

PROMOTION RECOMMENDATION
UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF ANESTHESIOLOGY

Lauren G. Koch, Ph.D., assistant professor of anesthesiology, Department of Anesthesiology, Medical School, is recommended for promotion to associate professor of anesthesiology, with tenure, Department of Anesthesiology, Medical School.

Academic Degrees:

Ph.D.	1990	Medical College of Ohio
B.S.	1985	Marietta College, Marietta, Ohio

Professional Record:

2009-present	Assistant Professor of Anesthesiology, University of Michigan
2004-2009	Assistant Professor of Physical Medicine and Rehabilitation, University of Michigan
2000-2004	Assistant Professor of Physiology and Molecular Medicine, Medical College of Ohio (note: Medical College of Ohio name changed to University of Toledo College of Medicine)

Summary of Evaluation:

Teaching: In the early phase of Dr. Koch's career (1989 to 2004) she taught physiology to allied health students and to physiology graduate students. While at University of Toledo College of Medicine, she taught medical students in a problem-based learning format. Since being recruited to Michigan, Dr. Koch has taught cardiovascular physiology in the small group sessions for first-year medical students. At Michigan, Dr. Koch served from 2004 to 2007 as a research mentor for 14 students. Some of these students are from the Undergraduate Research Opportunity Program (UROP). Evaluations letters submitted by students give her a high, positive ranking.

Research: Dr. Koch started 14 years ago a research program designed to test the aerobic hypothesis that the intrinsic capacity for oxygen metabolism is a major factor contributing to a divide between health and disease. Her working hypothesis was stimulated by epidemiological data showing that maximal oxygen consumption is a strong predictor of morbidity and mortality. In order to provide an experimental test of her working hypothesis she developed a colony of rodents that were selected for low and high aerobic capacity. After 10 generations of selective breeding, these two populations of rats differed by about 350% in the aerobic capacity (Sci 305:418, 2005). The highly aerobic rats ran and the low aerobic capacity rats did not excel at distance running. In support of her hypothesis, the low aerobic capacity animals were obese and modeled features homologous to human metabolic syndrome. The ongoing epidemic of obesity and metabolic syndrome, and the poorly understood link between this syndrome and co-morbid conditions makes her rodent model an important resource. A metric of the significance of her

research program is her high level of productivity and the support of her aerobic hypothesis. Dr. Koch and her collaborators reasoned that the most rigorous test of their working hypothesis would be provided if the rodent model could be made widely available to other investigators. By involving multiple investigators who use a wide array of techniques, at 30 or more universities, she is providing a robust test of her hypothesis. Most impressive is that a consensus is emerging from other investigative teams in favor of the hypothesis that diminished aerobic capacity is associated with a wide variety of abnormal conditions. Dr. Koch currently has published 70 peer reviewed papers. Evidence of national level recognition is provided by her invitation to the 2007 National Institutes of Health conference on Gene-Nutrition and Gene-Physical Activity: Interactions in the Etiology of Obesity. In the same year, Dr. Koch was invited to present at the National Academies Keck Futures Initiative conference on The Future of Human Healthspan: Demography, Evolution, Medicine, and Bioengineering. In 2009, Dr. Koch represented the University at the Arthur M. Sackler Colloquia of The National Academies of Sciences meeting on *Evolution in Health and Medicine*. Dr. Koch is the principal investigator on a P60 grant from the NIH/NIDDKD and co-principal investigator on an R24 from the NIH/NCRR.

Recent and Significant Publications:

Muncey AR, Saulles AR, Koch LG, Britton SL, Baghdoyan HA, Lydic R: Disrupted sleep and delayed recovery from chronic peripheral neuropathy are distinct phenotypes in rat model of low aerobic capacity. *Anesthesiology* June, 2010. (in press)

Swallow JG, Wroblewska AK, Waters RP, Renner KJ, Britton SL, Koch LG: Phenotypic and evolutionary plasticity of body composition in rats selectively bred for high endurance capacity. *Journal of Applied Physiology* Jun 17, 2010. [Epub ahead of print]

Kivelä, R, Silvennoinen M, Lehti M, Rinnankoski R, Purhonen T, Ketola T, Pullinen K, Vuento M, Mutanen N, Sartor MA, Reunanen H, Koch LG, Britton SL, Kainulainen H: Gene expression centroids that link with low intrinsic aerobic exercise capacity and complex disease risk. *The FASEB Journal* Jul 19, 2010 [Epub ahead of print].

Koch LG, Britton SL: Aerobic metabolism underlies complexity and capacity. *Journal of Physiology* 586:83-95, 2008.

Wisloff U, Najjar SM, Ellingsen Ø, Haram PM, Swoap S, Al-Share Q, Fernström M, Rezaei K, Lee SJ, Koch LG, Britton SL: Cardiovascular risk factors emerge after artificial selection for low aerobic capacity. *Science* 307:418-420, 2005. (Featured cover image for Science On-Line)

Service: University of Michigan service includes participation in the Michigan Diabetes Research and Training Center, and Michigan Metabolomics and Obesity Center, and the Michigan Bone & Joint Injury Prevention & Rehabilitation Center. Dr. Koch provides service as a reviewer for professional journals and review of grant applications to the National Science Foundation. Local community service includes participation in the Pioneer High School Community Resource Program.

External Review:

Reviewer A: "...Lauren Koch is an outstanding scientist. She has played a key role in the development of a transformation animal model, and then played an equally key role in the full intellectual exploitation of this model. She has used integrative physiology tools to perform detailed high-resolution phenotyping on this model, and via collaborative work information from this model has been used to generate novel insights on physiological adaptations in essentially every key organ system."

Reviewer B: "Her great strength has been and still is her ability to combine a deep understanding of physiological processes with that of modern genetics. She remains highly productive, evidenced by her 65 publications in this field and by her ability to obtain continuous funding for this work from the NIH and other agencies over many years...she is indeed a creative and independent investigator. She is certainly viewed this way by the general scientific community where she is held in high regard for her interesting and productive research, her intellectual capabilities, and her knowledge of the field."

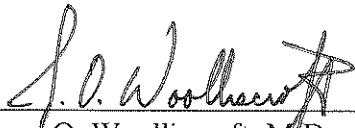
Reviewer C: "...a major hallmark of her work is a willingness to seek out collaborators from diverse disciplines, ranging from molecular genetics to evolutionary biology as well as diverse aspects of biomedical physiology. This kind of multidisciplinary collaboration is where the most important discoveries of the next decade will arise, but also the best path to funding in today's highly competitive grants environment."

Reviewer D: "The work they have taken on, initially with the idea of breeding high performance and low performance strains to study the genetics of aerobic capacity, has taken on a life of its own. I have seen many applications of this model which have developed in their laboratories and those of many collaborators in this country and abroad. It represents a level of scholarship which has had a huge impact on the way we perceive (and study) the capacity to exercise, and the many factors which are involved with this capacity. Their work has greatly changed and influenced their field, and the contributions of Dr. Koch are well appreciated by both her collaborators and her competitors."

Reviewer E: "Dr. Koch's scholarly and professional niche is truly unique in the field of exercise and cardiovascular physiology. Her work, in collaboration with Dr. Britton, in rat genetic models of aerobic capacity is, to my knowledge, not being conducted by another research group anywhere else in North America or the world. As such, it is clear that Dr. Koch's work is highly specialized and highly valued...I believe that Dr. Koch is an outstanding integrative cardiovascular physiologist, researcher, mentor, and a recognized leader in her field. As such, I give Dr. Koch my absolutely highest recommendation for promotion."

Summary of Recommendation:

Dr. Lauren Koch has a remarkably strong record of productivity. Her research has developed a new model system used for the study of complex diseases that affects over 50 million Americans, i.e. cardiovascular disease, type 2 diabetes, elevated blood pressure, abdominal obesity, abnormal blood lipid levels, and insulin resistance. Researchers from all over the world are now using her rat model for their studies. Her science is of the highest caliber and her research program has brought national and international recognition to herself, her department and our institution. I am pleased to recommend Dr. Lauren Koch for promotion to associate professor, with tenure, in the Department of Anesthesiology.



James O. Woolliscroft, M.D.

Dean

Lyle C. Roll Professor of Medicine

May 2011