Approved by the Regents
May 15, 2008

PROMOTION RECOMMENDATION
UNIVERSITY OF MICHIGAN MEDICAL SCHOOL
DEPARTMENT OF CELL AND DEVELOPMENTAL BIOLOGY

Kristen J. Verhey, Ph.D., Assistant Professor of Cell and Developmental Biology, Department of Cell and Developmental Biology, Medical School, is recommended for promotion to Associate Professor of Cell and Developmental Biology, without tenure, Department of Cell and Developmental Biology, Medical School.

Academic Degrees:

Ph.D.	1995	Harvard University
B.S.	1987	University of Michigan

Professional Record:

2002-Present	Assistant Professor of Cell and Developmental Biology, University of Michigan

Summary of Evaluation:

Teaching: In 2004, Dr. Verhey assumed the role of course director and lecturer in Cell Biology (CDB 530, a required Program in Biomedical Sciences graduate core course). She further developed this course into an integrated and interactive learning environment. She implemented active learning practices into this large lecture-based course after participating in an NSF-sponsored Learning Community "Bringing Active Learning to the Classroom." Dr. Verhey replaced one hour of lecture time per week with faculty-led small group discussions. With her help and encouragement, both from a student and faculty perspective, these changes have definitely increased the enjoyment, satisfaction and learning for all of the students enrolled in CDB 530. She has also mentored graduate student assistants, who lead their own discussion sections aimed at increasing comprehension and who also grade the homework and exams. Dr. Verhey has also lectured in the M1 sequence Cells and Tissues and the Cytoskeleton.

Dr. Verhey has served as the Chair of the CDB Graduate Recruitment Committee for three years, and has served for several years on the CDB Curriculum Committee, which considers the teaching responsibilities of faculty and graduate students and makes annual recommendations to the Chair for teaching assignments.

Dr. Verhey currently is mentor to five Ph.D. students, one postdoctoral fellow, and two undergraduate students. One of her graduate students is the recipient of a prestigious NSF Student Fellowship. Her most successful student was selected as an Associate of the Michigan Society of Fellows and also the winner of the nationally prestigious 2007 Norton B. Gilula Award for an Outstanding Graduate Student from the American Society of Cell Biology. She has or is currently serving on nine Ph.D. dissertation committees.

Research: The central theme of Dr. Verhey's research program is microtubule-based motors in mammalian cells. After coming to the University of Michigan, she continued to build on her previous work on the mechanism of Kinesin-1 activity, focusing primarily on its autoinhibition. Her laboratory used a new fluorescence technique in living cells to further elucidate the molecular mechanisms of autoinhibition. Her laboratory identified a novel binding partner of Kinesin-1, called FEZ1, that relieves this autoinhibition and contributes to activation of the motor upon cargo binding. These studies were highlighted in an article in the *Journal of Cell Biology*. These studies constituted the initial results from her first successful NIH R01 application.

Her laboratory also developed an interest in imaging kinesin transport in live cells, which is a particularly challenging endeavor as kinesin-based transport events occur at the temporal and spatial limits of light microscopy and are hindered by fluorescence background from autoinhibited kinesins as well as by cellular autofluorescence. By combining specific fluorescence labeling techniques of Kinesin-1 with specialized imaging techniques (collaborating with Dr. Edgar Meyhofer in the Mechanical Engineering Department), they described the motile characteristics of single Kinesin-1 motor molecules in live cells. This work described the first imaging of a motor in its natural environment and laid the foundation for her second successful NIH R01 application.

Since she began her independent research career in September 2002, Dr. Verhey has been continuously funded from several organizations, including the National Institutes of Health, the Alzheimers Association of America and the Michigan Diabetes Research and Training Center. Dr. Verhey's approach to scientific scholarship has been highly interactive and collaborative. She has established a large network of scientists with whom she routinely interacts, and feels strongly that these collaborations have been critical to her success. Like any good mentor, she attributes her success to her students.

Recent and Significant Publications:

Cai D, Verhey KJ and Meyhofer E: Tracking single kinesin molecules in the cytoplasm of mammalian cells. *Biophysical Journal* 92: 4137-4144, 2007.

Cai D, Hoppe AD, Swanson JA and Verhey KJ: Kinesin-1 structural organization and conformational changes revealed by FRET stoichiometry in live cells. *Journal of Cell Biology* 176: 51-63, 2007.

Blasius TL, Cai D, Jih GT, Toret CP and Verhey KJ: Two binding partners cooperate to activate the molecular motor kinesin-1. *Journal of Cell Biology* 176: 11-17, 2007.

Reed NA, Cai D, Blasius TL, Jih GT, Meyhofer E, J Gaertig J and KJ Verhey KJ. Microtubule acetylation promotes Kinesin-1 binding and transport. *Current Biology* 16: 2166-2172, 2006.

Verhey KJ, D Meyer, RM Deehan, J Blenis, BJ Schnapp, TA Rapoport and B Margolis. Cargo of kinesin identified as JIP scaffolding proteins and associated signaling molecules. *Journal of Cell Biology* 152: 959-970, 2001.

Service: Dr. Verhey is currently a member of the following CDB Departmental committees: Executive Committee; Graduate Affairs Committee; and Chair of the Curriculum Committee. She serves as a committee member for the Single Molecule Steering Committee, Review Committee for the Center for Live Cell Imaging, and the Biophysics Research Division. She is a member of the Cellular and Molecular Biology Training Program and also the Center for Organogenesis Training Program. She has served as a member of the Admissions Committee for the Program in Biomedical Sciences. She is an *ad hoc* reviewer for the National Science Foundation, MCB-Cellular Systems, and is an external advisor for the Dystonia P01, Division of Neuroscience, Massachusetts General Hospital. She has been invited to present talks at several national and international meetings. She is also a member of several professional societies.

External Review:

Reviewer A: "...Dr. Verhey is an excellent scientist [of her cohort] tracking an important question in the field of motor proteins. She has made significant discoveries and is well positioned to continue her ground-breaking work."

Reviewer B: "It is here that Dr. Verhey has made her unique contribution using fluorescence resonance energy transfer to execute a direct demonstration in an intracellular context that kinesin-dependent conformational changes do occur, consistent with motor activation upon substrate binding. Thus...it was Dr. Verhey who provided a definitive *in vivo* test of this idea of how microtubule motors can be maintained in an inactive confirmation until bound by cargoes."

Reviewer C: "...I find her work on the roles of tubulin post-translational modifications on transport to be novel, cutting-edge and important, since the problem has been around for decades, and she is the first to start to make any sense of it....During the summer I heard her present her work at a cutting edge meeting on motor proteins in Japan, where she presented one of the very best talks among many of the leaders in her field of research."

Reviewer D: "Kristen is clearly one of the leaders of the new generation of cell biologists....Kristen is a real asset and you are lucky to have her on the faculty."

Reviewer E: "...I am strongly supportive of the proposed promotion. I think Verhey's work is already having an important impact, and I think her work in the future will be field-leading and influential."

Reviewer F: "...she and her group recently came out with not just one, but a series of utterly important findings on kinesin activation and interaction with microtubules. With these findings Kristen not just carved out a niche, but actually established herself as an important player in the molecular motors field. She is held in high regard by every kinesin aficionado I talk to."

Summary of Recommendation:

Dr. Verhey has achieved a consistent record of exceptional research productivity and funding since coming to Michigan. The high quality of her research is recognized by colleagues here as well as at other premier institutions. Her expertise in microtubule based tracking in mammalian cells and her extremely strong publication record are widely acknowledged both within the University and at other institutions as evidenced by her many productive research collaborations. She has been fully engaged in graduate student teaching and training, as well as medical student teaching. Dr. Verhey has assumed significant administrative responsibilities by serving on a number of interdisciplinary training programs within the University, and chairing as well as serving on numerous committees in the Department of Cell and Developmental Biology. I enthusiastically recommend that Dr. Kristen J. Verhey be promoted to the rank of Associate Professor of Cell and Developmental Biology, without tenure.

James O. Woolliscroft, M.D.
Dean
Lyle C. Roll Professor of Medicine

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