

Approved by the Regents
May 19, 2011

PROMOTION RECOMMENDATION
UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF PEDIATRICS AND COMMUNICABLE DISEASES
DEPARTMENT OF HUMAN GENETICS

Catherine E. Keegan, M.D., Ph.D., assistant professor of pediatrics and communicable diseases, Department of Pediatrics and Communicable Diseases, and assistant professor of human genetics, Department of Human Genetics, Medical School, is recommended for promotion to associate professor of pediatrics and communicable diseases, with tenure, Department of Pediatrics and Communicable Diseases, and associate professor of human genetics, without tenure, Department of Human Genetics, Medical School.

Academic Degrees:

M.D.	1996	University of Michigan
Ph.D.	1996	University of Michigan
B.S.	1988	University of Michigan

Professional Record:

2009-present	Assistant Professor of Human Genetics, University of Michigan
2004-present	Assistant Professor of Pediatrics and Communicable Diseases, University of Michigan
2002-2004	Clinical Lecturer, Department of Pediatrics and Communicable Diseases, University of Michigan

Summary of Evaluation:

Teaching: Dr. Keegan serves as the educational lead for the Division of Pediatric Genetics. In this role, she provides curriculum development for pediatric residents, serves as the rotation coordinator for pediatric residents taking genetics as an elective rotation, and serves as a liaison between the Division of Genetics and the pediatric residency program director. Dr. Keegan dedicates 5% of her annual effort to educational activities. She provides classroom instruction to medical students in both the Department of Pediatrics and Human Genetics. She has provided research instruction to 11 graduate students, one graduate student, and one postdoctoral student in her laboratory. She also mentors UROP students and received the UROP Faculty Recognition Award for Outstanding Mentorship in 2008. Dr. Keegan also instructs students, pediatric residents, and medical genetics residents while serving as an attending on the pediatric genetics service. She provides peer instruction by presenting at monthly case conferences, giving pediatric grand rounds and participating in annual conferences and board review courses. Dr. Keegan is dedicated to her role as educational lead and has developed a series of over 35 cases on a variety of genetic disorders designed to give pediatric residents more exposure to genetics. She regularly presents these cases at morning report and has received excellent feedback. Dr.

Keegan continues to expand her curriculum and has recently worked with Dr. Ayesha Ahmad to bring a series dedicated to biochemical genetics to the residents.

Research: Dr. Keegan's research is focused on the genetics of human caudal malformations using human and mouse models. Funded research projects span the spectrum of ACD (adrenocortical dysplasia in mice and humans) due to telomere dysfunction, OEIS complex (Omphalocele-Exstrophy-Imperforate Anus-Spinal Defects) malformation syndrome in humans, Danforth short tail mutation in mice, and caudal regression in humans. Thus, the theme of her work in caudal developmental genetics is well-delineated, focused and funded. Dr. Keegan currently has over 25 peer-reviewed publications. Her manuscripts are in high profile genetics journals, such as *Molecular & Cellular Biology*, *Clinical Genetics*, *American Journal of Medical Genetics*, and *Molecular Genetics and Metabolism*. In her publications, she is the lead or senior author or has been a critical collaborative investigator with world leaders in telomere biology and clinical genetics. Dr. Keegan was been successful in obtaining an NIH R01, an American Cancer Society grant as well as continuing her March of Dimes funding. She is a past Child Health Research Center K12 awardee and has had a K08 career development award from 2002-2007.

Recent and Significant Publications:

Vlangos CN, Siuniak A, Ackley T, van Bokhoven H, Veltman J, Iyer R, Park JM, Keppler-Noreuil K, Keegan CE: Comprehensive genetic analysis of OEIS complex reveals no evidence for a recurrent microdeletion or duplication. *American Journal of Medical Genetics*, in press.

Kibe T, Osawa GA, Keegan CE, de Lange T: Telomere protection by TPP1 is mediated by Pot1a and Pot1b. *Molecular & Cellular Biology* 30:1059-1066, 2010.

Vlangos CN, O'Connor BC, Morley MJ, Krause AS, Osawa GA, and Keegan CE: Caudal regression in adrenocortical dysplasia (*acd*) mice is caused by telomere dysfunction with subsequent p53-dependent apoptosis. *Developmental Biology* 334:418-428, 2009.

Keegan CE, Hutz JE, Else T, Adamska M, Shah SP, Kent AE, Howes JM, Beamer WG, Hammer GD: Urogenital and caudal dysgenesis in adrenocortical dysplasia (*acd*) mice is caused by a splicing mutation in a novel telomeric regulator. *Human Molecular Genetics* 14:113-123, 2005.

Keegan CE, Vilain E, Mohammed M, Lehoczky J, Dobyns WB, Archer SM, Innis JW: Microcephaly, jejunal atresia, aberrant right bronchus, ocular anomalies, and XY sex reversal. *American Journal of Medical Genetics* 125A:293-298, 2004.

Service: Dr. Keegan serves the division, department and her specialty in many ways. In addition to serving as the educational lead for the Division of Pediatric Genetics, she is a member of the Department's Research Advisory Committee, the Organogenesis Steering Committee as well as the Developmental Sex Disorders Multidisciplinary Group. She is well known regionally and nationally; in October, 2008, she organized and chaired a scientific session at the American Society of Human Genetics meeting on Novel Insights into Telomere Structure and Function. Dr. Keegan is a member of the American Society of Human Genetics Mentor Network and has appeared on a regional news program as an expert on Fragile X syndrome.

Dr. Keegan's clinical attending activities are spread across weekly outpatient Pediatric Genetics Clinic, Pediatric Biochemical Genetics Clinic inpatient call, and Genetics Outreach Clinic in Marquette, Traverse City and Gaylord, MI.

External Review:

Reviewer A: "I have been impressed by her dedication to her clinical and research interests, and by her accomplishment across the full spectrum of tasks required for an academic physician....Her research on the *acd* mutant mouse is first rate, and she has made solid contribution [sic] to understanding the requirement for a telomerase protective protein in mammalian development."

Reviewer B: "I consider Dr. Keegan's career niche to be the translational research of birth defects – a physician-scientist bridging the laboratory and clinical worlds. This is a challenging area in which to work and there are few scientific practitioners in the country who are able to accomplish this. Thus, scientists like Dr. Keegan are extremely valuable to an academic medical center."

Reviewer C: "In studying the genetics of posterior development, Dr. Keegan has identified one of the most understudied areas of human biology...Through application of her unique medical/scientific training and proven scientific accomplishments, Dr. Keegan is establishing a vital and corrective niche in a major neglected area of human development. She is thus bringing exceptional scholarship to the University of Michigan, and to science and medicine as a whole."

Reviewer D: "It is impressive that Dr. Keegan has been able to obtain significant support for her translational mouse studies at a time when funding for the study of rare diseases appears to be declining. In addition, she is also competing successfully for grants addressing more basic research questions arising from her *Acd* gene identification. The latter shows her ability to tackle new fields and is highly commendable. She is poised to make significant contributions to our understanding of the genetic (and probably environmental) influences on complex malformations...She would clearly meet and/or exceed criteria for promotion to Associate Professor with tenure on the regular tenure track at our institution."

Reviewer E: "Dr. Keegan's publications nicely span clinical fields related to a range of birth defects to basic research studies largely related to the adrenocrotical dysplasia (*acd*) mouse mutant....Dr. Keegan has obtained excellent grant funding....this is an excellent reflection on her national reputation and her ability to define significant research questions and approaches to address these problems of great medical significance."

Summary of Recommendation:

Dr. Keegan is an exceptional physician-scientist whose drive and dedication is evident from her success in all areas of patient care, education and research. She is a highly valued faculty member and an ideal candidate for promotion to associate professor, with tenure, in the Department of Pediatrics and Communicable Diseases and associate professor, without tenure, in the Department of Human Genetics.



James D. Woolliscroft, M.D.

Dean

Lyle C. Roll Professor of Medicine

May 2011