DEPARTMENT OF NEPHROLOGY/HYPERTENSION
Medical Center

SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: MARCH 3, 2003

The Department of Nephrology/Hypertension is pleased to offer the following research project(s) for the summer of 2003. Interested students are urged to contact the faculty member(s) directing the project(s) that most interest them. By contacting the faculty member, you can discover more about the project, learn what your responsibilities will be, and if possible, develop a timetable for the twelve-week research period.

Cell and Molecular Biology of Acute Renal Failure (ARF)

Professor Prasad Devarajan
MLC 7022 636-4531 FAX: (513) 636-7407
E-Mail: Prasad.Devarajan@CCHMC.org

Our major research interest is in the cell and molecular biology of acute renal failure (ARF). This is an exceptionally important area of investigation in Nephrology. ARF from ischemia-reperfusion injury continues to represent a very significant and potentially devastating problem in clinical medicine. The incidence of ARF is high (200 cases per million adult population), and varies from 5% of hospitalized patients to 50% of patients in intensive care units. Despite significant technical advances in therapeutics, the mortality and morbidity associated with ARF remain dismally high (up to 80% in the ICU patient with multi-organ damage) and have not appreciably improved during the last four decades. In addition to its implications on human life and its quality, the treatment of ARF also represents an enormous financial burden to society, and ARF-associated medical expenses are estimated at over $8 billion per year among adults in the US alone. An improved understanding of the underlying pathophysiology and endogenous repair mechanisms will be critical for innovative and effective therapy. While pioneering studies over several decades have paved the way for successful therapeutic approaches in animal models, translational research efforts in humans have yielded disappointing results. The reasons for this include a lack of early markers for ARF (and hence a delay in initiating therapy), and the multi-factorial nature of the disease. Attempts at unraveling the molecular basis of these myriad mechanisms have been significantly facilitated by recent advances in functional genomics that have yielded new tools for genome-wide analysis of complex biologic processes. We have recently utilized these transcriptome inquiry approaches to analyze the renal response to ischemia both in vitro and in animal models. We have identified several players that appear to be predominant arbiters of cell death and cell survival in renal ischemia-reperfusion injury. A systematic analysis of candidate genes and proteins including loss of function and gain of function studies in a variety of animal, human and in vitro models is a major goal of our present and future research endeavors. Overall, these targeted studies will provide a comprehensive understanding of the molecular pathophysiology underlying ARF, and will reveal critical clues for our long-term goals, namely the identification of novel early biomarkers and the rational design of innovative and effective interventions aimed at ameliorating renal cell damage and/or accelerating the recovery process. Students will have several well-defined hypothesis-based subprojects to choose from, which are quite feasible for completion within the summer period. I

am always available for guidance and mentorship, and I have significance experience working with similar student programs in the past. The laboratory includes full-time technicians, post-doctoral fellows, and two Ph.D. research associates for the students to interact with on an ongoing basis. The laboratory is fully equipped and is funded by several grants from the NIH and other agencies.