**Mission**
To perform translational investigations unraveling system networks underlying several key human inflammatory diseases, including infectious disease, cardiovascular disease, obesity and diabetes, and neurological disorders.

**The Need for Research**
The existing strategies in effectively treating these devastating diseases are limited. The failure is largely due to the lack of system-wide analyses of the inflammation network. Our approach is to combine expertise in cellular and molecular signaling, chemical intervention of inflammation network, computational analyses of complex inflammation network, as well as human and animal studies. Our aim and focus is to characterize the fundamental and complex inflammation network that underlies the pathogenesis and/or regression of human diseases. The goals are to define critical targets and connections within the cellular network for effective therapeutic intervention of inflammatory diseases and complications.

**Technical Approach**
Excessive inflammation is the common mechanism for almost all human disease. Inflammation research conducted in Virginia Tech emphasizes on system network analyses of human inflammatory processes using biological, chemical, computational, and clinical approaches. Our cohesive and synergistic research teams have diverse expertise in molecular signaling, cell and tissue imaging, computational simulation, and chemical intervention, as well as translation research using human samples and animal models. Despite our diverse background, we work closely as focused teams to target key aspects of inflammation. Our participating faculties come from biological sciences and chemistry, the Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences, human nutrition and health, the Virginia Bioinformatics Institute, and the recently established Virginia Tech Carilion School of Medicine. Because of our close ties with neighboring medical schools, such as Wake Forest and Georgetown, many of our research groups are joining forces.

"Detecting critical targets and connections within the cellular network for effective therapeutic intervention of inflammatory diseases and complications."
**Focused areas**

- Experimental inflammation
- Defining the cellular and molecular signaling network controlling inflammation
- Imaging of cellular and tissue inflammatory processes in vivo and in vitro
- Intervention of inflammatory processes using chemical and nanomedicine
- Computational simulation of inflammation network and cross-talk with other cellular signaling pathways. Chemical synthesis of intervening compounds.
- Clinical inflammation
- Animal models of inflammatory diseases
- Translational studies of human inflammatory diseases and complications
- Targeted diseases include cardiovascular diseases, obesity and diabetes, neurological diseases, and infectious diseases

**Core Facilities**

**Flow Cytometry Core**

The Flow Cytometry Laboratory is equipped with state-of-the-art biomedical instrumentation by using the latest developments in laser and computer technology to rapidly and accurately generate detailed analyses of a variety of cell populations and functions.

**Confocal Microscopy Core**

Laser scanning microscopy is a technique that enables optical sectioning of samples, resulting in sharp confocal images with no contribution from out-of-focus light.

**Proteomics Core**

Virginia Tech Center for Genomics maintains a nanospray LC-tandem mass spectrometry unit for rapid protein identification (proteomics).

**Microarray Core**

Virginia Bioinformatics Institute (VBI)'s primary microarray platform is the GeneChip system provided by Affymetrix. VBI also builds custom microarrays for users by arraying gene-specific oligonucleotides onto glass slides.

**Imaging Core**

The Biomedical Imaging Division was established in 2006, which consists of the bioluminescence tomography (BLT) laboratory, computed tomography (CT) laboratory and high-performance computing (HPC) laboratory.

**Participating groups:**

- College of Science (biology, chemistry, physics, mathematics) [www.science.vt.edu](http://www.science.vt.edu)
- College of Agriculture and Life Sciences (human nutrition, biochemistry) [www.cals.vt.edu](http://www.cals.vt.edu)
- Virginia-Maryland Regional College of Veterinary Medicine [www.vetmed.vt.edu](http://www.vetmed.vt.edu)
- College of Engineering (School of Biomedical Engineering) [www.cals.vt.edu](http://www.cals.vt.edu)
- Virginia Tech-Carilion School of Medicine [www.vtc.vt.edu](http://www.vtc.vt.edu)

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