BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Chang H. Kim

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

POSITION TITLE: Kenneth and Judy Betz Professor

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)*	Completion Date MM/YYYY	FIELD OF STUDY
KAIST (Korea Adv. Inst. of Sci & Tech.)	B.S.	1986-90	Biology
KAIST	M.S.	1990-92	Biological Engineering
LG Biotech Institute	Scientist	1992-95	Immunology/Hematopoiesis
Indiana University School of Medicine	Ph.D.	1995-98	Immunology/Hematopoiesis
Stanford University School of Medicine	Postdoctoral fellow	1999-02	Immunology

A. Personal Statement

I am a Professor of Pathology and Kenneth and Judy Betz Professor in the Mary H Weiser Food Allergy Center (MHWFAC) at University of Michigan. I have been studying lymphocyte biology and immune regulatory mechanisms for more than two decades. More specifically, my research group studies lymphocyte trafficking and differentiation. We also study the regulatory functions of retinoic acid and gut microbial metabolites in regulation of innate and adaptive mucosal immune responses. Among our many accomplishments, we discovered germinal center Tfh cells (*J. Exp. Med*. 2001; *Nature Immunology*. 2001) and Tfr cells (*J. Clin. Invest*. 2004; Cutting Edge J Immunol 2005). We also discovered the role of retinoic acid in inducing Tregs (*J Immunol.* 2007; *Gastroenterology*. 2009) and regulating the development and migration of innate lymphoid cells (*Immunity*. 2015; SI, 2020). We have been studying the function of gut microbial metabolites in regulating lymphocytes including innate lymphoid cells, mucosal immunity, inflammation and cancer (Gastroenterology. 2013; *Cell host & microbe*. 2016). These experiences prepared our team well for the proposed studies on the migration of ILC progenitors from the bone marrow to peripheral tissues.

B. Positions and Honors.

Positions and Employment

1992-95: Research Scientist, Immune Regulation, R&D Center, LG Chem. LTD
1995-98: Instructor, Department of Microbiology and Immunology, Indiana University School of Medicine
1999-02: Postdoctoral fellow, Department of Pathology, Stanford University School of Medicine (Leukemia Society of America Fellow)
2002-2006: Assistant Professor, Department of Comparative Pathobiology, Purdue Cancer Center, Purdue University (Leukemia and Lymphoma Society Special Fellow)
2003-2017: Adjunct Professor, Indiana University School of Medicine (Course director for Human Immunology)
2006-2010: Associate Professor, Department of Comparative Pathobiology, Purdue University Life Science Programs, Purdue University (Sidney Kimmel Scholar)
2010-2017: Professor, Department of Comparative Pathobiology, Purdue University (University Faculty Scholar)
2011-2017: Section Head, Microbiology, Immunology and Molecular Genetics, Department of Comparative Pathobiology, Purdue University
2013-2017: Professor (courtesy), Weldon School of Biomedical Engineering, Purdue University
2015-2017: Program Leader, Purdue Institute of Inflammation, Immunology and Infectious Diseases.
2016-2017: Professor (courtesy), Department of Biological Sciences, Purdue University

2017-present: Professor of Pathology, University of Michigan School of Medicine
2017-present: Kenneth and Judy Betz Professor of Food Allergy Research, University of Michigan School of Medicine

Other Experience and Professional Memberships

- Grant Reviewer/Study Section: Science Foundation Ireland Investigator Award (2002), National Science Foundation CAREER Program (2005), American Heart Association Immunology and Microbiology/Virology Study Section (2006-2008), US-Israel Binational Science Foundation grant (2008, 2009), Program Project Review, NIH, National Heart, Lung and Blood Institute (2008, 2010), • NIH NIAID, RFA-AI-08-020, Immune Defense Mechanisms at the Mucosa (2009), The Wellcome Trust, Immunology and Infectious Disease, United Kingdom (09-10), CDMRP Breast Cancer Research Program (BCRP), Training-Cell Biology-B review panel (2010), National Medical Research Council (Singapore, 2011), NIH NIAID RFA-AI-10-008: Immune Defense Mechanisms at the Mucosa Cooperative Study Group (2011), NIH NCRR, Shared Instrumentation (2011, 2013), NIH Immunity and Host Defense Study Section (2012), Clinical Training Fellowship Program, Barts and The London Charity (Barts Health NHS Trust, 2012), NIH CMIB-Cellular and Molecular Immunology - B Study Section (2012-2017, 1-3 times/year), Italian Ministry of Education (2013, 2014), Research in Biomedicine and Agriculture (NIH ZRG1 IDM-S and ZRG1 IDM-R (07) S, 2014). Immunology IRG Special Emphasis Panels for F07 Immunology Fellowships and AREA: ZRG1 F07-J & ZRG1 IMM-J (2015); ZRG1 EMNR-S (02): Metabolism, Nutrition and Molecular Endocrinology (2015); NIH CMIA-Cellular and Molecular Immunology- A Study Section (2016); NIH ZRG1 EMNR-F Molecular and Cellular Aspects of Nutrition, Obesity and Diabetes (2016). ZRG1 DKUS-M Digestive, Kidney and Urological Systems Integrated Review Group (2017). NIAID, Tissue resident lymphocyte program project study section (2018); NIH Immunology Fellowship Study Section (June 2017, Feb 2018, June 2018, October 2018, March &June 2019); Swiss National Science Foundation (November 2018). DOD PRMRP DIS-A-PTOA Panel Member (June 2019); Emergency Awards: Rapid Investigation of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and Coronavirus Disease 2019 (COVID-19)
- Council member, Autumn Immunology Conference (2002-2005); Conference Chair, Chemokines (2004); Regulatory T cells (2005), Autumn Immunology, Chicago; Session Chair and Panel Discussion Moderator, The Sixth Annual Umbilical Cord Blood Transplantation Symposium (2008), Los Angeles, STOPENTERICS (EU) Round table (2011), AAI 2017 guest symposium organizer (2016-2017).
- Journal Editor: PLOS ONE (Academic Editor), Frontiers in Cellular and Infection Microbiology (FCIM, Associate Editor), Immune Network (Deputy Editor).

Honors

1997, Rudell/Wright Scholarship (Walther Cancer Institute)
1998, Presidential Award (1st Place), Society for Leukocyte Biology, 33rd Annual Meeting, San Diego
1999, Career Development Program Fellow Award (1999-2002), Leukemia Society of America
2002, Career Development Program Special Fellow Award (2002-2005), Leukemia and Lymphoma Society
2003, New Investigator Award. Leukemia Research Foundation
2005, Pfizer Showell Travel Award, American Association of Immunologists
2005, Sidney Kimmel Scholar Award (the Sidney Kimmel Foundation for Cancer Research) (2005-2007)
2006, Pfizer Award for Research Excellence
2007, Crohn's and Colitis Foundation Senior Investigator Award (2007-2010)
2008-2013, University Faculty Scholar (A distinguished professorship), Purdue University
2012, PVM Award for research excellence, Purdue University
2015-2017, President, Association of Korean Immunologists in America.
2017, Kenneth and Judy Betz Endowed Professorship, MHW Food Allergy Center, University of Michigan

C. Contribution to Science
Publications (Selected from ~120 articles)

1) Trafficking mechanisms of functionalized specialized lymphocytes. We have been studying lymphocyte trafficking for more than two decades. We defined the trafficking receptor profiles and migration behaviors of key effector T cells such as Th1, Th2, Th17, FoxP3+ T cells, and NKT cells along with their effector

functions in regulating immune responses and inflammation. Most recently, we reported that innate lymphoid cell subsets such as ILC1 and ILC3 undergo trafficking receptor switches in secondary lymphoid tissues a manner similar to Th cells to migrate into the intestine. In contrast, ILC2 acquire the migration potential in the bone marrow.

Kim CH, Rott LS, Kunkel EJ, Genovese M, Andrew DP, Wu L, and Butcher EC. Rules of chemokine receptor association with T cell polarization in vivo. J Clin Invest. 2001; 108(9):1331-9.

Kang SG, Piniecki RJ, Lim HW, HogenEsch H, Braun SE, Wiebke E, Matsumoto S, **Kim CH**. Identification of a chemokine network that recruits FoxP3+ regulatory T cells to inflamed intestine. Gastroenterology, 2007. 132, 966-981.

Wang C, Thangamani S, Kim M, Gu BH, Lee JH, Taparowsky EJ, **Kim CH**. BATF is required for normal expression of gut-homing receptors by T helper cells in response to retinoic acid. J Exp Med. 2013, 210(3):475-89.

Kim MH, Taparowsky EJ, **Kim CH**. Retinoic acid differentially regulates the migration of innate lymphoid cell subsets to the gut. Immunity. 2015; 43(1):107-19.

2) Chemokines and migration of hematopoietic stem and progenitor cells. Major factors that regulate the trafficking of hematopoietic stem and progenitor cells were unknown in 1990's. We found that SDF-1 (now commonly called CXCL12) regulates the migration of stem and progenitor cells and demonstrated that it is the most important trafficking factor for hematopoietic stem and progenitor cells in the bone marrow. Similarly, we demonstrated that it is the most efficacious chemoattractant for primitive T cell progenitors in the thymus. This finding set the stage for the widespread research on SDF-1 in regulating cell migration and hematopoiesis. Utilizing transgenic mice, we further found that SDF-1 is an important growth factor for stem and progenitor cells.

Kim CH and Broxmeyer HE. In vitro behavior of hematopoietic progenitor cells under the influence of chemoattractants: SDF-1, Steel Factor and the bone marrow environment. 1998, Blood, 91:100-110.

Kim CH, Pelus LM, White JR, and Broxmeyer HE. Differential chemotactic behavior of developing T cells in response to thymic chemokines. 1998, Blood, 91:4434-4443.

Broxmeyer HE, Cooper S, Kohli L, Hangoc G, Lee Y, Mantel C, Clapp DW, **Kim CH**. Transgenic expression of stromal cell-derived factor-1/CXC chemokine ligand 12 enhances myeloid progenitor cell survival/antiapoptosis in vitro in response to growth factor withdrawal and enhances myelopoiesis in vivo. 2003, J Immunol. 170:421-9.

Broxmeyer HE, Cooper S, Hangoc G, **Kim CH**. Stromal cell-derived factor-1/CXCL12 selectively counteracts inhibitory effects of myelosuppressive chemokines on hematopoietic progenitor cell proliferation in vitro. 2005. Stem Cells Dev. 14: 199-203.

3) Identification of GC Tfh and Tfr cells that regulate B cell responses. We found the presence of $CD4^+$ Th cells in germinal centers, and these cells are specialized in helping B cell differentiation and antibody production. Moreover, we discovered the presence of FoxP3+ T cells in germinal centers and these cells suppress the functions of B cells and Tfh cells. This was the first documentation of Tfr cells in the literature.

Kim CH, Rott LS, Clark-Lewis I, Campbell DJ, Wu L, Butcher EC. Subspecialization of CXCR5+ T cells: B helper activity is focused in a germinal center-localized subset of CXCR5+ T cells. 2001, J. Exp. Med. 193:1373.

Campbell DJ, **Kim CH** and Butcher EC, Separable populations of effector CD4+ T cells mediate B cell help and tissue inflammation. 2001, Nature Immunology, 9:876-881.

Lim HW, Hillsamer P, **Kim CH.** Regulatory T cells acquire migratory capacity to follicles upon T cell activation and suppress GC-T helper cell-driven B cell responses. 2004. J Clin Invest. 114:1640-1649.

Lim HW, Hillsamer P, Banham AH, and **Kim CH**, Cutting Edge: Direct suppression of B cells by CD4+CD25+ regulatory T cells. J Immunol 2005. 175: 4180-4183.

4) Identification of the role of retinoic acid in regulating immunity and immune tolerance. We discovered the role of retinoic acid in inducing FoxP3+ T cells. We went on to demonstrate the in vivo role of vitamin A in regulating inflammatory bowel disease. We also found that retinoic acid is required for migration and effector function of Th17 cells and ILCs in the gut. We also discovered the role of retinoic acid in inducing Arg1-expressing dendritic cells and P2X7 for effector T cell contraction in the gut.

Kang SG, Lim HW, Andrisani OM, Broxmeyer HE, and **Kim CH**. Vitamin A Metabolites induce gut homing FoxP3+ regulatory T cells. J Immunol, 2007. 179: 3724-3733.

Kang SG, Wang C, Matsumoto S, **Kim CH**. High and low vitamin A therapies induce distinct FoxP3+ T-cell subsets and effectively control intestinal inflammation. Gastroenterology. 2009,137(4):1391-402.

Hashimoto-Hill S, Friesen L, Park ST, Im S, Kaplan, M, Kim CH. RARa supports the development of Langerhans cells and langerin-expressing dendritic cells. 2018. Nature communications. 2018; 9(1):3896.

Friesen L, Gu B, Kim CH. A ligand-independent fast function of RARα promotes exit from metabolic quiescence upon T cell activation and controls T cell differentiation. Mucosal Immunol (2020). PMID: 32518366 DOI: 10.1038/s41385-020-0311-9

5) Roles of short-chain fatty acids in regulating immunity, inflammation and cancer. The commensal bacteria in the gut produce metabolites that are important for hosts in many different aspects. We found the roles of the gut microbial metabolites short-chain fatty acids (SCFAs) in potentiating epithelial innate immune responses to invading microbes. We also found that SCFAs boost the production of both effector (Th1 and Th17) and IL-10^{+} regulatory T cells. Recently, we reported that SCFAs support mucosal and systemic B cell responses.

Kim MH, Kang SG, Park JH, Yanagisawa M, **Kim CH.** Short-chain fatty acids activate gpr41 and gpr43 on intestinal epithelial cells to promote inflammatory responses in mice. Gastroenterology. 2013, (2):396-406.

Park J, Kim M, Kang SG, Jannasch AH, Cooper B, Patterson J, and **Kim CH**. Short chain fatty acids induce both effector and regulatory T cells by suppression of histone deacetylases and regulation of the mTOR-S6K pathway. Mucosal Immunol. 2015 (1):80-93.

Kim M, Qie Y, Park J, **Kim CH**. Gut microbial metabolites fuel host antibody responses. Cell host & microbe. 2016; 20(2):202-14. NIHMSID: NIHMS802990

Sepahi A, Liu Q, Friesen L, **Kim CH**. Dietary Fiber Metabolites Regulate Innate Lymphoid Cell Responses. Mucosal Immunol (2020). PMID: 32541842 DOI: 10.1038/s41385-020-0312-8

URL to a full list of published work:
http://www.ncbi.nlm.nih.gov/sites/myncbi/chang.kim.1/bibliography/40490947/public/?sort=date&direction=descending