Kelly B. Arnold, Ph.D.
(Kelly F. Benedict)
Assistant Professor, Department of Biomedical Engineering
University of Michigan
kbarnold@umich.edu

Education

2010-15 **Postdoctoral Fellow, Biological Engineering** **MIT**

- Advisor: Douglas Lauffenburger
- In collaboration with the Ragon Institute of MGH, MIT and Harvard
- Research: experimental and computational analysis of immune cell-cell communication networks in HIV and infectious disease

2004-10 **Ph.D., Biomedical Engineering** **University of Virginia**

- Advisor: Thomas Skalak
- Research: experimental and computational evaluation of microvascular network alterations in insulin resistance and type 2 diabetes, quantitative analysis of protein signaling networks

2000-04 **B.S., Bioengineering** **Rice University**

- Advisor: Ka-Yiu San
- Research: *E. coli* metabolic engineering

Honors and Awards

2014	Systems Biology of Infectious Disease Conference Poster Award
2010-2014	Ragon Fellow
2010	Biomedical Engineering Society Award for Outstanding Graduate Research
2007-2010	Tomorrow's Professors Today Program at University of Virginia
2007-2009	American Heart Association Pre-doctoral Fellowship
2000	Valedictorian, Fairfax High School

Publications

*denotes equal contribution

1. A.W. Chung*, M.P. Kumar*, **K.B. Arnold***, W.H. Yu*, M.K. Schoen, L.J. Dunphy, T.J. Suscovich, N. Frahm, C. Linde, A.E. Mahan, M. Hoffner, H. Streeck, M.E. Ackerman, J. McElrath, H. Schuitemaker, M.G. Pau, L.R. Baden, J.H. Kim, N.L. Michael, D.H. Barouch, D.A. Lauffenburger, and G. Alter. Dissecting the polyclonal nature of vaccine-induced humoral immunity using Systems Serology. *Cell* (2015). *Accepted.*
2. **K. B. Arnold***,* G.S. Szeto*, G. Alter, D.J. Irvine, and D.A. Lauffenburger. CD4+ T cell-dependent and -independent cytokine/chemokine network changes in immune responses of HIV-infected individuals. *Science Signaling* (2015). *Accepted.*
3. **K. B. Arnold***, A. Burgener*, K. Birse, L. Romas, L.J. Dunphy, K. Shahabi, M. Abou, J. Kwatampora, B. Nyanga, J. Kimani, L. Liebenberg, L. Masson, S.S. Abdool Karim, J.S. Passmore, D.A. Lauffenburger, R. Kaul, and L.R. McKinnon. Increased levels of inflammatory cytokines in the female reproductive tract are associated with altered

expression of proteases, mucosal barrier proteins, and an influx of HIV-susceptible target cells. *Mucosal Immunology* (2015) Jun 24 [Epub ahead of print].

4. K. Birse, **K.B. Arnold**, R.M. Novak, S. McCorrister, G.R. Westmacott, T.B. Ball, D.A. Lauffenburger, and A. Burgener. Molecular signatures of immune activation and epithelial barrier remodeling are enhanced during the luteal phase of the menstrual cycle: implications for HIV susceptibility. *Journal of Virology* (2015) Sep 1;89(17):8793-805.

5. R.P. Madan, J. Tugetman, L. Masson, L. Werner, A. Grobler, K. Mlisana, Y. Lo, D. Che, **K.B. Arnold**, S.S. Abdool Karim, J.S. Passmore, and B.C. Herold. Innate antibacterial activity in female genital tract secretions is associated with increased risk of HIV acquisition. *AIDS Research and Human Retroviruses* (2015) Jul 14. [Epub ahead of print].

6. L. Masson*, J.S. Passmore*, L.J. Lienbenberg*, L. Werner, C. Baxter, **K.B. Arnold**, C. Williamson, F. Little, L.E. Masoor, V. Naranbhai, D.A. Lauffenburger, K. Ronacher, G. Walzl, N.J. Garrett, B.L Williams, M. Couto-Rodriguez, M. Hornig, W.I. Lipkin, A. Grobler, Q. Abdool Karim, and S.S. Abdool Karim. Genital inflammation and the risk of HIV acquistition in women. *Clinical Infectious Diseases* (2015) Jul 15;61(2):260-9.

7. J. Z. Li*, **K.B. Arnold*,** J. Lo, A.-S. Dugast, J. Plants, H.J. Ribaudo, K. Cesa, A. Heisey, D.R. Kuritzkes, D.A. Lauffenburger, G. Alter, A. Landay, S. Grinspoon, and F. Pereyra. Differential levels of soluble inflammatory markers by human immunodeficiency virus controller status and demographics. *Open Forums of Infectious Disease* (2013) Jan 13;2(1):ofu117.

8. C. D. Palmer, J. Tomassilli, M. Sirignano, M. Romero Tejeda, **K.B. Arnold**, D. Che, S. Jost, T. Allen, K. H. Mayer, and M. Altfeld. Enhanced immune activation and transient endotoxemia in HIV-exposed seronegative men who have sex with men. *AIDS* (2014) Sep 10;28(14):2162-6.

9. R.P. Simmons, E.P. Scully, E.E. Groden, **K.B. Arnold**, J.J. Chang, K. Lane, J. Lifson, E. Rosenberg, D.A. Lauffenburger, and M. Altfeld. HIV infection induces strong production of IP-10 through TLR7/9-dependent pathways. *AIDS* (2013) Oct 23;27(16):2505-17.

10. **K.F. Benedict** and D.A. Lauffenburger. Insights into proteomic immune cell signaling and communication via data-driven modeling. *Current Topics in Microbiology and Immunology* (2013) 363:201-33.

11. Y.J. Yamanaka, G.L. Szeto, T.M. Gierahn, T.L. Forcier, **K.F. Benedict,** M.S. Brefo, D.A. Lauffenburger, D.J. Irvine, and J.C. Love. Cellular barcodes for efficiently profiling single-cell secretory responses by microengraving. *Analytical Chemistry* (2012) Dec 18;84(24):10531-6.

12. **K.F. Benedict,** G.S. Coffin, E.J. Barrett and T.C. Skalak. Hemodynamic systems analysis of capillary network remodeling during the progression of type 2 diabetes. *Microcirculation* (2011) Jan;18(1):63-73.

13. **K.F. Benedict,** F. Mac Gabhann*, R.K. Amanfu*, A.K. Chavali*, E.P. Gianchandani*, L.S. Glaw*, M.A. Oberhardt*, B.C. Thorne*, J.H. Yang*, J.A. Papin, S.M. Peirce, J.J. Saucerman, and T.C. Skalak. Systems analysis of small signaling modules relevant to eight human diseases. *Annals of Biomedical Engineering* (2011) Feb; 39(2): 621–635.

Selected Oral Presentations and Invited Talks

1. **K.B. Arnold,** G.S. Szeto, G. Alter, D.J. Irvine and D.A. Lauffenburger. Systems analysis of cytokine profiles identifies key cellular contributors to HIV immune response. *Biomedical Engineering Society Annual Meeting, 2015 (San Antonio, TX)*
2. **K.B. Arnold** and D.A. Lauffenburger. Integrated systems analysis of immune population responses relevant to infectious disease. *University of Cape Town Department of Virology Seminar, 2013 (Cape Town, South Africa)*
3. **K.B. Arnold**, L.R. McKinnon and D.A. Lauffenburger. Integrated systems analysis of immune population responses relevant to HIV acquisition and progression. *HIV Prevention Workshop, 2013 (Drakensberg, South Africa)*
4. **K.F. Benedict**, J. Choi, J.C. Love, and D.A. Lauffenburger. Data-driven modeling for inference of primary human immune cell-cell communication from single and multi-cell cytokine expression. *International Symposium on Quantitative Biology and Cytokine Signaling, 2011 (Engelberg, Switzerland)*
5. **K.F. Benedict**, J.L Unthank, and T.C. Skalak. Vascular adaptation to femoral artery occlusion: A quantitative perspective on the role of capillaries, arterioles, and collateral arteries. *Experimental Biology, 2011* (*Washington D.C.)*
6. **K.F. Benedict** and T.C. Skalak. Computational systems biology for generating insight into complex human diseases. *Seminar at AstraZeneca, 2010 (Mölndal, Sweden)*
7. **K.F. Benedict**, G.S. Coffin, E.J. Barrett, and T.C. Skalak. Hemodynamic systems analysis of capillary network remodeling during the progression of type 2 diabetes. *Biomedical Engineering Society Annual Meeting, 2010 (Austin, TX)*
8. **K.F. Benedict**, F. Mac Gabhann*, R.K. Amanfu*, A.K. Chavali*, E.P. Gianchandani*, L.S. Glaw*, M.A. Oberhardt*, B.C. Thorne*, J.H. Yang*, J.A. Papin, S.M. Peirce, J.J. Saucerman, and T.C. Skalak. Systems analysis of small signaling modules generates insight relevant to eight human diseases. *Biomedical Engineering Society Annual Meeting, 2009 (Pittsburgh, PA)*

Selected Abstracts and Poster Presentations

1. C. Palmer, J. Tomassilli, M. Romero Tejeda, M. Sirignano, K. Mayer, M. Altfeld, **K.B. Arnold**, D. Che, S. Jost, and T. Allen. Transient endotoxemia and enhanced immune activation in HIV-exposed seronegative men who have sex with men. *Keystone Symposia Conference, HIV Vaccines: Adaptive Immunity and Beyond, 2014 (Banff, Alberta, Canada)*
2. **K.F. Benedict**, K. Mogk, L.R. McKinnon, R. Novak, T. Ball, G. Westmacott, D.A. Lauffenburger and A. Burgener. Utilizing data-driven modeling and proteomic approaches for predicting mucosal immunity of the female genital tract. *AIDS Vaccine, 2013 (Barcelona, Spain)*
3. A.-S. Dugast, **K.F. Benedict**, M. Hoffner, F. Pereyra, D.A. Lauffenburger, and G. Alter. A unique inflammatory signature tracks with the development of bNAbs in the absence of high viremia. *AIDS Vaccine, 2013 (Barcelona, Spain)*
4. C.D. Palmer, J. Tomassilli, M. Sirignano, **K.F. Benedict**, T. Allen, K.H. Mayer, and M. Altfeld. Altered immune activation in HIV-negative high-risk men who have sex with men (MSM) compared to low-risk HIV-negative men. *AIDS Vaccine, 2013 (Barcelona, Spain)*
5. **K.F. Benedict,** J. Choi, R.L. Contento, Q. Han, J.C. Love, and D.A. Lauffenburger. Identification of cytokine secretion dynamics associated with human CD4+ T cell flexibility

vs. polarity in single and multi-cell microenvironments. *Workshop on Mucosal Immunology, HIV Vaccines, and Microbiocides, 2012* (*Hluhluwe, South Africa)*

6. **K.F. Benedict,** J. Choi, R.L. Contento, Q. Han, J.C. Love, and D.A. Lauffenburger. Identification of cytokine secretion dynamics associated with human CD4+ T cell flexibility vs. polarity in single and multi-cell microenvironments. *Biomedical Engineering Society Annual Meeting, 2012 (Atlanta, GA)*
7. **K.F. Benedict**, F. Mac Gabhann*, R.K. Amanfu*, A.K. Chavali*, E.P. Gianchandani*, L.S. Glaw*, M.A. Oberhardt*, B.C. Thorne*, J.H. Yang*, J.A. Papin, S.M. Peirce, J.J. Saucerman, & T.C. Skalak. Systems analysis of bounded signaling modules generates novel insight into eight major human diseases. *International Conference on Systems Biology, 2009 (Palo Alto, CA)*
8. **K.F. Benedict**, E.J. Barrett, and T.C. Skalak. Capillary network remodeling during the progression of type 2 diabetes in the Zucker diabetic rat. *World Congress of Microcirulation, 2007 (Milwaukee, WI)*

Teaching Experience

2013	Lecturer	Boston Univ. *Quantitative Systems Immunology Summer School*
2010	Guest Lecturer	UVa BME 3315, *Computational Biomedical Engineering*
2010	Guest Lecturer	UVa BME 2101, *Physiology I*
2008	Guest Lecturer	Sweetbriar College, *Engineering Seminar*
2007-08	Teaching Assistant	UVa BME 2101, *Physiology I*

Selected Mentoring Experience

2013-2015 Laura Dunphy *(MIT undergraduate)*

- First place winner of Znaty-Merck Bioengineering Research Award
- Two peer-reviewed publications
- Summer research project in South Africa
- Oral presentation at Biomedical Engineering Society Annual Meeting 2014

2013-2015 Denise Che *(MIT undergraduate)*

- Two peer-reviewed publications
- Summer internship at Mathworks

2013-2015 Gregory Coffin *(high school student)*

- One peer-reviewed publication

Extracurricular Activities and Service

- Volunteer at Daybreak Center (2013-2015)
- Park Street Church Missions Committee (2011-2015)
- MIT Masters Swim Team (2010-2013)
- University of Virginia Women's Water Polo Team (2004-2010)
    - Collegiate Club All-American, 2005, 2007, 2009
- Rice University Women's Water Polo Team (2000-2004)
    - President, 2003-2004
    - Texas Division Player of the Year, 2003