2015 Summer Research Experiences (SRE) for Undergraduates and Teachers
Abstract

BEDELL, M., LIN, Y., ROMÁN-MELÈNDEZ, E., MAROULAS, V. and I. SGOURALIS. Modeling the distribution of fluid pressure in the rat kidney. National Institute for Mathematical and Biological Synthesis, Knoxville, TN; Carnegie Mellon University, Pittsburgh, PA; Emory University, Atlanta, GA; University of Puerto Rico, Mayaguez, PR; The University of Tennessee, Knoxville, TN.

Kidneys remove metabolic waste from the blood and regulate blood volume and blood pressure. These functions are influenced by the pressure in the renal interstitium. Here we develop a multi-compartmental computational model of the rat kidney and use it to investigate the relationship between arterial and interstitial pressures. Furthermore, we investigate how tissue flexibility influences this relationship. Due to the complexity of the model, the large number of parameters, and the inherited uncertainty of the experimental data, Monte Carlo sampling is utilized to study the model's behavior under a wide range of parameter values. Characteristically, the model predictions allow for positive and negative relationships, with the flexibility of the pre-afferent arteriole vasculature controlling the transition between them.