Collagen IV Assembly and Trafficking

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SUMMARY

This project is a dynamic collaboration between Tennessee State University, an Historically Black College and University (HBCU) and Vanderbilt University through the Center of Matrix Biology. The venture is to strengthen the research environment for Tennessee State University and to enrich research experiences for underrepresented students, both college level and high school level, attending Tennessee State University, Hunters Lane Comprehensive High School (Nashville, Tenn.) and the Nashville Big Picture High School (Nashville, Tenn.).

The kidney structural filtering unit is called the glomerulus. Disorders of the glomerulus constitute over 60% of all cases of severe kidney disease, a major health problem worldwide. The research focuses on the examination of properties involved with the molecular assembly and arrangement of collagen IV networks required in the glomerular architecture of the kidney. The basis of network stability which can influence the combination of NC1 monomers associated with triple helical protomer formation of self-assembling collagen IV will be determined. Throughout the duration of the project, effort will be rendered to explore the cellular location of the domain assemblage for collagen IV that may help identify the molecular machinery needed to direct tetramerization as a consequence of carbohydrates coupled to collagen molecules. Discovery of the possible pathways in which carbohydrate units impact structural network features will delineate in more detail the significance of saccharides geometry and stability requirements which are fundamental to self-assembly of collagen IV molecules. Research efforts will necessitate the use of cell culture techniques and media, SDS-PAGE procedures, subcellular fractionation, ultracentrifugation analysis, and chemicals that permit the differentiation between carbohydrate molecules.

Currently, this project has six students (two graduates, two undergraduates, and two high school students) participating in research as Tennessee State University/Vanderbilt University Aspirnaut summer research interns. Through the benefits of training and learning in the scientific laboratories, these interns are gaining exposure to biomedical research related to kidney problems and diabetes.
Dr. Michael T. Ivy is a full professor in the Department of Biological Sciences of the College of Agricultural, Human, and Natural Sciences. He received his B.A. degree in Biological Sciences from Southern Illinois University-Carbondale in 1978 and his Ph.D. degree in Physiology from the University of Illinois-Chicago in 1986. Dr. Ivy received extensive expertise in pharmacology research through completion of two post doctoral appointments: Texas Tech University, Lubbock and Loyola University Medical Center in Maywood, Illinois. Prior to joining Tennessee State University, Dr. Ivy served as assistant professor in the Indiana University Center for Medical Education at Indiana State University. His areas of competency are in the fields of neurochemistry, neuroscience, and neurophysiology. During his academic and research career, Dr. Ivy has secured approximately $1.4 million dollars in external funding for neuroscience related research from the National Institutes of Health. As an accomplished researcher, Dr. Ivy has authored and co-authored 16 peer-reviewed publications. Further, Dr. Ivy has been involved in training and mentoring underrepresented minority (URM) students in both the Minority Access to Research Careers (MARC) and Tennessee Louis Stokes Alliance for Minority Participation (TLSAMP) programs that focus on science, technology, engineering and mathematics (STEM) education, which correlates directly with the Aspirnaut Initiative.

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