BIOGRAPHICAL SKETCH

NAME OF APPLICANT: Rebecca Martin

eRA COMMONS USER NAME: RKMARTIN

POSITION TITLE: Assistant Professor, Microbiology and Immunology, Flow Cytometry Shared Resource Director

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	START DATE MM/YYYY	END DATE *(or expected end date)* MM/YYYY	FIELD OF STUDY
Virginia Commonwealth University Richmond, Virginia	B.S. *cum laude*	08/2006	05/2009	Biology
Virginia Commonwealth University Richmond, Virginia	Ph.D.	08/2009	05/2014	Microbiology/ Immunology
Virginia Commonwealth University Richmond, Virginia		06/2014	08/2018	Immunology

A. Personal Statement

I have experience in both mouse and human systems, as well as *in vitro* cell culture. In particular, my extensive training in flow cytometry, with a decade of experience, has proven instrumental to further understanding the physiology of disease states. I am currently the Flow Cytometry Shared Resource Director. I utilize both flow cytometry analysis and cell sorting extensively in my work. I have a steady publication record and have additionally received travel awards to speak at several national and international meetings throughout my career. Because of my own remarkable mentorship experience, I know the importance of being a good mentor and have had the opportunity to train many students, undergraduate and graduate. In 2016, one of my mentees nominated me for an outstanding faculty mentor award that despite not being a faculty member at the time, an exception was made and I was awarded it by the Office of Research. I direct the journal club course Current Topics in Immunology. I am currently continuing my work on harnessing the ability of the B1 cell, as a source of natural IgE that leads to reduced immune action against helminth parasites, in the fight against allergic disease.

B. Positions and Honors

Positions and Employment

05/08-08/08 HHMI Summer Undergraduate Scholar, Virginia Commonwealth University, Richmond, VA
08/08-08/09 Lab Aide, Immunology Lab, Virginia Commonwealth University, Richmond, VA
06/14-07/16 IRACDA Postdoctoral Fellow, Virginia Commonwealth University, Richmond, VA
08/14- Instructor, MICR 505-Immunobiology, Virginia Commonwealth University, Richmond, VA
01/15-05/15 Teaching Externship- MICR 201 Microbiology, Virginia Union University, Richmond, VA
04/15-08/18 F32 Fellow, Virginia Commonwealth University, Richmond, VA
08/16- Instructor, MICR 365-Infection & Immunity-Dental Hygienists, Virginia Commonwealth University, Richmond, VA
08/16- Course Director, MICR 694 Current Topics in Immunology, Virginia Commonwealth University, Richmond, VA
01/17-05/17 Lecturer, BIOL 691 Topics: Techniques in Cell and Developmental Biology, Virginia Commonwealth University, Richmond, VA

01/18- Instructor, BIOC 504 Biochemistry, Cell & Molecular Biology, Virginia Commonwealth University, Richmond, VA
10/18- Instructor, MS1, Infection and Immunity, Virginia Commonwealth University, Richmond, VA
9/18- Assistant Professor, Microbiology and Immunology, Virginia Commonwealth University, Richmond, VA
12/18- Flow Cytometry Shared Resource Director, Virginia Commonwealth University, Richmond, VA

Other Experience and Professional Memberships

2013-2018 Trainee member, American Association of Immunologists
2014- Reviewer- *Allergy, Journal of Immunology,* and *International Journal of Inflammation*
2015- STEM Advisor, AUCTUS: The Undergraduate Journal of Research at Virginia Commonwealth University, Richmond, VA
2016-2017 Vice President, Postdoctoral Association, Virginia Commonwealth University, Richmond, VA
2016-2018 University Council Member, Postdoctoral Representation, Virginia Commonwealth University, Richmond, VA
2017-2018 President, Postdoctoral Association, Virginia Commonwealth University, Richmond, VA
2017-2018 School of Medicine Professionalism Committee Member, Postdoctoral Representation, Virginia Commonwealth University, Richmond, VA
2018- Regular member, American Association of Immunologists

Academic and Professional Honors

2008 Miles F. Johnson Award for Excellence in Biology, Virginia Commonwealth University, Department of Biology
2009 Dean's List, Virginia Commonwealth University, Department of Biology
2013 American Association of Immunologist, Abstract Award
2014 Virginia Commonwealth University Postdoctoral Association Travel Award Recipient
2014 Statement of Accomplishment, An Introduction to Evidence-Based Undergraduate STEM Teaching, Vanderbilt University through Coursera,
2014 Institutional Research and Academic Career Fellowship Award (IRACDA)
2015 National Academies Teaching Fellow in the Life Sciences
2015, 2017 National Institutes of Health-Loan Repayment Program Award Recipient
2016 Undergraduate Research Opportunities Program, Outstanding Faculty Mentor Award
2016 National Institutes of Health- F32 Fellowship Award Recipient
2016 American Association of Immunologists, Abstract Award
2016 American Association of Immunologists, Travel Award to the International Congress of Immunology
2017 American Association of Immunologists, Abstract Award
2017 Biolegend 15-Year Anniversary Post-Doc Award Winner
2018 American Association of Immunologist, Abstract Award

C. Contributions to Science

My Contributions to Science are organized into three time periods: I. Graduate Career, II. Postdoctoral Career, and III. Faculty Career

I. Graduate Career. My graduate career studies focused on the interaction between mast cells and myeloid derived suppressor cells (MDSC). In my initial publication in this project, I was the first to highlight the importance of mast cells to MDSC function in the context of tumor and allergic disease. This first author publication was included in "News Beyond of Pages," *JACI.* I then extrapolated on this work and further dissected the interaction between the mast cell and the MDSC, looking into the role histamine plays in augmenting MDSC function. I was able to show that histamine induces MDSC proliferation, differentiation, and function. I showed a reversal of MDSC induced parasitic clearance, as well as diminished pro-tumor effects when mice were treated with the anti-histamine drugs, cetirizine and cimetidine. I then extended the findings to allergic patient blood showing that an environment rich in histamine causes increased numbers of MDSCs circulating in allergic patients. This first author publication was featured in a press release by Massey Cancer Center, on NPR affiliate WCVE community ideas station (2014 Mar 20), on the NBC local news station (2014 Mar 26), and made Massey Cancer Center's "Philanthropic Review" for 2013. It was *J. Leukoc Biol*. most accessed publication from August 10, 2014 thru

February 10, 2015. Additional side projects during my graduate career earned me two other first author publications and two contributing author publications. Through collaboration with Birgitta Heyman PhD, in Uppsala, Sweden, I was able to spend a month in 2011 working in her lab at Uppsala University to master techniques important for the study of immune complexes. This collaboration later led to my first author publication showing that exosomes are involved in IgE immune complex transfer from B cells to dendritic cells. I was able to present my work orally at the International Society for Extracellular Vesicles conference in 2012 in Sweden on exosomes in 2012 as well as both the MDSC and exosome work at the American Association for Immunologists annual meeting in Hawaii in 2013. I also had several other poster presentations at international and national conferences.

1. Martin RK*, Brooks KB*, Henningsson F, Heyman B, and Conrad DH. Antigen transfer from exosomes to dendritic cells as an explanation for the immune enhancement seen by IgE immune complexes. *PlosONE.* 2014 Oct 20.

2. Martin RK*, Saleem SJ*, Folgosa LE, Zellner HB, Damle SR, Nguyen GT, *et al*. Mast cell-histamine promotes the immunoregulatory activity of myeloid derived suppressor cells. *J. Leukoc Biol*. 2014 Mar.

3. Saleem SJ*, **Martin RK***, Morales JK, Sturgill JL, Gibb DR, Graham L, *et al.* Cutting edge: mast cells critically augment myeloid-derived suppressor cell activity. *J. Immunol*. 2012 Jul. 15;189(2):511–5. PMCID: PMC3392490

4. Chaimowitz NS*, **Martin RK*,** Cichy J, Gibb DR, Patil P, Kang, DJ, *et al*. A disintegrin and metalloproteinase 10 regulates antibody production and maintenance of lymphoid architecture. *J. Immunol*. 2011 Nov. 15

*indicates co-first authorship

II. Postdoctoral career. As a postdoctoral fellow, my initial research has been to investigate the role of non-specific B1-derived IgE in helminth infections. Developing countries have high levels of helminth infections and low occurrence of allergic disease, whereas the inverse is seen in developed countries. Yet, in developed countries helminth infected individuals have high levels of IgE. My research project made great strides in explaining that this IgE induced in helminth infections is poly-specific and comes from B1 cells. I am the first to show that B1 IgE is augmented with the addition of IL-25, an important cytokine in the onset of Th2 disease. Helminths have evolved a mechanism of induction of B1 IgE as a protective mechanism, as B1 IgE does not induce mast cell degranulation. This research could lead to advances in treatments for allergic disease if the protective power of B1 IgE can be harnessed. This initial publication on this research has just been published in *Cell Reports*. During this time period, I have additionally worked in collaboration on the effects of knocking out Macrophage migration inhibitory factor (MIF) in the context of Th2 parasitic disease. I have shown that elimination of this cytokine reduces helminth infection models through a $CD4^+$ T cell dependent mechanism that can be replicated through the use of an inhibitor, sulforaphane, which is found naturally in cruciferous vegetables like brussel sprouts. This work is currently published in *Mucosal Immunology.* I have also published a book chapter on the contributions of ADAM 10 and 17 to allergic disease. I have two additional manuscripts, one on dendritic cell ADAM10 and Th2 disease, published in *Allergy* and the other, that I am co-corresponding on, concerns the regulation of ICOS and ICOSL by ADAM10 on B cells and is published in *Journal of Immunology*. I was additionally given travel support through abstract awards to present at the American Association of Immunologist annual meetings in Austin, TX in 2018, Washington, D.C. in 2017, as well as Seattle, WA in 2016, and the International Congress of Immunology in Melbourne, Australia in 2016. I also presented my data orally at the FASEB conference, “IgE and Allergy, 50 years and Onward” in 2016 as well as several other presentations at national and international conferences. I am also a very active mentor. Since finishing my IRACDA fellowship and moving onto the F32 fellowship, for which I attended and presented at the NIAID F32 annual meeting this year, I have not broken ties with the program. I currently participate in IRACDA activities and I am on the admissions committee for the program at my university. I attended the National IRACDA conference in Birmingham, AL last year through funding from the National Research Mentors Network, in which I participate. I am additionally attending the IRACDA conference in Atlanta, GA this summer. I am involved in an undergraduate research journal as the STEM advisor, am the president of the postdoctoral association, as well as, enjoy teaching.

1. **Martin RK***, Damle SR*, Valentine YA, Zellner MP, James BN, et al. B1 cell IgE impedes mast cell-mediated enhancement of parasite expulsion through B2 IgE blockade. *Cell Reports.* 2018 February 13.
2. Lownik JC, Luker AJ, Damle SR, Cooley LF, El Sayed R, Hutloff A, Pitzalis C, **Martin RK#,** El Shikh M#, Conrad DH#. ADAM10-Mediated ICOS Ligand Shedding on B Cells Is Necessary for Proper T Cell ICOS Regulation and T Follicular Helper Responses. *Journal of Immunology*. 2017; Epub 2017/08/18.
3. Damle SR, **Martin RK**, Cockburn CL, Lownik JC, Carlyon JA, Smith AD, Conrad DH. ADAM10 and Notch1 on murine dendritic cells control the development of type 2 immunity and IgE production. *Allergy*. 2017. Epub 2017/07/27.
4. Damle, SR*, **Martin, RK***, Cross, J. V & Conrad, D. H. Macrophage migration inhibitory factor deficiency enhances immune response to Nippostrongylus brasiliensis. *Mucosal Immunol.* 1–10 (2016).

***indicates co-first authorship #indicates co-corresponding authorship**

III. Faculty Career. Since my appointment to Assistant Professor at Virginia Commonwealth University, I have published four manuscripts, two as corresponding author. One manuscript was published in *Journal of Immunology*. This research focuses on the contribution of ADAM10 shedding of to the ICOSL to ICOS regulation in lupus prone mouse models. Another was just accepted to *BBRC* on the requirement for ADAM17 in IL-33 responses on ILC2s. I am currently the Flow Cytometry Shared Resource Director.

1. Lownik, JC, Conrad, DH, & **Martin, RK**. A Disintegrin and Metalloproteinase 17 is Required for ILC2 Responses to IL-33. *Biochemical and Biophysical Research Communications*. Mar 27.
2. Lownik, JC, Winberly, J, Conrad, DH,& **Martin RK**. B cell ADAM10 controls murine lupus progression through regulation of the ICOS:ICOS-ligand axis. 2019. *Journal of Immunology.* 2019. Jan 4.
3. Rodino K, Adcox H, **Martin RK**, Patel V, Conrad DH & Carlyon JC. The obligate intracellular bacterium Orientia tsutsugamushi targets NLRC5 to modulate the MHC class-I pathway. *Infection and Immunity*. 2018 Dec 17.
4. Cockcurn C, Green, R, Damle SR, **Martin RK,** Ghahrai, N, Colonne, P, Fullerton, M, Conrad, DH, Chalfant, C, Voth, D, Rucks, E, Gilk, S, & Carlyon, J. Functional inhibition of acid sphingomyelinase disrupts infection by intracellular bacteria. *Life Science Alliance*. 2019. March 22.

Full list of Publications in MyBibliography (URL)
https://www.ncbi.nlm.nih.gov/sites/myncbi/1lerv6782gpk8/bibliography/51758213/public/?sort=date&direction=ascending

D. Additional Information: Research Support and/or Scholastic Performance

Past Research Support

1F32AI124502 MARTIN, REBECCA K (PI) 4/01/16-8/01/18
National Institutes of Allergy and Infectious Diseases (NIAID), Helminth induced B1 IgE is protective against allergic disease. Aims are to (1) Characterize the role of B1 IgE in helminth infection and (2) to determine if B1 IgE is responsible for the protection against allergic disease afforded by helminth infection.
Role:PI

Pending Research Support

1 R21 AI148977-01 (Martin) 09/01/2019 – 08/31/2021
NIH/NIAID $411,468
Goals:To examine if IL1R2 interacts with IL1RAP on ILC2s and determine the influence of ADAM17 on this interaction and to determine the functional role of IL1R2 on ILC2s, particularly in the context of IL-33 responsiveness.

Current Research Support

1R56AI139658-01 (Martin) 05/01/2019 – 03/31/2020
NIH/NIAID $250,000
IL-25 as a master regulator of extrafollicular benign IgE

Goals:To establish the contribution of B1 cell IgE to the total serum pool and determine how B1 IgE modulates the allergic phenotype during helminth infection, To assess the role of IL-25 in B1 IgE production during helminth infection, and to characterize human IL-25R+ B cells as IgE producing cells.

3R01AI1018697-37 (Martin) 05/01/1989 – 05/31/2019
NIH/NIAID $604,839
Structure and Function of the B Lymphocyte FCe Receptor
Goals:Examine the effect of multiple antigen injections on the ADAM10 B-/- phenotype as well as examine models of disease and see if modulation of ADAM10 will improve disease outcomes.