BIOGRAPHICAL SKETCH

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NAME: Martin, Rebecca K

eRA COMMONS USER NAME (credential, e.g., agency login): RKMARTIN

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

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	END DATE *(or expected end date)* MM/YYYY	FIELD OF STUDY
Virginia Commonwealth University Richmond, Virginia	BS *cum laude*	05/2009	Biology
Virginia Commonwealth University Richmond, Virginia	PhD	05/2014	Microbiology/ Immunology
Virginia Commonwealth University Richmond, Virginia		08/2018	Immunology

A. Personal Statement

My research group is focused on asthma and allergic disease, with a particular focus on IgE-mediated disease. I have over a decade of experience working on IgE-related pathologies. My laboratory has experience studying both mouse and human systems. In my laboratory, we utilize the Scireq Flexivent system to assess airway hyperresponsiveness in mouse models of asthma. I have over a decade of experience in a variety of mouse asthma models. I am currently the Flow Cytometry Shared Resource (FCSR) director at Virginia Commonwealth University (VCU), Massey Cancer Center (MCC). My extensive training in flow cytometry has proven instrumental to the research in my laboratory. The lab utilizes innovative flow cytometry analysis and cell sorting extensively to inform our research. The research interests of my laboratory focus on innate mechanisms of sensitization that lead to IgE-mediated allergic asthma.

1. Ceramide in apoptosis and oxidative stress in allergic inflammation and asthma. James BN, Oyeniran C, Sturgill JL, Newton J, **Martin RK**, Bieberich E, Weigel C, Maczis MA, Palladino END, Lownik JC, Trudeau JB, Cook-Mills JM, Wenzel S, Milstien S, Spiegel S. *J Allergy Clin Immunol.* May 2021;PMID: 33130063;PMCID: PMC8081742.
2. A Disintegrin and Metalloproteinase 17 is required for ILC2 responses to IL-33. Lownik JC, Conrad DH, **Martin RK**. *Biochem Biophys Res Commun*. May 2019. PMID: 30926166; PMCID: PMC6467721.
3. B1 Cell IgE Impedes Mast Cell-Mediated Enhancement of Parasite Expulsion through B2 IgE Blockade. **Martin RK**, Damle SR, Valentine YA, Zellner MP, James BN, Lownik JC, Luker AJ, Davis EH, DeMeules MM, Khandjian LM, Finkelman FD, Urban JF Jr, Conrad DH. *Cell Rep*. Feb. 2018 PMID: 29444434;PMCID: PMC5832064.
4. ADAM10 and Notch1 on murine dendritic cells control the development of type 2 immunity and IgE production. Damle SR, **Martin RK**, Cockburn CL, Lownik JC, Carlyon JA, Smith AD, Conrad DH. *Allergy*. Jan 2018; PMID: 28745029; PMCID: PMC5739941.

Ongoing projects that I would like to highlight include:

P2X3 is a Female-Dominant Amplifier of Mast Cell Function
This grant is aimed at dissecting the sex-skewed nature of P2X3 signaling in response to ATP during mast cell degranulation.
Role: Co-I

2R25GM089614 Lloyd, Shiang (MPI) 12/31/2020-12/31/2025
Virginia Commonwealth University Post baccalaureate Research Education Program
This application supports a one-year biomedical research training for recent college graduates in groups that are underrepresented in the biomedical sciences with a goal of completing a PhD in the biomedical sciences.
Role: Scientific Director

NIH/NCI 5P30 CA016059-37 Winn (PI) 12/01/1995-04/30/2022
Cancer Center Core Support Grant
This is the core support grant for the Massey Cancer Center, Virginia Commonwealth University
Role: Director of the Flow Cytometry Shared Resource

Institutional Support: CCTR Endowment Fund Martin (PI) 05/31/2021-05/31/2022
Metabolic reprogramming of dendritic cells regulates allergic sensitization in asthma
This grant is aimed at understanding the metabolic perturbations that occurs post-allergen exposure in dendritic cells that influence co-stimulation to Tfh13 cells.
Role: PI

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2008	HHMI Summer Undergraduate Scholar, Virginia Commonwealth University, Richmond, VA
2008-2009	Laboratory Aide, Immunology Lab, Virginia Commonwealth University, Richmond, VA
2013-2018	Trainee member, American Association of Immunologists
2014-2016	IRACDA Postdoctoral Fellow, Virginia Commonwealth University, Richmond, VA
2014-present	Ad Hoc Reviewer- *Allergy*, *Journal of Immunology*, *Journal of Biomedical Science*, *Clinical and Experimental Immunology*, *Journal of Cellular and Molecular Medicine*, *Oncotargets and Therapy*, *International Journal of Inflammation*, *Breast Cancer Management*, *Adipocyte*, *International Journal of Endocrinology*, *International Journal of Metabolism*, *Journal of Cellular Physiology*, *Cancers*, *Theranostics*, *Cells*, *Vaccines*, *Seminars in Cancer Biology, STAR Methods, Current Bioinformatics, iScience, Scientific Reports, Haematologica,* and *Clinical and Translational Medicine*.
2014-present	Instructor, MICR 505-Immunobiology, Virginia Commonwealth University, Richmond, VA
2015	Teaching Externship- MICR 201 Microbiology, Virginia Union University, Richmond, VA
2015-2019	STEM Advisor, AUCTUS: The Undergraduate Journal of Research at Virginia Commonwealth University, Richmond, VA
2015-2018	F32 Fellow, 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
2016-present	Instructor, MICR 365-Infection & Immunity-Dental Hygienists, Virginia Commonwealth University, Richmond, VA
2016-present	Course Director, MICR 694 Current Topics in Immunology, Virginia Commonwealth University, Richmond, VA
2017-2021	Instructor, MICR 686 Advanced Immunology, Virginia Commonwealth University, Richmond, VA
2017	Lecturer, BIOL 691 Topics: Techniques in Cell and Developmental Biology, Virginia Commonwealth University, Richmond, VA
2017-present	Lecturer, PHIS 652 Science and Disease-MD/PhDs, 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

2018-2020 Instructor, BIOC 504 Biochemistry, Cell & Molecular Biology, Virginia Commonwealth University, Richmond, VA
2018-present Lecturer, MD/PhD M1 Journal Club, Virginia Commonwealth University, Richmond, VA
2018-present Regular member, American Association of Immunologists
2019, 2021 Lecturer, MICR 618- Microbial Pathogenesis, Virginia Commonwealth University, Richmond, VA
2018-present Instructor, MS1, Infection and Immunity, Virginia Commonwealth University, Richmond, VA
2018-present Assistant Professor, Microbiology and Immunology, Virginia Commonwealth University, Richmond, VA
2018-present Flow Cytometry Shared Resource Director, Virginia Commonwealth University, Richmond, VA
2019-present Member, American Heart Association
2019-present Nominated Faculty Reviewer for Faculty Opinions
2019-2020 Alternate, Faculty Senate, Virginia Commonwealth University, Richmond, VA
2020-present School of Medicine Professionalism Committee Appointed Member, Biological Sciences, Virginia Commonwealth University, Richmond, VA
2020 Reviewer, NIH IMM-M10 Review Panel
2021-present Scientific Director, Post baccalaureate Research Education Program, Virginia Commonwealth University, Richmond, Virginia
2021-present Center for Clinical and Translational Research Endowment Fund Scientific Review Committee
2022-present Editorial Board member, *Adipocyte*

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 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
2017 National Institutes of Health-Loan Repayment Program Award Recipient
2018 American Association of Immunologist, Abstract Award
2019 American Association of Immunologists, Travel Award to the International Union of Immunological Societies
2019 Outstanding Departmental Teaching Award, Microbiology and Immunology
2019 National Institutes of Health-Loan Repayment Program Award Recipient
2022 American Association of Immunologists, Abstract Award

C. Contributions to Science

1. **Mechanisms in IgE-mediated Disease.** As a postdoctoral fellow, I began an investigation into the role of IgE generated in helminth infections. I became interested in both high-affinity IgE responses as well as extrafollicular IgE responses that generated polyclonal IgE. I initially discovered that poly-specific IgE was being generated by B1 cells. I was the first to show that this B1 IgE was augmented by IL-25. My research laboratory continues to examine the origin and mechanisms of the large amounts of poly-specific IgE generated during helminth infection. Additionally, I have shown that loss of ADAM10 from dendritic cells leads to a loss of IgE antibody production in a mouse model of allergic asthma. This work illustrated the importance of dendritic cell notch signaling in T cell polarization. Further, our laboratory has developed and optimized several mouse asthma models, important for examining IgE-mediated allergic asthma and other

asthma subtypes. Our current work on dendritic cell metabolism in polarization of Tfh13s is being submitted for publication.

a. Ceramide in apoptosis and oxidative stress in allergic inflammation and asthma. James BN, Oyeniran C, Sturgill JL, Newton J, **Martin RK**, Bieberich E, Weigel C, Maczis MA, Palladino END, Lownik JC, Trudeau JB, Cook-Mills JM, Wenzel S, Milstien S, Spiegel S. *J Allergy Clin Immunol*. May 2021;PMID: 33130063;PMCID: PMC8081742.
b. Luker AJ, Lownik JC, Conrad DH, **Martin RK**. A new look at IgE beyond allergies. *F1000Res*. 2019; PMID: 31168357; PMCID: PMC6537913.
c. B1 Cell IgE Impedes Mast Cell-Mediated Enhancement of Parasite Expulsion through B2 IgE Blockade. **Martin RK**, Damle SR, Valentine YA, Zellner MP, James BN, Lownik JC, Luker AJ, Davis EH, DeMeules MM, Khandjian LM, Finkelman FD, Urban JF Jr, Conrad DH. *Cell Rep*. Feb. 2018 PMID: 29444434;PMCID: PMC5832064.
d. ADAM10 and Notch1 on murine dendritic cells control the development of type 2 immunity and IgE production. Damle SR, **Martin RK**, Cockburn CL, Lownik JC, Carlyon JA, Smith AD, Conrad DH. *Allergy*. Jan 2018; PMID: 28745029; PMCID: PMC5739941.

2. **Mast cell mechanisms in allergic disease.** I initially began my research focusing on the interaction between mast cells and myeloid derived suppressor cells (MDSC). In my graduate work, I was the first to highlight the importance of mast cells to MDSC function in the context of tumor and allergic disease. I then examined histamine's role in augmenting MDSC function. I was able to show that histamine induces MDSC proliferation, differentiation, and function. I showed that anti-histamine drugs, cetirizine and cimetidine reversed MDSC-induced parasitic clearance, as well as diminished pro-tumor effects in mice. I then extended these findings to allergic patient blood showing that an environment rich in histamine causes increased numbers of MDSCs circulating in allergic patients. I have continued working on mast cell projects, most recently examining the role of Stat5B in IgE-mediated mast cell function.
    a. Stat5B is required for IgE-Mediated mast cell function in vitro and in vivo. Kiwanuka KN, Motunrayo Kolawole E, Mcleod JJA, Baker B, Paez PA, Zellner MP, Haque TT, Paranjape A, Jackson K, Kee SA, Dailey J, **Martin RK**, Ryan JJ. *Cell Immunol*. Jun 2021 PMID: 33780747; PMCID: PMC8104437.
    b. Mast cell histamine promotes the immunoregulatory activity of myeloid-derived suppressor cells. **Martin RK**, Saleem SJ, Folgosa L, Zellner HB, Damle SR, Nguyen GK, Ryan JJ, Bear HD, Irani AM, Conrad DH. *J Leukoc Biol*. Apr. 2014; PMID: 24338630; PMCID: PMC4056279.
    c. Myeloid-derived suppressor cells enhance IgE-mediated mast cell responses. Morales JK, Saleem SJ, **Martin RK**, Saunders BL, Barnstein BO, Faber TW, Pullen NA, Kolawole EM, Brooks KB, Norton SK, Sturgill J, Graham L, Bear HD, Urban JF Jr, Lantz CS, Conrad DH, Ryan JJ. *J Leukoc Biol.* Apr 2014 PMID: 24338630; PMCID: PMC3958743.
    d. Cutting edge: mast cells critically augment myeloid-derived suppressor cell activity. Saleem SJ, **Martin RK**, Morales JK, Sturgill JL, Gibb DR, Graham L, et al. *J Immunol*. Jul 2012. PMID: 22706087; PMCID: PMC3392490 *Highlighted in JACI-"News Beyond our Pages"

3. **Mechanisms of T follicular helper cell regulation by ICOS:ICOSL axis.** We identified that ADAM10 was the primary sheddase for ICOSL *in vivo* and that shedding of ICOSL was necessary for proper T cell ICOS regulation. When ICOSL shedding from B cells is eliminated, T follicular helper (Tfh) cell responses are disrupted. Further, we showed that regulation of the ICOS:ICOSL axis through B cell ADAM10 loss led to decreased autoantibodies and decreased nodal proliferation in lupus prone mice. We additionally examined the post-translational mechanisms of ICOS regulation. We show that ligation of ICOS leads to internalization, but if this ligation is paired with CD3 co-stimulation, ICOS is recycled. In the absence of CD3 co-stimulation ICOS is degraded in the lysosome. These studies overall illustrate the importance of ICOSL and ICOS on Tfh responses.
    a. T cell receptor signaling defines the fate and pathway of ICOS internalization. Lownik JC, Conrad DH, **Martin RK**. *Biochem Biophys Rep*. Dec 2020 PMID: 32984557; PMCID: PMC7494666
    b. B Cell ADAM10 Controls Murine Lupus Progression through Regulation of the ICOS:ICOS Ligand Axis. Lownik JC, Wimberly JL, Conrad DH, **Martin RK**. *J Immunol.* Feb 2019 PMID: 30610163; PMCID: PMC6344316.

c. ADAM10-mediated ICOS ligand shedding on B cells is necessary for proper T cell ICOS regulation and T follicular helper responses. Lownik JC, Luker AJ, Damle SR, Cooley LF, El Sayed R, Hutloff A, Pitzalis C, **Martin RK**, El Shikh MEM, Conrad DH. *J Immunol*. Oct 2017 PMCID: PMC5605448.
d. A disintegrin and metalloproteinase 10 regulates antibody production and maintenance of lymphoid architecture. Chaimowitz NS, Martin RK, Cichy J, Gibb DR, Patil P, Kang DJ, Farnsworth J, Butcher EC, McCright B, Conrad DH. *J Immunol.* Nov 2011; PMID: 21998451; PMCID: PMC4006936.

4. **Novel diagnostic testing approaches for SARS-CoV-2 Virus Detection.** Our laboratory examined the kinetic limitations of extraction-free rapid cycle quantitative real-time RT-PCR for SARS-CoV-2 virus detection using commercially available equipment and reagents. We established a protocol from nasopharyngeal swab to answer in less than 20 minutes with little hands-on time requirements. Further, our lab demonstrated by using extreme RT-PCR, a product verification by melting could be completed in under 3 minutes. We additionally designed a fast, inexpensive methodology for variant detection using snapback primer-based high-resolution melting to test for more than 20 SARS-CoV-2 spike mutations.

    a. Fast SARS-CoV-2 Variant Detection Using Snapback Primer High-Resolution Melting. Lownik JC, Farrar JS, Way GW, McKay A, Roychoudhury P, Greninger AL, **Martin RK**. *Diagnostics* (Basel). Sep 2021 PMID: 34679489; PMCID: PMC8534650.
    b. Extraction-Free Rapid Cycle Quantitative RT-PCR and Extreme RT-PCR for SARS-CoV-2 Virus Detection. Lownik JC, Way GW, Farrar JS, **Martin RK**. *J Mol Diagn.* Dec 2021 PMID: 34454108; PMCID: PMC8386134.

5. **The role of ADAM10 and ADAM17 in metabolic inflammation.** We have been working on the cellular source of TNF in the fatpad during obesity-induced inflammation. We have published that adipocyte ADAM17 is dispensable as the TNF-inducing cellular source that influences immunometabolism. We have extensively characterized the HFD feeding model differences between males and females in regards to the immune compartment and indirect calorimetry, revealing extensive sexual dimorphism. We are currently working on a model of ADAM17 deletion in the myeloid compartment, and testing how this deletion alters obesity-induced inflammation in a model of HFD feeding. This manuscript is close to publication. We have additionally collaborated on several works in relation to metabolic inflammation to help characterize the immune infiltrate in the fatpad.
    a. Isolation of the Stromal Vascular Fraction from Adipose Tissue and Subsequent Differentiation into White or Beige Adipocytes. Farrar JS, **Martin RK**. *Methods Mol Biol.* 2022 PMID: 35212990.
    b. Rajesh Y, Reghupaty SC, Mendoza RG, Manna D, Banerjee I, Subler MA, Weldon K, Lai Z, Giashuddin S, Fisher PB, Sanyal AJ, **Martin RK,** Dozmorov MG, Windle JJ, Sarkar D. Dissecting the Balance Between Metabolic and Oncogenic Functions of Astrocyte-Elevated Gene-1/Metadherin. *Hepatol Commun.* Mar 2022 PMID: 34741448; PMCID: PMC8870024.
    c. Identification of the transgene insertion site for an adipocyte-specific adiponectin-cre model and characterization of the functional consequences. Farrar JS, Lownik JC, Way GW, Rodriguez MC, Celi FS, **Martin RK.** *Adipocyte.* Dec 2021 PMID: 33565916; PMCID: PMC7889145.
    d. Adipocyte ADAM17 plays a limited role in metabolic inflammation. Lownik JC, Farrar JS, Pearce JV, Celi FS, **Martin RK.** *Adipocyte*. Dec 2020 PMID: 32892692; PMCID: PMC7714430.

Full list of Publications (34 original works and reviews) in MyBibliography (URL)
https://www.ncbi.nlm.nih.gov/myncbi/rebecca.martin.2/bibliography/public/