

## CURRICULUM VITAE

### BIOGRAPHICAL

Name: William E. Miller, Ph.D.

Home Address: 448 Vineyard Hills Drive Home Phone: (513) 947-8432  
Cincinnati, OH 45255

Business Address: 2256 Medical Science Building  
Department of Molecular Genetics, Biochemistry,  
and Microbiology  
University of Cincinnati College of Medicine  
Cincinnati, OH 45267-0524

Contact Info: Phone: (513) 558-0866  
FAX: (513) 558-8474  
E-mail: william.miller@uc.edu

### EDUCATION

1986-1990	Pennsylvania State University University Park, PA	B. S. 1990 (Biology-Genetics and Development)
1991-1997	University of North Carolina Chapel Hill, NC	Ph. D. 1997 (Microbiology and Immunology)

### PROFESSIONAL EXPERIENCE

1998-2002	Duke University Medical Center Howard Hughes Medical Institute	Post-Doctoral Fellow
2002-2008	University of Cincinnati Department of Molecular Genetics	Assistant Professor
2008-Present	University of Cincinnati Department of Molecular Genetics	Associate Professor

### MEMBERSHIP IN PROFESSIONAL SOCIETIES

2003-Present	American Society for Biochemistry and Molecular Biology
2007-Present	American Society for Microbiology
2007-Present	American Society for Pharmacology and Experimental Therapeutics

### HONORS

1988-1990	C.D. Prutzman Undergraduate Scholarship, Pennsylvania State University
1989-1990	Dean's List, Pennsylvania State University
1996	Lineberger Award for Excellence in Research, University of North Carolina
2004	March of Dimes Basil O'Connor Scholar Award

## RESEARCH SUPPORT

### Active

1. NIH R01 AI058159. 6/1/05-2/28/10 \$875,000 total direct costs.  
Regulation of HCMV US28 Signaling by  $\beta$ arrestin proteins  
William E. Miller, Ph.D. (P.I., 50% Effort)
2. NIH R56 AI023695. 8/1/08-7/31/09 \$225,000 total direct costs.  
Biologic Activities of the pertussis toxin B-pentamer  
Alison Weiss, Ph.D. (P.I., 25% Effort)  
William E. Miller, Ph.D. (P.I., 15% Effort)
3. Cincinnati Center for Microbial Pathogenesis. 7/1/08-6/30/09 \$20,000 total direct costs.  
Role of cytomegalovirus GPCRs in viral pathogenesis in vivo.  
William E. Miller, Ph.D. (P.I., 0% Effort)

### Recently Completed

1. March of Dimes 5-FY04-17. 2/1/04-7/31/06. \$150,000 total direct costs.  
Regulation of Human cytomegalovirus US28 signaling by  $\beta$ arrestin proteins.  
William E. Miller, Ph.D. (P.I.)
2. American Heart Association 0465236B. 7/1/04-12/31/06. \$121,000 total direct costs.  
Intersection of the ALP PDZ/LIM protein with GPCR and  $\beta$ arrestin signaling pathways.  
William E. Miller, Ph.D. (P.I., 15% Effort)
3. American Heart Association 0615196B. 7/1/06-6/30/08. \$42,000 total direct costs.  
Genetic Analysis of the HCMV-GPCR US28: Role of chemokines in signaling and smooth muscle cell migration. Predoctoral Fellowship, Melissa Maxwell-Stropes.  
William E. Miller, Ph.D. (Sponsor)

### INVITED REVIEWER

Journals: Journal of Virology, Journal of Biological Chemistry, Journal of Leukocyte Biology, Trends in Pharmacology, FASEB Journal, International Journal of Cancer, Biochemistry, Nature Reviews Molecular and Cellular Biology, PNAS, Virus Research, Journal of Clinical Microbiology, Cancer Research, Cell Biology International.

NIH Study Section: NIH IDM-G90 (S) Study Section (October 2005)

AHA Study Section: Molecular Signaling 1 (April 2008)

NSF Study Section: Molecular Signaling (October 2008)

### INVITED PRESENTATIONS

University of Virginia, Department of Pharmacology, Oct. 2001.

University of Cincinnati, Department of Laboratory Medicine, Oct. 2002.

Cincinnati Children's Hospital Medical Center, Department of Infectious Disease, Nov. 2003.

University of Massachusetts Medical School, Department of Molecular Genetics, Feb. 2004.

Canadian Society for Biochemistry and Molecular Biology Annual Meeting, May 2004.

University of Tennessee, Department of Microbiology and Immunology, October 2005.  
Midwest Microbial Pathogenesis Conference, October 2006.  
University of Cincinnati, Division of Infectious Diseases, November 2006.  
International Herpesvirus Workshop, July 2007.  
Northwestern University College of Medicine, Department of Microbiology, September 2007.  
LSU-Health Sciences Center, Department of Microbiology, October 2007.  
Loyola College of Medicine, Department of Pharmacology, November, 2007.  
University of Illinois at Urbana-Champaign, Department of Microbiology, February 2008.  
Experimental Biology 2009, April 2009.

#### **TEACHING**

Microbiology (formerly, Prokaryotic Genetics for the Modern Biologist) (2002-Present)  
Advanced Topics in Pathogenic Mechanisms (2003-Present)  
Advanced Topics in Pathogenic Mechanisms (2004-Present, Course Director)  
Pathogenic Mechanisms (2003-Present)  
Mechanisms of Signal Transduction (2003-Present)  
Mechanisms of Signal Transduction (2006-Present, Course Director)  
Molecular Biology of the Cell II Core Course (2007-Present)

#### **INSTITUTIONAL COMMITTEES**

Millenium Project- Subcommittee on Recruiting (2003-2005)  
LCME Review for College of Medicine Re-Accreditation -Junior Faculty Representative (2003)  
Core Course Curriculum Subcommittee (2004-Present)  
Molecular Genetics Graduate Committee (2004-Present)  
Molecular Genetics Summer Undergraduate Program Director (2005-2007)  
Molecular Genetics Seminar Coordinator (2006-Present)  
Molecular Genetics Chair Search Committee (2006-2007)

#### **GRADUATE STUDENT TRAINING**

Melissa Maxwell-Stropes, Department of Molecular Genetics (2003-Present)  
Joseph Sherrill, Department of Molecular Genetics (2003-Present)  
Olivia Schneider, Department of Molecular Genetics (2005-Present)

#### **OTHER STUDENT TRAINING**

Daniel Larson, Summer Undergraduate Fellow (2003), Presently Medical Student at U. Cincinnati  
Clifton Randall, Rotation Student, Department of Molecular Genetics (2005)  
Suzi Duwait, Rotation Student, Department of Molecular Genetics (2005)  
Michael Flagler, Rotation Student, Department of Molecular Genetics (2005)  
Derek Trobough, Summer Undergraduate Fellow (2006), Presently Ph..D. Student at U. Mass  
Randall Scott Dudis, Summer Undergraduate Fellow (2007)  
Joanna Brenneman, Medical Student Summer Research Program (2008)  
Julia Shearman, University of Western England Applied Genetics Internship (2008-2009)

#### **GRADUATE STUDENT COMMITTEES**

Melissa Maxwell-Stropes, Department of Molecular Genetics (2003-Present)  
Joseph Sherrill, Department of Molecular Genetics (2003-Present)  
Olivia Schneider, Department of Molecular Genetics (2005-Present)

Nikhil Sharma, Department of Molecular Genetics (2003-2006) Masters Awarded Spring 2006  
Douglas Millay, Department of Molecular Genetics (2003-Present)  
Elizabeth Loreaux, Department of Molecular Genetics (2003-Present)  
Jiang Qin, Department of Molecular Genetics (2003-2006) Ph.D. awarded Spring 2006  
Mike Hambleton, Department of Molecular Genetics (2005-2007) Ph.D. awarded Spring 2007  
Matthew Bernard, Department of Molecular Genetics (2005-Present)  
Nabeel Al Moamen, Department of Molecular Genetics (2006-Present)  
Serena Jennings, Department of Molecular Genetics (2005-Present)  
Shika Khatri, Department of Cell and Cancer Biology (2006-Present)  
Leah Nesbitt, Division of Developmental Biology (2006-Present)  
Kevin Fuller, Department of Pathology and Molecular Medicine (2007-Present)

**PUBLICATIONS (WHILE GRADUATE STUDENT AT UNIVERSITY OF NORTH CAROLINA)**

1. N. Raab-Traub, R. Sadler, R.H. Edwards, **W.E. Miller**, C.L. Chen, S. Huff, M. Abdel-Hamid, K. Flynn, and P. Rajadurai. EBV Infection in Nasopharyngeal Carcinoma: Viral Expression and Strain Variation. 1993 *The Epstein-Barr Virus and Associated Malignancies*, **225**:467-475.
2. **W.E. Miller**, R.H. Edwards, D.M. Walling and N. Raab-Traub. Sequence Variation in the Epstein-Barr Virus Latent Membrane Protein 1. 1994 *Journal of General Virology*, **75**:2729-2740.
3. N. Raab-Traub, D.M. Walling and **W.E. Miller**. Epstein-Barr Virus Strain Variation and Expression in Oral Hairy Leukoplakia. 1995 *Oral Manifestations of HIV Infection*, **2**:159-165.
4. **W.E. Miller**, H.S. Earp, and N. Raab-Traub. The Epstein-Barr Virus Latent Membrane Protein 1 (LMP1) Induces Expression of the Epidermal Growth Factor Receptor. 1995 *Journal of Virology*, **69**:4390-4398.
5. K.L. Fries, **W.E. Miller**, and N. Raab-Traub. Epstein-Barr Virus Latent Membrane Protein 1 Blocks p53-Mediated Apoptosis Through Induction of the A20 Gene. 1996 *Journal of Virology*, **70**:8653-8659.
6. **W.E. Miller**, G. Mosialos, E. Kieff, and N. Raab-Traub. Epstein-Barr Virus LMP1 Induction of the Epidermal Growth Factor Receptor is Mediated Through a TRAF Signaling Pathway Distinct From NF- $\kappa$ B Activation. 1997 *Journal of Virology*, **71**:586-594.
7. Hatzivassiliou, E. **W.E. Miller**, N. Raab-Traub, E. Kieff, and G. Mosialos. A fusion of the Epstein-Barr Virus latent membrane protein 1 (LMP1) transmembrane domains to the CD40 cytoplasmic domain is similar to LMP1 in constitutive activation of epidermal growth factor receptor expression, nuclear factor  $\kappa$ B, and stress-activated protein kinase. 1998 *Journal of Immunology*, **160**:1116-1121.
8. **W.E. Miller**, J.L. Cheshire, Baldwin Jr., A.S. and N. Raab-Traub. The NPC derived C15 LMP1 protein confers enhanced activation of NF- $\kappa$ B and induction of the EGFR in epithelial cells. 1998 *Oncogene*, **16**:1869-1877.

9. Patel, J. Hanson, T. McLean, J. Olgiate, M. Hilton, **W.E. Miller**, and S.L. Bachenheimer. Herpes Simplex Virus type 1 induction of persistent NF- $\kappa$ B nuclear translocation increases the efficiency of virus replication. 1998 *Virology*, **247**:212-222.
10. **W.E. Miller**, J.L. Cheshire and N. Raab-Traub. Interaction of the Tumor necrosis factor receptor signaling proteins with the latent membrane protein 1 PXQXT motif is essential for induction of epidermal growth factor receptor expression. 1998 *Molecular and Cellular Biology*, **18**:2835-2844.
11. H. Takeshita, T. Yoshizaki, **W.E. Miller**, H. Sato, M. Furukawa, J. Pagano, N. Raab-Traub. Both C-terminal activation regions -1 and -2 in Epstein-Barr Virus latent membrane protein 1 (LMP1) are needed to induce matrix metalloproteinase 9. 1999 *Journal of Virology*, **73**: 5548-5555.
12. K. Fries, **W.E. Miller**, and N. Raab-Traub. The A20 protein interacts with the Epstein-Barr virus latent membrane protein 1 (LMP1) and alters the LMP/TRAF/TRADD complex. 1999 *Virology*, **264**:159-166.
13. **W.E. Miller** and N. Raab-Traub. The EGFR as a target for viral oncoproteins. 1999 *Trends in Microbiology*, **7**:453-458.

**PUBLICATIONS (WHILE POST-DOCTORAL FELLOW AT DUKE UNIVERSITY)**

14. L. Luttrell, S. Ferguson, Y. Daaka, **W.E. Miller**, S. Maudsley, G. Della Rocca, F-T. Lin, H. Kawakatsu, K. Owada, D. Luttrell, M. Caron, and R. Lefkowitz. Beta-Arrestin-dependent formation of  $\beta$ 2 adrenergic receptor/Src kinase complexes and mitogenic signaling. 1999 *Science*, **283**:655-661.
15. F. Lin, **W.E. Miller**, L. Luttrell, and R. Lefkowitz. Feedback regulation of Beta-arrestin function by extracellular signal-regulated kinases. 1999 *Journal of Biological Chemistry*, **274**:15971-15974.
16. Y. Tang, L. Hu, **W.E. Miller**, N. Ringstad, R. Hall, J. Pitcher, P. DeCamilli, and R. Lefkowitz. Identification of the endophilins (SH3p4/SH3p8/SH3p13) as novel binding partners for the Beta1-adrenergic receptor. 1999 *Proceedings of the National Academy of Science*, **96**:12559-12564.
17. Seo, E. Choy, S. Maudsley, **W.E. Miller**, B. Wilson, and L. Luttrell. Pasturella multocida toxin stimulates MAP kinase activity via a Gq/11-dependent transactivation of the epidermal growth factor receptor. 2000 *Journal of Biological Chemistry*, **275**:2239-2245.
18. S. Maudsley, K. Pierce, A. Zamah, **W.E. Miller**, S. Ahn, Y. Daaka, R. Lefkowitz, and L. Luttrell. The Beta2-adrenergic receptor mediates MAP kinase activation via assembly of a multireceptor complex including the EGF receptor. 2000 *Journal of Biological Chemistry*, **275**:9572-9580.
19. **W.E. Miller**, S. Maudsley, S. Ahn, K. Khan, L. Luttrell, and R. Lefkowitz. Beta-arrestin1 interacts with the catalytic domain of the tyrosine kinase c-Src. 2000 *Journal of Biological Chemistry*, **275**:11312-11319.
20. L.A. Hu, Y. Tang, **W.E. Miller**, M. Cong, R. Lefkowitz, and R.A. Hall. Beta1-adrenergic receptor association with PSD-95: Inhibition of receptor internalization and facilitation of Beta1-

adrenergic receptor interaction with NMDA receptors. 2000 *Journal of Biological Chemistry*, **275**:38659-38666.

21. P.H. McDonald\*, C.W. Chow\*, **W.E. Miller\***, S.A. Laporte, M.E. Field, F-T. Lin, R.J. Davis, and R. Lefkowitz. Beta-Arrestin2: A novel receptor-regulated MAPK scaffold for the activation of JNK3. 2000 *Science*, **290**:1574-1577.

\*These authors contributed equally to this work.

22. **W.E. Miller** and R. Lefkowitz. Expanding roles for beta-arrestins as scaffolds and adapters in GPCR signaling and trafficking. 2001 *Current Opinion in Cell Biology*, **13**:139-145.

23. L.M. Luttrell, F.L. Roudabush, E.W. Choy, **W.E. Miller**, M.E. Field, K.L. Pierce, F-T. Lin, R. Lefkowitz. Activation and targeting of extracellular signal-regulated kinases by Beta-arrestin scaffolds. 2001 *Proceedings of the National Academy of Science*, **98**:2449-2454.

24. **W.E. Miller** and R. Lefkowitz. Arrestins as signaling molecules involved in apoptotic pathways: A real eye opener. 2001 *Sciences STKE*, **69**:1-3.

25. **W.E. Miller**, P.H. McDonald, S.F. Cai, M.E. Field, R.J. Davis, and R. Lefkowitz. Identification of a motif in the carboxy terminus of Beta-arrestin2 responsible for activation of JNK3. 2001 *Journal of Biological Chemistry*, **276**:27770-27777.

26. T. Imamura, J. Huang, S. Dalle, I. Usui, S. Ugi, **W.E. Miller**, L.M. Luttrell, R. Lefkowitz, and J.M. Olefsky. Beta-arrestin mediated recruitment of the Src family kinase Yes mediates endothelin-1 stimulated glucose transport. 2001 *Journal of Biological Chemistry*, **276**:43663-43667.

27. A. Claing, W. Chen, **W.E. Miller**, N. Vitale, J. Moss, R.T. Premont, and R. Lefkowitz. Beta-arrestin mediated ARF6 activation and Beta2-adrenergic receptor endocytosis. 2001 *Journal of Biological Chemistry*, **276**:45209-45213.

28. W. Chen, L. Hu, M. Semenov, S. Yanagawa, A. Kikuchi, R. Lefkowitz, and **W.E. Miller**. Beta-arrestin1 modulates LEF transcriptional activity through interaction with phosphorylated Dishevelled proteins. 2001 *Proc. Natl. Acad. Sci*, **98**:14889-14894.

29. S. Laporte, **W.E. Miller**, K-Y. Kim, and M. Caron. Beta-arrestin/AP-2 interaction in GPCR internalization: Identification of a Beta-arrestin binding site in Beta2-Adaptin. 2002 *Journal of Biological Chemistry*, **277**:9247-9254.

30. D.S. Feldman, A.M. Zamah, K.L. Pierce, **W.E. Miller**, F. Kelly, A. Rapacciuolo, H.A. Rockman, W.J. Koch, and L.M. Luttrell. Selective inhibition of heterotrimeric Gs signaling: Targeting the receptor-G protein interface using a peptide minigene encoding the Galphas carboxyl terminus. 2002 *Journal of Biological Chemistry*, **277**:28631-28640.

31. S.J. Perry, G.S. Baillie, T.A. Kohout, I. McPhee, M.M. Magiera, K.L. Ang, **W.E. Miller**, A.J. Mclean, M. Conti, M.D. Houslay, and R.J. Lefkowitz. Targeting of cAMP degradation to beta2-adrenergic receptors by beta-arrestins. 2002 *Science*, **298**:834-836.

32. S. Ahn, C.D. Nelson, T.R. Garrison, **W.E. Miller**, and R.J. Lefkowitz. Desensitization, internalization and signaling functions of beta-arrestins demonstrated by RNA interference. 2003 *Proc. Natl. Acad. Sci.*, **100**:1740-1744.

**PUBLICATIONS (WHILE ASSISTANT PROFESSOR AT UNIVERSITY OF CINCINNATI)**

33. **W.E. Miller\***, D.A. Houtz, C.D. Nelson, P.E. Kolattukudy, and R.J. Lefkowitz. GRK phosphorylation and beta-arrestin binding regulate the constitutive signaling activity of the human cytomegalovirus US28 GPCR. 2003 *Journal of Biological Chemistry*, **278**:21663-21671.

\*This work was completed at the University of Cincinnati and W.E. Miller is the corresponding author.

34. J. Wu, K. Peppel, C.D. Nelson, F-T. Lin, T.A. Kohout, **W.E. Miller**, S.T. Exum, and N.J. Freedman. The adapter protein beta-arrestin2 enhances endocytosis of the LDL receptor. 2003 *Journal of Biological Chemistry*, **278**:44238-44245.

35. W. Chen, D. ten Berge, J. Brown, S. Ahn, L.A. Hu, **W.E. Miller**, M.G. Caron, L.S. Barak, R. Nusse, and R.J. Lefkowitz. Dishevelled 2 recruits beta-arrestin2 to mediate Wnt5A-stimulated endocytosis of frizzled 4. 2003 *Science*, **301**:1391-1394.

36. D.S. Witherow, T.R. Garrison, **W.E. Miller**, and R.J. Lefkowitz. Beta-arrestin inhibits NF- $\kappa$ B activity by means of its interaction with the NF- $\kappa$ B inhibitor I $\kappa$ B $\alpha$ . 2004 *Proc. Natl. Acad. Sci.*, **101**:8603-8607.

37. H. Ardilla-Osorio, C. Pioche-Durieu, F. Puvion-Dutilleu, B. Clause, J. Wiels, **W. E. Miller**, N. Raab-Traub, P. Busson. TRAF interactions with raft-like buoyant complexes, better than TRAF rates of degradation, differentiate signaling by CD40 and Epstein-Barr virus latent membrane protein 1. 2004 *International Journal of Cancer*, **113**:267-275.

38. J. Mialet-Perez, S.A. Green, **W.E. Miller**, and S.B. Liggett. A primate-dominant third glycosylation site of the  $\beta$ 2-adrenergic receptor routes receptors to degradation during agonist regulation. 2004 *Journal of Biological Chemistry*, **279**:38603-38607.

39. M. Stropes and **W.E. Miller**. Signaling and regulation of G-protein coupled receptors encoded by cytomegaloviruses (invited review). 2004 *Biochemistry and Cell Biology*, **82**:636-642.

40. J-H. Wu, R. Goswani, L.K. Kim, **W.E. Miller**, K. Peppel, N.J. Freedman. The PDFR- $\beta$  phosphorylates and activates GRK2: A mechanism for feedback inhibition. 2005 *Journal of Biological Chemistry*, **280**:31027-31035.

41. J. Sherrill and **W.E. Miller**. G protein-coupled receptor (GPCR) kinase 2 regulates constitutive Gq/11 signaling from the mouse cytomegalovirus GPCR M33. 2006 *Journal of Biological Chemistry*, **52**:39796-39805.

42. O. Schneider, A. Weiss, and **W.E. Miller**. Pertussis Toxin utilizes proximal components of the T-cell receptor complex to initiate signal transduction events in T-cells. *2007 Infection and Immunity*, **75**:4040-4049.
43. M. Maxwell-Stropes and **W.E. Miller**. Functional analyses of human cytomegalovirus US28 mutants in infected cells. *2008 Journal of General Virology*, **89**:97-105.
44. J. Sherrill and **W.E. Miller**. Desensitization of herpesvirus-encoded G protein coupled receptors (invited review). *2008 Life Sciences*, **82**:125-134.
45. O. Schneider, A. Weiss, and **W.E. Miller**. Pertussis Toxin signaling through the T-cell receptor initiates cross-desensitization of the chemokine receptor CXCR4. *2008 Submitted for Publication*.
46. J. Sherrill, Melissa Maxwell-Stropes, Olivia Schneider, Diana Koch, and **W.E. Miller**. Activation of Intracellular Signaling Pathways by the MCMV GPCR M33 Occurs Via PLC- $\beta$ /PKC Dependent and Independent Mechanisms. *2008 Submitted for Publication*.
47. M. Maxwell-Stropes and **W.E. Miller**. The human cytomegalovirus US28 carboxyl terminal regulatory domain regulates agonist-dependent and agonist-independent signaling in virus infected cells. *2008 Manuscript in preparation*