Approved by the Regents
May 21, 2020

PROMOTION RECOMMENDATION
THE UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF PEDIATRICS
DEPARTMENT OF MOLECULAR AND INTEGRATIVE PHYSIOLOGY

Carey N.K. Lumeng, M.D., Ph.D., associate professor of pediatrics, with tenure, Department of Pediatrics, and associate professor of molecular and integrative physiology, without tenure, Department of Molecular and Integrative Physiology, Medical School, is recommended for promotion to professor of pediatrics, with tenure, Department of Pediatrics, and professor of molecular and integrative physiology, without tenure, Department of Molecular and Integrative Physiology, Medical School.

Academic Degrees:

M.D.	2000	University of Michigan
Ph.D.	2000	University of Michigan
A.B.	1992	Princeton University

Professional Record:

2014-present	Associate Professor of Pediatrics, University of Michigan
2014-present	Associate Professor of Molecular and Integrative Physiology, University of Michigan
2008-2014	Assistant Professor of Pediatrics, University of Michigan
2008-2014	Assistant Professor of Molecular and Integrative Physiology, University of Michigan
2006-2008	Clinical Lecturer of Pediatrics, University of Michigan

Summary of Evaluation:

Teaching: Dr. Lumeng has established a remarkable track record of mentorship at all levels of trainees including undergraduate and graduate students, post-doctoral trainees, medical students, house officers, pediatric pulmonary fellows, and junior faculty. He teaches didactically to medical students, house officers, and pediatric pulmonary fellows while on clinical service. Dr. Lumeng is an active member of graduate student educational programs in Molecular and Integrative Physiology, Cell and Molecular Biology and the Graduate Program in Immunology. He has served on multiple Ph.D. dissertation committees. Several of his trainees currently hold academic faculty positions in biomedical research. The effectiveness and quality of his research mentorship is evidenced by the high number of NIH fellowship awards that his mentees have received with one mentee having secured an R01.

Dr. Lumeng's long-standing commitment to diversity includes his leadership role as the director of the University of Michigan SMART undergraduate summer program within the Medical Scientist Training Program. This program provides research opportunities and experiences for a diverse group of students who are underserved and underrepresented in the sciences including those from disadvantaged educational, economic, cultural, or geographic backgrounds including students with physical or mental disabilities.

Research: Dr. Lumeng's research centers on obesity-induced inflammation and the contribution of adipose tissue immune cells to obesity associated complications such as type 2 diabetes and metabolic syndrome. His laboratory seeks to understand why having excess adipose tissue disrupts

normal physiology in hopes of identifying ways to disrupt the links between obesity and disease. Since his promotion to associate professor, Dr. Lumeng's lab has made several paradigm shifting discoveries that have revealed important and novel aspects of immune cells in adipose tissue, and he has pioneered new techniques to define and characterize adipose tissue dendritic cells. These contributions have resulted in intramural and extramural collaborations related to inflammatory mechanisms of obesity. Dr. Lumeng's research now extends from mice with diet-induced obesity to human obese patients undergoing bariatric surgery in collaboration with a University of Michigan leading bariatric surgeon, Dr. Robert O'Rourke. Dr. Lumeng has had strong and successful extramural funding from the National Institutes of Health, the Veterans Affairs, the American Diabetes Association, and through foundations. Dr. Lumeng has published more than 68 peer-reviewed articles, and has been invited to present his research on 45 occasions regionally, nationally and internationally.

Recent and Significant Publications:

Muir LA, Kiridena S, Griffin C, DelProposto JB, Geletka L, Martinez-Santibañez G, Zamarron BF, Lucas H, Singer K, O'Rourke RW, Lumeng CN: Frontline Science: Rapid adipose tissue expansion triggers unique proliferation and lipid accumulation profiles in adipose tissue macrophages. *Journal of Leukocyte Biology* 103(4): 615-628, 2018.

Zamarron BF, Mergian TA, Cho KW, Martinez-Santibanez G, Luan D, Singer K, Delproposto JL, Geletka LM, Muir LA, Lumeng CN: Macrophage Proliferation Sustains Adipose Tissue Inflammation in Formerly Obese Mice *Diabetes* 66(2): 392-406, 2017.

Cho, KW, Zamarron, BJ, Muir, LA, Singer, K, Delproposto, JL, Geletka, L, Meyer, KA, O'Rourke, RW, and Lumeng, CN: Adipose Tissue Dendritic Cells Are Independent Contributors to Obesity-Induced Inflammation and Insulin Resistance *Journal of Immunology* 197(9): 3650-3661, 2016.

Muir LA, Neeley CK, Meyer KA, Baker NA, Brosius AM, Washabaugh AR, Varban OA, Finks JF, Zamarron BF, Flesher CG, Chang JS, DelProposto JB, Geletka L, Martinez-Santibanez G, Kaciroti N, Lumeng CN, O'Rourke RW: Adipose tissue fibrosis, hypertrophy, and hyperplasia: Correlations with diabetes in human obesity. *Obesity (Silver Spring)* 24(3): 597-605, 2016.

Cho KW, Morris DL, DelProposto JL, Geletka L, Zamarron B, Martinez-Santibanez G, Meyer KA, Singer K, O'Rourke RW, Lumeng CN: An MHC II-Dependent Activation Loop between Adipose Tissue Macrophages and CD4+ T Cells Controls Obesity-Induced Inflammation. *Cell Reports* 23(9): 605-617, 2014.

Service: Dr. Lumeng cares for pediatric patients with respiratory illnesses including asthma, cystic fibrosis, bronchopulmonary dysplasia, and sleep apnea in inpatient and outpatient settings. These pediatric disorders are all associated with metabolic abnormalities or are worsened by obesity, thus, they provide important links between his research focus and clinical practice.

He has a strong record of service within the institution and nationally. At the national level, Dr. Lumeng served as member of the Research Grant Review Committee of the American Diabetes Association, and presently serves as an associate editor for *JCI Insight* and as an associate editor for *Diabetes*. He has been a frequent grant reviewer for the NIH and was appointed in 2017 as a permanent member of the Integrative Physiology of Obesity and Diabetes (IPOD) Study Section, which is the primary study section reviewing grants relevant to immunometabolism research. He has served as an ad-hoc reviewer for many prominent journals, including *PLoS One*, *Diabetes*,

Pediatrics, and *Cell*. Institutionally, Dr. Lumeng has served as a member and chair of the Biomedical Research Council, as a member of the Medical School Admissions Executive Committee, and the faculty mentoring lead for the Michigan Institute for Clinical and Health Research (MICHR). He serves as the director of Faculty Development in the Department of Pediatrics. Dr. Lumeng was appointed as the Frederick G.L. Huetwell Professor for the Cure and Prevention of Birth Defects in 2018.

External Reviewers:
Reviewer A: "Dr. Lumeng has been the author or co-author of 67 peer-reviewed publications, including 59 original research manuscripts, largely focusing on the mechanisms of obesity-related effects on inflammation and immunity…Further evidence of his scientific stature is provided by his funding as Principal Investigator or Co-Principal Investigator of two R01 grants, his appointment as a Permanent Member of an NIH (IPOD) Study Section, his 45 extramural invited presentations at the national and international levels, and his being awarded an endowed Chair (the Frederick G.L. Huetwell Professorship for the Cure and Prevention of Birth Defects)…Dr. Lumeng is an outstanding physician-scientist, as attested by the impactful and high quality of his research work, his extramural funding, and his national and international reputation."

Reviewer B: "In my estimation, Dr. Lumeng has consistently published novel papers that are of the highest quality and import in understanding of adipose tissue inflammation. The importance of his manuscripts is underscored by the fact they are referred to by other prominent researchers in the field and are [sic] also form an important foundation of the latest knowledge for researchers investigating obesity-associated inflammation…In his 2016 paper in Journal of Immunology, his work investigating the independent role of adipose tissue dendritic cells in obesity associated inflammation and insulin resistance provides a critical link to understanding the significance of dendritic cell activation with obesity and associated metabolic complications. Importantly, this paper provided a revised strategy to definitively identify adipose tissue macrophages and adipose tissue dendritic cell which had up to this point in time had hindered that ability of researchers to clearly elucidate the role of macrophages and dendritic cells in adipose tissue of obese animals and mice."

Reviewer C: "He is widely recognized for the contributions his lab has made to the understanding of immunologic aspects of adipose tissue and the role immune cells in adipose tissue play in metabolic disease and the regulation of metabolism in adipocytes…Important recent contributions to the field of diabetes research have come from his efforts in clinical/translational obesity research in collaboration with a bariatric surgeon-scientist Bob O'Rourke MD in the Department of Surgery…His mean Relative Citation Ratio (RCR) of 3.78 demonstrates that his papers receive over 3 times as many citations per year as other NIH-funded publications in the field of diabetes research. His expertise has been recognized by the appointments as a standing member of the Integrative Physiology of Obesity and Diabetes (IPOD) NIH study section which the primary review group focused on funding grants related to immune contributions to diabetes."

Reviewer D: "Since his promotion to Associate Professor in 2014 he has continued to make important scholarly contributions to the field. He has recently identified key roles of macrophages and dendritic cells as well as class II MHC restricted CD4+ T cells in regulating tissue inflammation associated with obesity and metabolic syndrome. He is internationally recognized for this work and he has an h-index of 28. In addition to this, his work has been recognized and supported by the NIH. In addition to his research program, he has an exceptional record of teaching, clinical care, and University service."

Reviewer E: "He is an 'emerging leader' in the field of immunometabolism. He has made several seminal contributions including the discovery that adipose tissue macrophage function as an antigen presenting cell is required to induce T cell activation and metabolic inflammation in mice, a finding of enormous importance which has triggered a new trend in adipose tissue dysfunction and related insulin resistance. He has made numerous other important discoveries including the key role of fibrosis and dendritic cells in the adipose tissue inflammation of obese animal models and humans."

Reviewer F: "His scholarly impact has been very high, as evidenced by the quality and quantity of the contribution to the literature. He has 68 peer-reviewed manuscripts. Half of these publications were during the past 5 years since his promotion to associate professor with tenure, which demonstrates his continued high level of scholarly achievement. Among his publications during the past 5 years, there have been 5 highly cited publication focusing upon the mechanistic role of dendritic and macrophage cells in adipose tissue inflammation. In addition, Dr. Lumeng has maintained an extremely high level of extra-mural research funding, particularly from NIH, throughout his career. He has an excellent national and international research reputation, as evidenced by invitation to participate in prominent national and international research grant review committees, and as a speaker at prominent national and international conferences."

Summary of Recommendations:
Dr. Lumeng is a scientist of international renown for his pioneering work in the field of adipose tissue immunity. He continues to make new discoveries about the cellular components of this response in mice and humans, and is poised to advance his research on individual immune cell subsets and their gene expression. He is also an outstanding mentor and clinician who has performed valuable service to the University of Michigan and the field at large. I am pleased, therefore, to recommend Carey N.K. Lumeng, M.D., Ph.D. for promotion to professor of pediatrics, with tenure, Department of Pediatrics, and professor of molecular and integrative physiology, without tenure, Department of Molecular and Integrative Physiology, Medical School.

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

May 2020