

## Ian A. York, DVM, MSc, PhD

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Team Lead, Molecular Virology & Vaccines  
Immunology and Pathogenesis Branch  
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### Education

- 1990-1994 **Ph.D.**, Molecular Virology & Immunology  
McMaster University (Hamilton, Ontario, Canada)
- 1988-1990 **M.Sc.**, Veterinary Microbiology & Immunology  
Ontario Veterinary College, University of Guelph (Guelph, Ontario, Canada)
- 1979-1985 **D.V.M.**, Veterinary Medicine  
Ontario Veterinary College, University of Guelph (Guelph, Ontario, Canada)

### Skills

- Extensive molecular biology, virology, and immunology experience since 1988
- Physiology and pathophysiology, veterinary medicine, animal models of disease
- Bioinformatics, statistics, programming: Intermediate knowledge of Python, R, SQL; basic knowledge of Perl, SAS, HTML, CSS; Author of software package *XPlasMap* (plasmid and genome mapping software)
- Leadership: Team Lead at CDC since 2010; Principal Investigator since 2006
- Communication: Keynote speaker at multiple conferences and events; extensive teaching experience

### Professional positions

- 2012- **Team Lead**, Molecular Virology and Vaccines Team, Immunology & Pathogenesis Branch, Influenza Division, National Centers for Immunization and Respiratory Disease, Centers for Disease Control and Prevention, Atlanta, GA
- Manage and supervise a team of researchers
  - Perform and communicate risk assessment of novel and emerging influenza viruses
  - Develop and assess novel influenza vaccines
  - Analyze influenza immunogenicity

- Analysis and prediction of influenza antigenic changes
- Development of novel tools and techniques for influenza vaccine research
- Publish scientific manuscripts for peer reviewed publication
- Present research findings at scientific conferences and meetings

2010- 2012 **Team Lead**, Pandemic Preparedness Team, Molecular Virology and Vaccines Branch, Influenza Division, National Centers for Immunization and Respiratory Disease, Centers for Disease Control and Prevention, Atlanta, GA

- Manage and supervise a team of researchers
- Production of influenza candidate vaccine viruses
- Surveillance of new and emerging influenza viruses
- Perform and communicate risk assessment of novel and emerging influenza viruses
- Develop and assess novel influenza vaccines
- Development of novel tools and techniques for influenza vaccine research
- Publish scientific manuscripts for peer reviewed publication
- Present research findings at scientific conferences and meetings

2006-2010 **Assistant Professor**, Department of Microbiology & Molecular Genetics, Michigan State University, East Lansing, MI

- Manage and supervise undergraduate and graduate students and technicians
- Teach graduate and veterinary medical students
- Research on molecular factors underlying autoimmune disease, viral immune evasion, and vaccine development

2001-2006 **Research Assistant Professor and Instructor**, University of Massachusetts Medical School, Worcester, MA

- Supervise technicians and students
- Teach graduate and medical students
- Research on antigen presentation, viral immune evasion, and molecular mechanisms of immunodominance

1994-2001 **Post-doctoral Research Fellow**, Harvard University/Dana-Farber Cancer Inst., Boston, MA and University of Massachusetts Medical School, Worcester, MA

- Teach graduate and medical students
- Research on antigen presentation and molecular mechanisms of immunodominance

- 1985-1992     **Clinical veterinary practice**, private practices, Ontario, Canada
- Large and small animal veterinary medicine
  - Veterinary emergency medicine

### **Honors and Awards**

- 2015-2019     **NIH R01 Award** “Adenoviral Vector-based Pandemic Influenza Vaccine” (PI: Suresh Mittal; co-PIs: Ian A. York, Suryaprakash Sambhara) - \$1,554,716
- 2015           **CDC internal SEB competitive award** “Analysis of antibody repertoire to assess quality of influenza immunity” (PI: Ian A. York) - \$130,000
- 2010-2015     **NIH R01 Award** “ER-localized Aminopeptidases in Ankylosing Spondylitis” (PI: Ian A. York) - \$1,500,000 (Declined)
- 2010-2013     **Rackham Foundation Research Award** “Marek’s Disease Virus: Vaccine Development and Immune Evasion” (PI: Ian A. York) - \$87,000 (Declined)
- 2008-2011     **Strategic Partnership Grant** “Development of the MSU Center for Vaccine Development and Deployment” (PI: Andrea Amalfitano; co-PI: Ian A. York) - \$500,000
- 2007-2008     **MSU Companion Animal Fund** “Feline Herpesvirus Immune Evasion and Vaccine Development” (PI: Ian A. York; co-PI: Roger Maes) - \$25,000
- 2006-2009     **Michigan State University Internal laboratory start-up package** (PI: Ian A. York) - \$570,000
- 1994-1997     **Junior Research Fellowship**, National Cancer Institute of Canada
- 1994           **Medical Research Council of Canada Fellowship** (declined)
- 1993-1994     **W. Rawls Memorial Scholarship**, McMaster University
- 1990-1991     **Centennial Scholarship**, McMaster University
- 1980           **Early In-course Scholarship**, University of Guelph
- 1979           **Early In-course Scholarship**, University of Guelph

### **Teaching**

- 2013-2014     **Influenza immunology 101 for EID fellows** – CDC
- 2007-2010     **Veterinary Immunology and Virology** – Michigan State University
- 2008-2010     **Graduate Immunology** – Michigan State University

2007-2010 **Graduate Virology** – Michigan State University  
2001-2006 **Medical Immunology** – University of Massachusetts Medical School

### Patents

U.S. 5,858,376: HSV proteins for inhibiting cell recognition by cytotoxic T lymphocytes. Johnson, David C., **York, Ian A.**  
CA 2177699 :Vector, viral protein, nucleotide sequence coding therefor and method for inhibiting Immune recognition. Johnson, David C., **York, Ian A.**

### Publications

1. Wilson JR, Guo Z, Reber A, Kamal RP, Music N, Gansebom S, Bai Y, Levine M, Carney P, Tzeng WP, Stevens J, York IA. 2016. An influenza A virus (H7N9) anti-neuraminidase monoclonal antibody with prophylactic and therapeutic activity in vivo. *Antiviral Res.* 135:48-55.
2. Alymova IV, York IA, Air GM, Cipollo JF, Gulati S, Baranovich T, Kumar A, Zeng H, Gansebom S, McCullers JA. 2016. Glycosylation changes in the globular head of H3N2 influenza hemagglutinin modulate receptor binding without affecting virus virulence. *Sci Rep* 6:36216.
3. Music N, Reber AJ, Kim JH, York IA. 2016. Peripheral Leukocyte Migration in Ferrets in Response to Infection with Seasonal Influenza Virus. *PLoS One.* 11(6):e0157903.
4. Zhong W, Liu F, Wilson JR, Holiday C, Li ZN, Bai Y, Tzeng WP, Stevens J, York IA, Levine MZ. 2016. Antibody-Dependent Cell-Mediated Cytotoxicity to Hemagglutinin of Influenza A Viruses After Influenza Vaccination in Humans. *Open Forum Infect Dis.* 18;3(2):ofw102.
5. Music, N., A. J. Reber, M. C. Kim, I. A. York, and S. M. Kang. 2016. Supplementation of H1N1pdm09 split vaccine with heterologous tandem repeat M2e5x virus-like particles confers improved cross-protection in ferrets. *Vaccine* 34: 466-473.
6. Cao, W., J. S. Liepkalns, R. P. Kamal, A. J. Reber, J. H. Kim, A. R. Hofstetter, S. Amoah, J. Stevens, P. Ranjan, S. Gangappa, I. A. York, and S. Sambhara. 2016. RIG-I ligand enhances the immunogenicity of recombinant H7HA protein. *Cell. Immunol.* 304-305:55-8
7. Cao, W., J. S. Liepkalns, A. O. Hassan, R. P. Kamal, A. R. Hofstetter, S. Amoah, J. H. Kim, A. J. Reber, J. Stevens, J. M. Katz, S. Gangappa, I. A. York, S. K. Mittal, and S. Sambhara. 2016. A highly immunogenic vaccine against A/H7N9 influenza virus. *Vaccine* 34: 744-749.
8. Wilson, J. R., Z. Guo, W. P. Tzeng, R. J. Garten, X. Xiyan, E. G. Blanchard, K. Blanchfield, J. Stevens, J. M. Katz, and I. A. York. 2015. Diverse antigenic site targeting of influenza hemagglutinin in the murine antibody recall response to A(H1N1)pdm09 virus. *Virology* 485: 252-262.
9. Kamal, R. P., A. Kumar, C. T. Davis, W. P. Tzeng, T. Nguyen, R. O. Donis, J. M. Katz, and I. A. York. 2015. Emergence of Highly Pathogenic Avian Influenza

- A(H5N1) Virus PB1-F2 Variants and Their Virulence in BALB/c Mice. *J. Virol.* 89: 5835-5846.
10. Hearn, C., L. Preeyanon, H. D. Hunt, and I. A. York. 2015. An MHC class I immune evasion gene of Marek's disease virus. *Virology* 475: 88-95.
  11. Wilson, J. R., W. P. Tzeng, A. Spesock, N. Music, Z. Guo, R. Barrington, J. Stevens, R. O. Donis, J. M. Katz, and I. A. York. 2014. Diversity of the murine antibody response targeting influenza A(H1N1pdm09) hemagglutinin. *Virology* 458-459: 114-124.
  12. Shepard, S. S., C. T. Davis, J. Bahl, P. Rivaller, I. A. York, and R. O. Donis. 2014. LABEL: fast and accurate lineage assignment with assessment of H5N1 and H9N2 influenza A hemagglutinins. *PLoS one* 9: e86921.
  13. Music, N., A. J. Reber, A. S. Lipatov, R. P. Kamal, K. Blanchfield, J. R. Wilson, R. O. Donis, J. M. Katz, and I. A. York. 2014. Influenza vaccination accelerates recovery of ferrets from lymphopenia. *PLoS one* 9: e100926.
  14. Kamal, R. P., J. M. Katz, and I. A. York. 2014. Molecular determinants of influenza virus pathogenesis in mice. *Curr. Top. Microbiol. Immunol.* 385: 243-274.
  15. Blanchfield, K., R. P. Kamal, W. P. Tzeng, N. Music, J. R. Wilson, J. Stevens, A. S. Lipatov, J. M. Katz, and I. A. York. 2014. Recombinant influenza H7 hemagglutinins induce lower neutralizing antibody titers in mice than do seasonal hemagglutinins. *Influenza and other respiratory viruses* 8: 628-635.
  16. Alymova, I. V., I. A. York, and J. A. McCullers. 2014. Non-avian animal reservoirs present a source of influenza A PB1-F2 proteins with novel virulence-enhancing markers. *PLoS one* 9: e111603.
  17. York, I., and R. O. Donis. 2013. The 2009 pandemic influenza virus: where did it come from, where is it now, and where is it going? *Curr. Top. Microbiol. Immunol.* 370: 241-257.
  18. Seregin, S. S., D. P. Rastall, I. Evnouchidou, C. F. Aylsworth, D. Quiroga, R. P. Kamal, S. Godbehere-Roosa, C. F. Blum, I. A. York, E. Stratikos, and A. Amalfitano. 2013. Endoplasmic reticulum aminopeptidase-1 alleles associated with increased risk of ankylosing spondylitis reduce HLA-B27 mediated presentation of multiple antigens. *Autoimmunity* 46: 497-508.
  19. Tong, S., Y. Li, P. Rivaller, C. Conrardy, D. A. Castillo, L. M. Chen, S. Recuenco, J. A. Ellison, C. T. Davis, I. A. York, A. S. Turmelle, D. Moran, S. Rogers, M. Shi, Y. Tao, M. R. Weil, K. Tang, L. A. Rowe, S. Sammons, X. Xu, M. Frace, K. A. Lindblade, N. J. Cox, L. J. Anderson, C. E. Rupprecht, and R. O. Donis. 2012. A distinct lineage of influenza A virus from bats. *Proceedings of the National Academy of Sciences of the United States of America* 109: 4269-4274.
  20. Nguyen, T., P. Rivaller, C. T. Davis, T. Hoa do, A. Balish, N. H. Dang, J. Jones, D. T. Vui, N. Simpson, N. T. Huong, B. Shu, R. Loughlin, K. Ferdinand, S. E. Lindstrom, I. A. York, A. Klimov, and R. O. Donis. 2012. Evolution of highly pathogenic avian influenza (H5N1) virus populations in Vietnam between 2007 and 2010. *Virology* 432: 405-416.
  21. Kincaid, E. Z., J. W. Che, I. York, H. Escobar, E. Reyes-Vargas, J. C. Delgado, R. M. Welsh, M. L. Karow, A. J. Murphy, D. M. Valenzuela, G. D. Yancopoulos,

- and K. L. Rock. 2012. Mice completely lacking immunoproteasomes show major changes in antigen presentation. *Nat. Immunol.* 13: 129-135.
22. Spesock, A., M. Malur, M. J. Hossain, L. M. Chen, B. L. Njaa, C. T. Davis, A. S. Lipatov, I. A. York, R. M. Krug, and R. O. Donis. 2011. The virulence of 1997 H5N1 influenza viruses in the mouse model is increased by correcting a defect in their NS1 proteins. *J. Virol.* 85: 7048-7058.
  23. Nguyen, T. T., S. C. Chang, I. Evnouchidou, I. A. York, C. Zikos, K. L. Rock, A. L. Goldberg, E. Stratikos, and L. J. Stern. 2011. Structural basis for antigenic peptide precursor processing by the endoplasmic reticulum aminopeptidase ERAP1. *Nat. Struct. Mol. Biol.* 18: 604-613.
  24. Hossain, M. J., M. Bourgeois, F. S. Quan, A. S. Lipatov, J. M. Song, L. M. Chen, R. W. Compans, I. York, S. M. Kang, and R. O. Donis. 2011. Virus-like particle vaccine containing hemagglutinin confers protection against 2009 H1N1 pandemic influenza. *Clinical and vaccine immunology : CVI* 18: 2010-2017.
  25. Evnouchidou, I., R. P. Kamal, S. S. Seregin, Y. Goto, M. Tsujimoto, A. Hattori, P. V. Voulgari, A. A. Drosos, A. Amalfitano, I. A. York, and E. Stratikos. 2011. Cutting Edge: Coding single nucleotide polymorphisms of endoplasmic reticulum aminopeptidase 1 can affect antigenic peptide generation in vitro by influencing basic enzymatic properties of the enzyme. *J. Immunol.* 186: 1909-1913.
  26. Barlow, P. G., P. Svoboda, A. Mackellar, A. A. Nash, I. A. York, J. Pohl, D. J. Davidson, and R. O. Donis. 2011. Antiviral activity and increased host defense against influenza infection elicited by the human cathelicidin LL-37. *PloS one* 6: e25333.
  27. Hearn, A., I. A. York, C. Bishop, and K. L. Rock. 2010. Characterizing the specificity and cooperation of aminopeptidases in the cytosol and endoplasmic reticulum during MHC class I antigen presentation. *J. Immunol.* 184: 4725-4732.
  28. Georgiadou, D., A. Hearn, I. Evnouchidou, A. Chroni, L. Leondiadis, I. A. York, K. L. Rock, and E. Stratikos. 2010. Placental leucine aminopeptidase efficiently generates mature antigenic peptides in vitro but in patterns distinct from endoplasmic reticulum aminopeptidase 1. *J. Immunol.* 185: 1584-1592.
  29. Dang, Y., X. Wang, I. A. York, and Y. H. Zheng. 2010. Identification of a critical T(Q/D/E)x5ADx2(I/L) motif from primate lentivirus Vif proteins that regulate APOBEC3G and APOBEC3F neutralizing activity. *J. Virol.* 84: 8561-8570.
  30. Dang, Y., R. W. Davis, I. A. York, and Y. H. Zheng. 2010. Identification of 81LGxGxxlxW89 and 171EDRW174 domains from human immunodeficiency virus type 1 Vif that regulate APOBEC3G and APOBEC3F neutralizing activity. *J. Virol.* 84: 5741-5750.
  31. Kawahara, M., I. A. York, A. Hearn, D. Farfan, and K. L. Rock. 2009. Analysis of the role of tripeptidyl peptidase II in MHC class I antigen presentation in vivo. *J. Immunol.* 183: 6069-6077.
  32. Hearn, A., I. A. York, and K. L. Rock. 2009. The specificity of trimming of MHC class I-presented peptides in the endoplasmic reticulum. *J. Immunol.* 183: 5526-5536.
  33. Dang, Y., X. Wang, T. Zhou, I. A. York, and Y. H. Zheng. 2009. Identification of a novel WxSLVK motif in the N terminus of human immunodeficiency virus and

- simian immunodeficiency virus Vif that is critical for APOBEC3G and APOBEC3F neutralization. *J. Virol.* 83: 8544-8552.
34. Towne, C. F., I. A. York, J. Neijssen, M. L. Karow, A. J. Murphy, D. M. Valenzuela, G. D. Yancopoulos, J. J. Neefjes, and K. L. Rock. 2008. Puromycin-sensitive aminopeptidase limits MHC class I presentation in dendritic cells but does not affect CD8 T cell responses during viral infections. *J. Immunol.* 180: 1704-1712.
  35. Towne, C. F., I. A. York, L. B. Watkin, J. S. Lazo, and K. L. Rock. 2007. Analysis of the role of bleomycin hydrolase in antigen presentation and the generation of CD8 T cell responses. *J. Immunol.* 178: 6923-6930.
  36. York, I. A., M. A. Brehm, S. Zendzian, C. F. Towne, and K. L. Rock. 2006. Endoplasmic reticulum aminopeptidase 1 (ERAP1) trims MHC class I-presented peptides in vivo and plays an important role in immunodominance. *Proceedings of the National Academy of Sciences of the United States of America* 103: 9202-9207.
  37. York, I. A., N. Bhutani, S. Zendzian, A. L. Goldberg, and K. L. Rock. 2006. Tripeptidyl peptidase II is the major peptidase needed to trim long antigenic precursors, but is not required for most MHC class I antigen presentation. *J. Immunol.* 177: 1434-1443.
  38. York, I. A., E. P. Grant, A. M. Dahl, and K. L. Rock. 2005. A mutant cell with a novel defect in MHC class I quality control. *J. Immunol.* 174: 6839-6846.
  39. Towne, C. F., I. A. York, J. Neijssen, M. L. Karow, A. J. Murphy, D. M. Valenzuela, G. D. Yancopoulos, J. J. Neefjes, and K. L. Rock. 2005. Leucine aminopeptidase is not essential for trimming peptides in the cytosol or generating epitopes for MHC class I antigen presentation. *J. Immunol.* 175: 6605-6614.
  40. Rock, K. L., I. A. York, and A. L. Goldberg. 2004. Post-proteasomal antigen processing for major histocompatibility complex class I presentation. *Nat. Immunol.* 5: 670-677.
  41. York, I. A., A. X. Mo, K. Lemerise, W. Zeng, Y. Shen, C. R. Abraham, T. Saric, A. L. Goldberg, and K. L. Rock. 2003. The cytosolic endopeptidase, thimet oligopeptidase, destroys antigenic peptides and limits the extent of MHC class I antigen presentation. *Immunity* 18: 429-440.
  42. York, I. A., S. C. Chang, T. Saric, J. A. Keys, J. M. Favreau, A. L. Goldberg, and K. L. Rock. 2002. The ER aminopeptidase ERAP1 enhances or limits antigen presentation by trimming epitopes to 8-9 residues. *Nat. Immunol.* 3: 1177-1184.
  43. Saric, T., S. C. Chang, A. Hattori, I. A. York, S. Markant, K. L. Rock, M. Tsujimoto, and A. L. Goldberg. 2002. An IFN-gamma-induced aminopeptidase in the ER, ERAP1, trims precursors to MHC class I-presented peptides. *Nat. Immunol.* 3: 1169-1176.
  44. Rock, K. L., I. A. York, T. Saric, and A. L. Goldberg. 2002. Protein degradation and the generation of MHC class I-presented peptides. *Adv. Immunol.* 80: 1-70.
  45. York, I. A., A. L. Goldberg, X. Y. Mo, and K. L. Rock. 1999. Proteolysis and class I major histocompatibility complex antigen presentation. *Immunol. Rev.* 172: 49-66.

46. Russell, H. I., I. A. York, K. L. Rock, and J. J. Monaco. 1999. Class II antigen processing defects in two H2d mouse cell lines are caused by point mutations in the H2-DMA gene. *Eur. J. Immunol.* 29: 905-911.
47. York, I. A., and K. L. Rock. 1996. Antigen processing and presentation by the class I major histocompatibility complex. *Annu. Rev. Immunol.* 14: 369-396.
48. York, I. A. 1996. Immune evasion strategies of the herpesviruses. *Chem. Biol.* 3: 331-335.
49. Tomazin, R., A. B. Hill, P. Jugovic, I. York, P. van Endert, H. L. Ploegh, D. W. Andrews, and D. C. Johnson. 1996. Stable binding of the herpes simplex virus ICP47 protein to the peptide binding site of TAP. *EMBO J.* 15: 3256-3266.
50. Levatte, M. A., L. C. Weaver, I. A. York, D. Johnson, and G. A. Dekaban. 1995. Delivery of a foreign gene to sympathetic preganglionic neurons using recombinant herpes simplex virus. *Neuroscience* 66: 737-750.
51. Hill, A., P. Jugovic, I. York, G. Russ, J. Bennink, J. Yewdell, H. Ploegh, and D. Johnson. 1995. Herpes simplex virus turns off the TAP to evade host immunity. *Nature* 375: 411-415.
52. York, I. A., C. Roop, D. W. Andrews, S. R. Riddell, F. L. Graham, and D. C. Johnson. 1994. A cytosolic herpes simplex virus protein inhibits antigen presentation to CD8+ T lymphocytes. *Cell* 77: 525-535.
53. York, I. A., and D. C. Johnson. 1993. Direct contact with herpes simplex virus-infected cells results in inhibition of lymphokine-activated killer cells because of cell-to-cell spread of virus. *J. Infect. Dis.* 168: 1127-1132.
54. York, I. A., and J. Thorsen. 1992. Evaluation of a subunit vaccine for bovine adenovirus type 3. *Am. J. Vet. Res.* 53: 180-183.