



# RTG kick-off day

## The Center for Inflammation and Regenerative Modeling

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# Mathematical biology of acute inflammation

- Hot! This will change the world
- Multidisciplinary
  - Mathematics, Medicine, Engineering, Computational Biology, CS, Bioinformatics
  - Undergrads, Grad students, post-docs
  - Pitt, CMU
- Close mentorship
  - Scientific guidance
  - Papers, grant writing (post-docs)
  - Exposure (conference)
- Employment



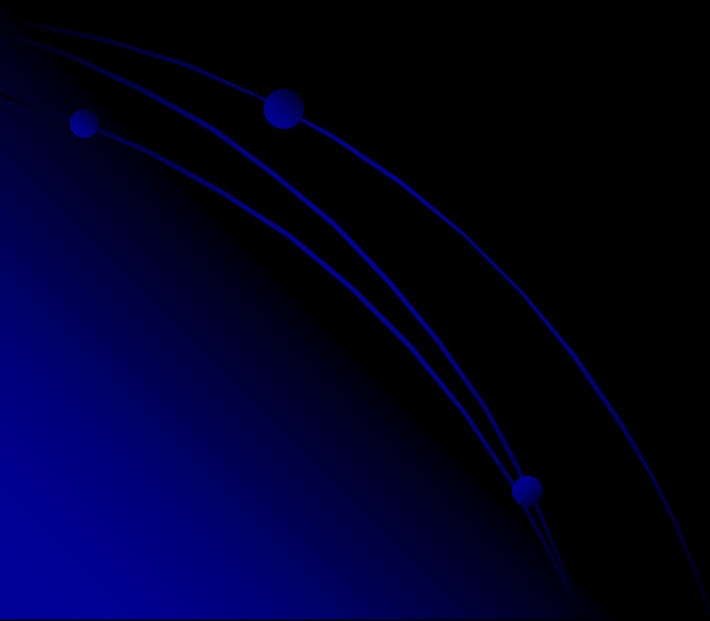
# Mathematical disciplines involved

- Dynamics
  - Model design and simulation
- Optimization
  - Linear algebra, applied analysis, statistical mathematics, control, differential geometry, numerics
- Machine-learning algorithms



# Computation

- Numerical algorithms
- Distributed and parallel computing

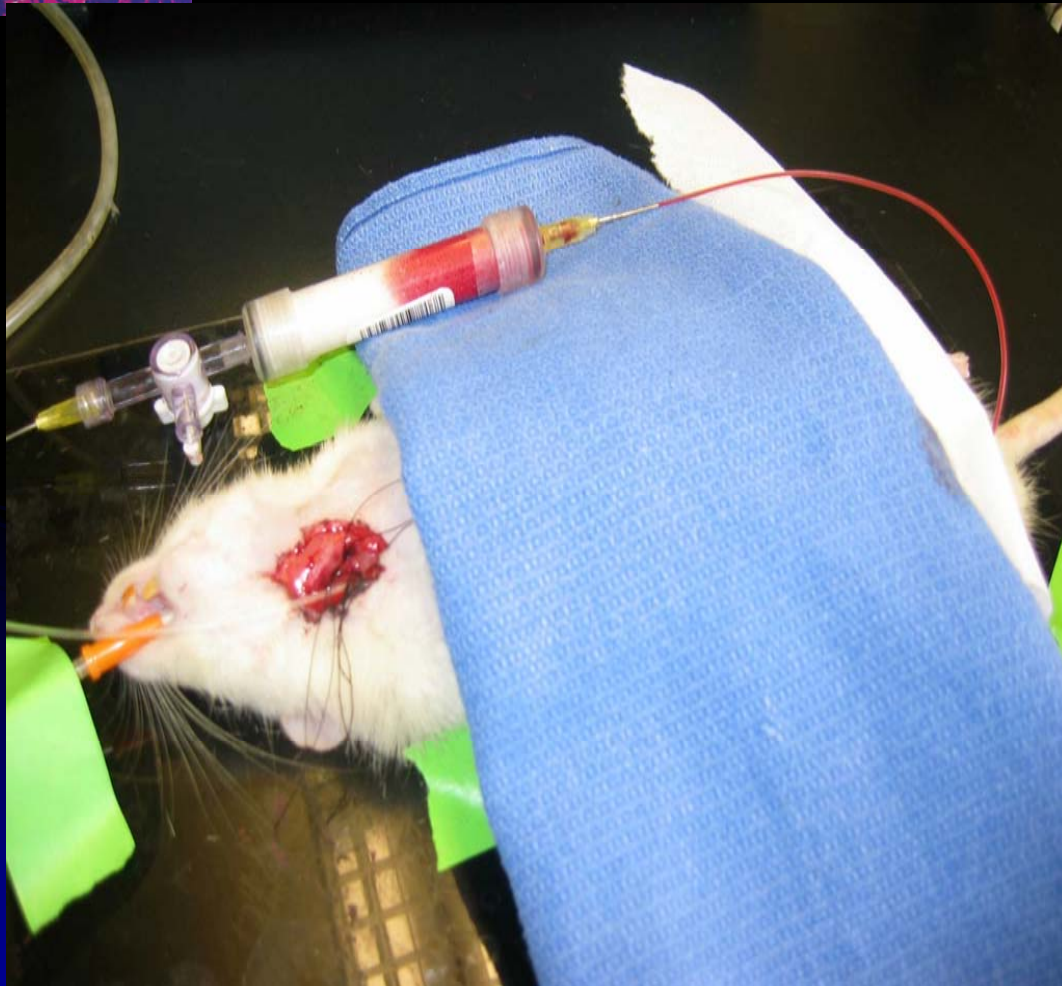




# Specific projects

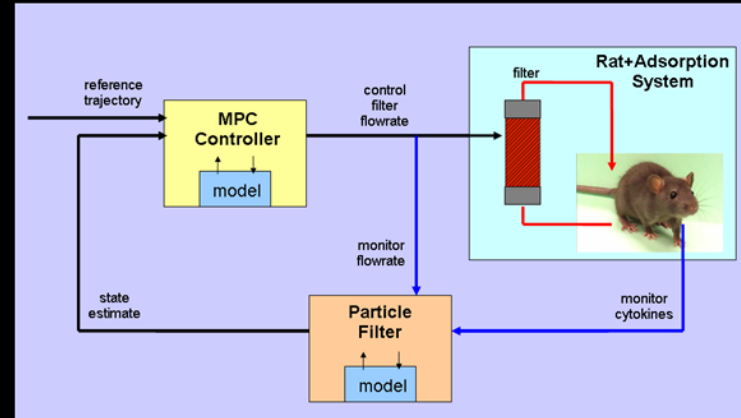
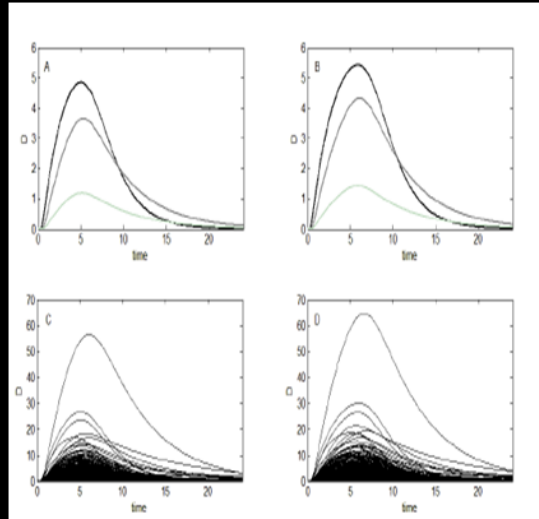
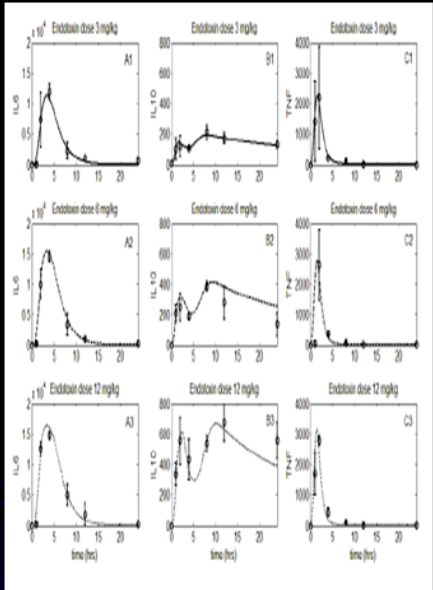
- **Biological models of influenza A virus**
  - Multiscale (lung function/cells/pathways)
  - Ermentrout/Swigon
- **Model-based therapy of uncontrolled inflammation**
  - **SEPsIS project (Rubin)**
  - **Vocal cord injury and healing (Swigon)**
  - **Multiorgan failure (Ermentrout/Rubin)**
    - Renal failure
  - Epidemiology and models of acute pancreatitis
- **Medical decision support**
  - **Model-based bayesian inference (Rubin)**
  - **Machine-learning inference**

# The SEPsIS project



- Animal (LPS, CLP model of sepsis
- Adjust hemoadsorption intervention to optimize outcome
  - Mathematical model of disease
  - Computational tools

# The SEPsIS project



State Variables

