUCATION/TRAINING

| INSTITUTION AND LOCATION | DEGREE (if applicable) | Completion Date MM/YYYY | FIELD OF STUDY |
|---|---|---|---|
| University of New Brunswick, Fredericton, Canada | BSc | 05/1995 | Biochemistry |
| University of British Columbia, Vancouver, Canada | PhD | 05/2000 | Virology |
| University of California, San Francisco, San Francisco, CA | Postdoctoral Fellow | 06/2006 | Virology |

## A. PERSONAL STATEMENT

My research is focused on understanding host antiviral stress responses and the tactics employed by viruses to overcome these defenses. We are primarily focused on influenza viruses, herpesviruses and coronaviruses.

## B. POSITIONS AND HONORS

### Positions and Employment

2006 - 2013 Assistant Professor, Department of Microbiology & Immunology, DALHOUSIE UNIVERSITY
2013 - 2016 Associate Professor, Department of Microbiology & Immunology, DALHOUSIE UNIVERSITY
2016 – Professor, Department of Microbiology & Immunology, DALHOUSIE UNIVERSITY

### Other Experience and Professional Memberships

2015 - current Associate Editor, *Viruses*
2021 - current Associate Editor, *Autophagy*
2017 - current Editorial Board Member, *Biochemistry and Cell Biology*
2016 - current Co-Founder, Canadian Society for Virology (currently CSV University Delegate)

### Honors

2018 Lecturer of the Year (selected by undergraduate Microbiology & Immunology students)
2019 Rosemary Gill Award (recognition of outstanding service to students, beyond teaching)

### Supervisory Record (13 years)

First 3 Postdoctoral Fellows are all now independent PIs; 19 Graduate Students – including Drew Leidal, PhD, Banting Postdoctoral Fellow at University of California San Francisco.

## C. Contribution to Science (trainees underlined)

**Influenza A virus:** We discovered viral mechanisms that prevent infected cells from stalling translation and forming stress granules (SGs). We discovered that the virus deploys 3 proteins, NS1, NP and PA-X, that block SG formation by distinct mechanisms (1, 2). We elucidated the mechanism of action of PA-X, a unique host shutoff RNA endonuclease (3, 4). Using an SG-based screen, we discovered a new antiviral mechanism for thiopurines that involves activation of the unfolded protein response and prevention of viral glycoprotein processing and accumulation (5). We elucidated a mechanism whereby defective viral RNAs induce a MAVS-dependent HLA upregulation (6).

1. Khaperskyy DA, Hatchette TF, **McCormick C**. (2012) Influenza A virus inhibits cytoplasmic stress granule formation. *FASEB J*. 26(4):1629-39. PMID: 22202676

2. Khaperskyy DA, Emara MM, Johnston BP, Anderson P, Hatchette TF, **McCormick C**. (2014) Influenza A virus blocks antiviral stress-induced translation arrest. *PLOS Pathogens* 10(7):e1004217. PMID: 25010204
3. Khaperskyy DA*, Schmaling S*, Larkins-Ford J, **McCormick C#**, Gaglia MM#. (2016) Selective degradation of host RNA polymerase II transcripts by influenza A virus PA-X host shutoff protein. *PLOS Pathogens,* 12(2):e1005427 (*co-first authors, # = co-corresponding authors) PMID: 26849127
4. Gaucherand L*, Porter BK*, Levene RE, Price EL, Schmaling SK, Rycroft CH, Kevorkian Y, **McCormick C#**, Khaperskyy DA#, Gaglia MM#. (2019) The influenza A virus endoribonuclease PA-X usurps host mRNA processing machinery to limit host gene expression. *Cell Reports* 27(3):776-792. (* = co-first authors, # = co-corresponding authors) PMID: 30995476
5. Slaine PD, Kleer M, Duguay B, Pringle ES, Kadijk E, Ying S, Balgi AD, Roberge M, **McCormick C#**, Khaperskyy DA# (2021) Thiopurines activate an antiviral unfolded protein response that blocks influenza A virus glycoprotein accumulation. *Journal of Virology, Mar 2021, JVI.00453-21)*. # = co- corresponding authors PMID: 33762409
6. Rahim MM*, Parsons B*, Price EL, Slaine PD, Chilvers BL, Seaton GS, Wight A, Medina-Luna D, Dey S, Grandy SL, Anderson LE, Zamorano Cuervo N, Grandvaux N, Gaglia MM, Kelvin AA, Khaperskyy DA, **McCormick C**[#], Makrigiannis AP[#]. (2020) Defective influenza A virus RNA products mediate MAVS-dependent upregulation of human leukocyte antigen class I proteins. *Journal of Virology* Apr 2020, JVI.00165-20; DOI: 10.1128/JVI.00165-20. (* = co-first authors, # = co-corresponding authors) PMID: 32321802

**Kaposi's sarcoma-associated herpesvirus (KSHV):** We discovered new functions for KSHV oncoproteins. We discovered mechanisms whereby KSHV proteins increase the production of host pro-inflammatory and angiogenic proteins by stabilizing the AU- rich-element-containing mRNAs that encode them (1, 2, 3). We discovered mechanisms whereby tandemly expressed v-cyclin and v-FLIP proteins usurp autophagy, block oncogene-induced senescence and facilitate the proliferation of latently infected cells (4). These discoveries form a solid foundation for current efforts to identify and characterize viral proteins that subvert the unfolded protein response and ensure the efficient synthesis of viral proteins (5, 6, 7).

1. **McCormick C**, Ganem D. (2005) The kaposin B protein of KSHV activates the p38/MK2 pathway and stabilizes cytokine mRNAs. *Science* 307:739-41. PMID: 15692053
2. Corcoran JA, Khaperskyy DA, Johnston BP, King CA, Cyr DP, Olsthoorn AV, **McCormick C.** (2012) Kaposi's sarcoma-associated herpesvirus G-protein coupled receptor prevents AU-rich element-mediated mRNA decay. *J. Virol.* 86(16):8859-71. PMID: 22696654
3. Corcoran JA, Johnston BP, **McCormick C**. (2015) Viral activation of MK2-hsp27-p115RhoGEF-RhoA signaling axis causes cytoskeletal rearrangements, p-body disruption and ARE-mRNA stabilization. *PLoS Pathog* 11(1): e1004597. PMID: 25569678
4. Leidal AM, Cyr DP, Hill RJ, Lee PWK, **McCormick C**. (2012) Subversion of autophagy by Kaposi's sarcoma-associated herpesvirus impairs oncogene-induced senescence. *Cell Host Microbe*, 11:167-80. PMID: 22341465
5. Pringle ES, Robinson CA, **McCormick C**. (2019) KSHV lytic replication interferes with mTORC1 regulation of autophagy and viral protein synthesis**.** *J. Virol.* Aug 2. Pii: JVI.00854-19. doi: 10.1128/VI.00854-19. PMID: 31375594
6. Johnston BP, Pringle ES, **McCormick C**. (2019) KSHV activates unfolded protein response sensors but suppresses downstream transcriptional responses to support lytic replication. *PLOS Pathogens* 15(12):e1008185. PMID: 31790507
7. Pringle ES, Robinson CA, Crapoulet N, Monjo AL-A, Bouzanis K, Leidal AM, Lewis SM, Gaston D, Uniacke J, **McCormick C**. (2020) ORF57 is required for efficient eIF4F-independent translation of KSHV lytic mRNAs**.** *bioRxiv* 356162; doi: https://doi.org/10.1101/356162

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## D. RESEARCH SUPPORT (current operating funds only – organized by end date)

2020/10/01-2025/09/30
Canadian Institutes of Health Research (CIHR) Operating Grant
Herpesvirus subversion of unfolded protein responses
Role: PI (D. Ron, J. Rohde, B. Duguay, Co-Investigators)

2019/04/01-2024/03/30
Natural Sciences and Engineering Research Council of Canada (NSERC) – Discovery Grant
Synthetic herpesvirus genomes with an expanded genetic code
Role: PI (B. Duguay, co-investigator)

2018/07/01-2023/06/30
NIH R01
Molecular mechanism of action of the influenza A virus PA-X host shutoff protein
Role: Subcontractor (M. Gaglia, PI)

2016/09/01-2021/08/30
Canadian Institutes of Health Research (CIHR) Operating Grant
Discovery and preclinical development of novel stress granule-inducing antiviral drugs
Role: PI (M. Roberge, D. Khaperskyy, Co-Investigators)

2020/08/01-2021/07/31
NSERC Alliance COVID-19 Grant
Chitin biopolymer derivatives as antiviral long-lasting surface coatings, functional films and PPE
Role: PI (BP Johnston, collaborator; Industry Partner: TerraVerdae Bioworks, Inc.)

2020/05/01-2021/04/30
Nova Scotia COVID-19 Health Research Coalition Grant
Temperature effects on coronavirus replication
Role: PI