Relaxin, a 6-kDa peptide hormone in the insulin-relaxin superfamily, has important vascular actions that include potent vasodilation and anti-fibrotic effects. The U.S. Food and Drug Administration gave relaxin “breakthrough status” in 2013 and Cleveland Clinic named relaxin as one of the Top 10 Medical Innovations for 2014. Much of our knowledge of relaxin has stemmed from investigations of maternal vascular adaptations to pregnancy. With the discovery of local tissue expression and function of relaxin and relaxin receptor in non-pregnant females and males, relaxin has become even more important in the context of the cardiovascular system. This presentation will focus on discussing our relaxin-related work throughout the past decade, covering basic physiology to potential therapeutic applications: (1) Although our original focus was on relaxin’s vascular actions in the context of pregnancy, we made a surprising discovery that relaxin’s vascular actions are not confined to females; males respond equally robustly. Furthermore, relaxin-induced vascular geometric remodeling, and not compositional remodeling, contributes to increased vascular passive compliance under physiological conditions. (2) We provided the first evidence for local relaxin ligand-receptor expression and function in arteries. (3) We have been examining relaxin’s cardiac actions and therapeutic potential in the context of two pathologies: relaxin-induced left atrial remodeling and suppression of atrial fibrillation and relaxin-induced left ventricular remodeling and associated functional benefits in the setting of diastolic dysfunction. The cardiovascular actions of relaxin, especially potent systemic and renal vasodilation and potential for improving renal function, were the bases for recent clinical trials examining relaxin’s therapeutic efficacy in the setting of acute heart failure.

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Dr. Shroff is widely recognized as a distinguished scholar in the cardiovascular arena, with the following focus areas: (1) Relationships between left ventricular mechano-energetic function and underlying cellular processes, with a special emphasis on contractile and regulatory proteins and post-translational regulation of cardiac contraction (e.g., via phosphorylation or acetylation). (2) The role of pulsatile arterial load (vascular stiffness in particular) in cardiovascular function and potential therapeutic applications of vascular stiffness-modifying drugs and/or hormones (e.g., relaxin). (3) The role of regional contraction dyssynchrony in global ventricular mechanics and energetics. In addition to basic research, Dr. Shroff has developed and continues to develop novel, simulation-based material (i.e., mathematical models of biological systems and associated “virtual experiments”) for education and engineering design. Prior to joining the University of Pittsburgh, Dr. Shroff was a faculty member at the University of Chicago for 17 years in the Department of Medicine (Cardiology Section). Trained as an electrical engineer (Bachelor of Technology from the Indian Institute of Technology, Kanpur, India and Master of Engineering from McMaster University, Hamilton, Canada), Dr. Shroff obtained his doctoral degree in bioengineering from the University of Pennsylvania.