

PROMOTION RECOMMENDATION  
THE UNIVERSITY OF MICHIGAN  
MEDICAL SCHOOL  
DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY

Eric C. Martens, Ph.D., associate professor of microbiology and immunology, with tenure, Department of Microbiology and Immunology, Medical School, is recommended for promotion to professor of microbiology and immunology, with tenure, Department of Microbiology and Immunology, Medical School.

Academic Degrees:

Ph.D.	2005	University of Wisconsin
B.S.	1997	Washington University

Professional Record:

2016 – present	Associate Professor of Microbiology and Immunology, with tenure, University of Michigan
2009 – 2016	Assistant Professor of Microbiology and Immunology, University of Michigan
2009	Instructor of Pathology, Washington University

Summary of Evaluation:

Teaching: Dr. Martens' signature contribution to classroom education is Microbiology 430, Microbial Symbiosis, a course that he co-developed and for which he is currently course director. The course is a timely offering allowing upper level undergraduate students to gain an in-depth understanding of what has become an expanding area of research. It focuses on the ways in which pathogenic and non-pathogenic microorganisms interact with their hosts at various body sites. Dr. Martens regularly contributes to medical student education as a group leader for the M1 infectious disease course, and periodically contributes lectures or laboratory exercises to graduate and undergraduate courses across campus. In 2020, he was awarded the Endowment for the Basic Sciences Teaching Award. In the laboratory, he has mentored seven graduate students, six post-doctoral fellows, three visiting scholars and five undergraduate students. As a tribute to his skill as a mentor, all of his former trainees are currently pursuing careers in science, most in academics. He has served or is serving on 14 Ph.D. dissertation committees, and he recently served as the chair of the Microbiology and Immunology Graduate Studies Committee.

Research: Dr. Martens has studied polysaccharide utilization functions of members of these indigenous microbes, their regulation, and their effects on host biology. A prominent group of these bacteria, the Bacteroidetes, have evolved mechanisms to sense, degrade and import sugars derived from dietary fiber polysaccharides and other sources such as mucosal glycans, dietary additives and other microbes. They employ a series of carbohydrate utilization systems known as Sus-like systems that are encoded by multiple homologous regions known as polysaccharide utilization loci, or PULs. Dr. Martens' work has been central in contributing to our understanding of these systems and their role in human health. His studies have shown that that these organisms possess hierarchical polysaccharide utilization behaviors in which more preferred nutrients, such as components of dietary fiber, are consumed first while less preferred nutrients are reserved for

later growth after those with higher priority are depleted or gone. This work has led to the discovery that chronic dietary fiber deprivation promotes both increased activity and abundance of bacteria that are capable of degrading host mucosal glycans. Loss of these mucosal glycans reduces the thickness of colonic mucus leading to increased susceptibility of mice to infectious agents and inflammatory bowel diseases. Dr. Martens' interest in bacterial polysaccharide utilization has also led to investigation of the functions of bacterial capsular polysaccharide antigens *in vivo*. This work built off of his prior work analyzing polysaccharide utilization loci, and helped to illuminate the functional roles of capsular polysaccharides and how they interact with the immune system and confer colonization fitness. Most recently, the Martens laboratory's work has extended into the bacteriophage arena showing that capsular polysaccharides and other surface molecules made by key gut commensals can determine the susceptibility of the bacteria to bacteriophage, influencing not only the bacteria themselves but also the intestinal virome and possibly human health. Dr. Martens' record reveals an active and independent laboratory as well as strong national and international collaborations, resulting in widespread scholarly impact and a reputation as a leader in his field. He is in great demand as a collaborator and as an invited speaker both nationally and internationally. His research has been continually funded through the NIH and foundation grants, and is routinely published in high-impact journals such as *Cell Host, Microbe, Nature Microbiology and Cell* among others.

#### Recent and Significant Publications:

Porter NT, Hryckowian AJ, Merrill BD, Fuentes JJ, Gardner JO, Glowacki RWP, Singh S, Crawford RD, Snitkin ES, Sonnenburg JL, and Martens EC: Phase-variable capsular polysaccharides and lipoproteins modify bacteriophage susceptibility in *Bacteroides thetaiotaomicron*. *Nature Microbiology* In press June 29<sup>th</sup>, 2020

Glowacki RWP, Pudlo NA, Tuncil Y, Luis AS, Sajjakulnukit P, Terekhov AI, Lyssiotis CA, Hamaker BR, and Martens EC: A Ribose-Scavenging System Confers Colonization Fitness on the Human Gut Symbiont *Bacteroides thetaiotaomicron* in a Diet-Specific Manner. *Cell Host and Microbe*, 27:79-92, 2020

Porter NT, Canales P, Peterson DA, Martens EC: A polysaccharide capsule in the human commensal *Bacteroides thetaiotaomicron* that promotes increased competitive fitness in the mouse gut. *Cell Host & Microbe* 22:494-506, 2017.

Desai MS, Seekatz AM, Koropatkin NM, Kamada N, Hickey CA, Wolter M, Pudlo NA, Kitamoto S, Terrapon N, Muller A, Young VB, Henrissat B, Wilmes P, Stappenbeck TS, Núñez G, Martens EC: A Dietary Fiber-Deprived Gut Microbiota Degrades the Colonic Mucus Barrier and Enhances Pathogen Susceptibility. *Cell* 167:1339-1353, 2016.

Pudlo NA, Urs K, Suresh Kumar S, German JB, Mills DA, Martens EC: Symbiotic human gut bacteria with variable metabolic priorities for host mucosal glycans. *MBio* 6:e01282-15, 2015.

Service: Since his last promotion, Dr. Martens has continued to contribute energetically to institutional, national, and international organizations. At the university level, he has served on the Microbiology and Immunology Academic Promotions and Awards Committee, and he recently served as the chair of the Graduate Studies committee. Nationally and internationally, he is an

associate or section editor for the *Journal of Bacteriology*, *Microbiome*, *Frontiers in Cellular and Infection Microbiology*, and *Gut Microbiome*, and is an active reviewer for numerous other journals. He serves on several national and international study sections and as a consultant for several independent companies and start-ups.

External Reviewers:

Reviewer A: “The publications from the Martens lab set the benchmark for excellent work in the microbiome field...Simply put, Eric is the world leader in this field. He is the first person that anyone would contact for collaboration or consultation regarding complex carbohydrate utilization by the microbiome.”

Reviewer B: “This portfolio is outstanding. He has assembled an amazing body of work that has made profound discoveries in how anaerobic gut bacteria colonize the gut and influence the well-being of the animal...I cannot think of a researcher in Dr. Martens’ peer group that has been more productive, had a greater impact or had secured more federal funding...He has published numerous key papers, developed an independent and internationally recognized research program and has a clear path to maintain this level of work in the future.”

Reviewer C: “Dr. Martens is producing fundamental research findings in the field of microbiome sciences that is the highest caliber of scientific rigor and quality...The quality of his research program is reflected by the fact that he is well funded by NIH grants and is publishing high impact papers in top tier journals.”

Reviewer D: “Altogether, Eric and his group have made foundational contributions to the study of carbohydrate utilization by intestinal bacteria and how this impacts host health...Overall, Eric and his lab have produced an impressive body of work that has made foundational advances in the understanding of bacterial carbohydrate utilization in the gut and its impact on microbial ecology and host health. He routinely publishes high-impact papers and has amassed a portfolio of grant support that will generously fuel his work over the next several years.”

Reviewer E: “...Dr. Martens does excellent work, which has been published in quality journals. His work on polysaccharide degradation by gut bacteria is particularly strong and creative...His work has had a significant impact in the microbiome field.”

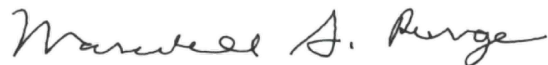
Reviewer F: “Eric’s CV is impressive on a number of levels, and provides a clear vision of the impact of his work on the field of microbiome research...Eric is one of the top two researchers discovering the role of *Bacteroides* polysaccharide biochemistry, physiology and evolution in the mammalian gut tract, an area of study that has exploded in importance both from its academic significance and its practical application in identifying specific dietary impacts on the maintenance of health and mitigation of disease.”

Reviewer G: “The quality of these papers are quite high and have established him as premier internationally recognized investigator in the area of gut microbial metabolism of dietary fiber and intestinal mucus...He has internationally recognized scientific contributions that are both sustained and increasing in activity. His numerous publications and research insights have international impact as evidenced by his consistent very high quality publications, current grant

funding and multiple invitations to speak at high impact national and international research conferences.”

Summary of Recommendations:

Dr. Martens has distinguished himself as an outstanding researcher who is a leader in a new and expanding field of microbiome research, providing and contributing to profound discoveries. He is internationally renowned in the area of gut microbial metabolism of dietary fiber and intestinal mucus. He is an outstanding educator, and has strong service institutionally, nationally and internationally. I am pleased to recommend Eric C. Martens, Ph.D. for promotion to professor of microbiology and immunology, with tenure, Department of Microbiology and Immunology, Medical School.



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Marschall S. Runge, M.D., Ph.D.  
Executive Vice President of Medical Affairs  
Dean, Medical School

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