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Research Area: Computational Vascular Research

When patients accumulate calcified plaque on the inner arterial wall (intima), cardiac surgeons perform an arterial balloon angioplasty or intravascular stenting to improve the vascular flow, returning the body to homeostasis. However, during the angioplasty or stenting, the endothelial cells of the inner artery and, sometimes, the smooth muscle cells of the medial portion of the artery become damaged, causing intimal hyperplasia or arterial remodeling. This project will focus on mathematically modeling the effects of estrogen on the endothelial cells and thus, elucidating the behavior of matrix metalloproteinases (MMPs) which are responsible for vascular degradation in the injury process. The model will be developed in the JSim software. The University of Tennessee Medical Center will provide parameters for the modeling equations by conducting biomedical measurements and analysis of the enzymatic concentrations and enzymatic reaction rates for these process applications, potentially using zymography, HPLC, microcantilever biosensing technologies and/ or immunocytometry.

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Modeling and Simulation Group

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