

## Title: The Virtual Physiological Rat Project

Abstract: Although there exist both a depth of knowledge of basic cardiovascular physiology and a host of physiological and genomic data from animal models of disease, we lack an understanding of how multiple genes and environmental factors interact to determine cardiovascular phenotype. The Virtual Physiological Rat Project is focused on developing computational tools to capture the underlying systems physiology as well as the pathophysiological perturbations associated with disease. These tools are being developed and validated based on experimental characterization of physiological function across a number of organ systems in rat strains engineered to show relevant disease phenotypes. Computer simulation is used to integrate disparate data (genomic, anatomic, physiological, etc.) to explain and predict function, and to translate the findings from animal models to yield new information on specific interrelated complex diseases in humans, including hypertension, kidney disease, heart failure, and metabolic syndrome. The developed multi-scale physiological models will ultimately be linked to genotype-phenotype parametric maps to construct a Virtual Physiological Rat resource, which will be used to predict the influence of genetic variability and environmental factors on phenotypes and to predict phenotypes of new strains that will be experimentally derived and characterized.