FEINBERG CARDIOVASCULAR RESEARCH INSTITUTE

The Feinberg Cardiovascular (CV) Research Institute at Northwestern Medicine is on a trajectory to become one of the world’s leading research centers for basic and translational vascular investigation. While building on the breadth and depth of Northwestern talent on our Chicago and Evanston campuses, the Institute is developing collaborative, thematically-based research centers in three distinctive areas—Heart, Translational Vascular Biology, and Kidney Diseases and Cardiovascular Health.

With Dr. Susan Quaggin’s innovative leadership, the Feinberg CV Research Institute is aligning investigators and laboratories to accelerate these three biologically interwoven programs with goals to energize our physician-scientist, graduate, and postdoctoral research training programs; compete for and secure local, national and international research grant opportunities; and optimize our philanthropic funding efforts.

The Feinberg CV Research Institute provides laboratory space for faculty scientists, access to key world-renowned core resource facilities and services, participation in the Institute’s robust campus and citywide seminar series, access to national and international research meetings, and world-class training programs. Dr. Quaggin and her team are committed to deepening the Institute’s partnership with Northwestern’s Bluhm Cardiovascular Institute and forging strong new partnerships with other key clinical groups at Northwestern.

Cross-cutting Research Centers

Heart Center
The Institute’s flagship Heart Center interfaces with the Bluhm Cardiovascular Institute, clinical cardiology, cardiovascular surgery, vascular surgery, and multiple basic science departments across both Northwestern campuses. Within the ‘Heart’ theme, research areas include:

- **Cardiomyocyte Biology** - Studies of aging, metabolism, the role of mitochondria (energy machinery of the cell), and inflammation at the level of heart muscle cells.
- **Arrhythmias** - Research centering on abnormal heart rhythms and the molecular channels involved.
- **Genetics and Development** - Research on genetic and developmental diseases of the heart, including muscular dystrophy and cardiomyopathies.
- **Imaging** - The use of molecular probes to visualize heart cells and blood flow in patients.

Atrial fibrillation, commonly referred to as A-fib, is an exciting area of study within our Heart Center. Atrial fibrillation is the most common heart rhythm disorder and a growing problem, with more than 2.2 million Americans having A-fib today and a projected 5.5 million Americans by the year 2050. A-fib is a major risk factor for thromboembolic events, such as stroke, and is commonly associated with congestive heart failure. Unfortunately, current therapies, including ablation, are not very successful in patients with structural heart disease, such as heart failure. At the Feinberg CV Research Institute, we are developing new ‘biological’ therapies for A-fib that are targeted at the molecular mechanisms that underlie this condition. By understanding the autonomic nervous system, fibrosis (scarring), and metabolic pathways (such as oxidative stress), this team will define new targets for therapy to prevent or interrupt the development of A-fib.

Translational Vascular Biology
For cardiovascular and tissue health, it is essential to maintain the body’s blood and lymphatic vessels. The Institute’s Translational Vascular Biology program focuses on two major health areas: complications associated with diabetes and lymphatic vessel health.

“Research is the key driver to progress in medicine. At the Feinberg Cardiovascular Research Institute, we are expanding our partnerships across the Chicago and Evanston campuses to facilitate some of the great research already taking place. By promoting the scope of investigation, we will explore the basic mechanisms of vascular development and maintenance that are critical for function, not only of the heart, but of the eye, kidney, and lung, and how they interact with one another.”

Susan Quaggin, MD, director of Feinberg Cardiovascular Research Institute, chief of Nephrology, and Charles Horace Mayo Professor of Medicine
The pathogenesis of diabetic complications is poorly understood and occurs as a result of the disruption of the vasculature affecting a person’s large and small vessels.

The Feinberg CV Research Institute is building a collaborative, multidisciplinary program to develop targeted therapies for diabetic complications. This program interfaces with the Diabetic Complications clinical initiative, a consortium of Feinberg clinicians and scientists focused on eradicating the life-threatening complications of chronic diabetes. Recently, a disruption of lymphatic function has been linked to diseases not typically associated with lymphatic dysfunction, including glaucoma, obesity, inflammatory bowel diseases, high blood pressure, heart failure, and kidney disease. These discoveries have led to intense interest from vascular scientists, funding agencies, and pharmaceutical companies. At the Institute, we have launched a cross-cutting program in lymphatic development and health. We are actively recruiting experts in this burgeoning area with an eye on becoming one of the nation’s most prominent centers on the study of the clinical importance of the understudied lymphatic circulatory system.

Dr. Quaggin and her collaborators at the Institute recently discovered a novel cause of glaucoma in an animal model with immediate relevance to children born with a severe form of glaucoma as well as common forms of adult glaucoma. Related to their findings, they are developing an eye drop aimed at curing this disease, which is a leading cause of blindness and steals eyesight from 60 million people worldwide. The new study identifies, for the first time, the molecular building blocks needed to make the “drainage” vessels of the eye, providing the necessary chemical tools to repair the eye’s plumbing. Up until now, the basis of glaucoma has been poorly understood. This discovery gives scientists a foothold to develop new treatments. Dr. Quaggin’s and her team’s goal is to grow new drainage vessels to cure glaucoma.

“Just imagine if we could grow a bigger Schlemm’s canal (‘drainage system’) in patients with glaucoma to lower the pressure in the eye,” says Dr. Quaggin. “That’s what we are aiming for with this new eye drop.”

**Kidney Diseases and Cardiovascular Health**

Cardiovascular disease, vascular calcification, and accelerated vascular aging are complications of chronic kidney disease affecting more than 60 million Americans. Through our Kidney Diseases and Cardiovascular Health Research Center, investigators within the Feinberg CV Research Institute are bridging fundamental aspects of vascular biology and chronic kidney disease. World-renowned experts now have established programs in cardiovascular risk and vascular calcification, innovation in vascular procedures for chronic kidney disease patients, and regenerative medicine.

**Cardiovascular Risk and Vascular Calcification:** This program spans all aspects of cardiovascular complications of chronic kidney disease—from population outcome studies, to dietary interventions, to basic mechanisms.

**Innovations in Vascular Procedures:** The Institute is launching a clinical Vascular Access Program for kidney patients at Northwestern Memorial Hospital and the Jesse Brown Veterans Administration Hospital. Gaining physical access to blood vessels is a lifeline for patients of all ages who suffer from kidney failure and require hemodialysis to survive. We are establishing academic, cutting-edge Interventional Nephrology clinical and training programs. Our Institute scientists are performing translational research on the mechanisms responsible for access failure and will develop innovative approaches for ensuring these ‘lifelines’ remain open for our patients suffering from kidney disease.

**Regenerative Medicine:** Northwestern’s bioengineering, developmental biology, and nanomedicine groups have joined forces with an international team to build a kidney with the goal to improve access to organs for transplant patients. The major limiting factor in artificial organ development is vascularization, which underscores the need for vascular biology and the presence of the Feinberg CV Research Institute. In 2013, the Institute jointly sponsored an international “Build a Kidney” symposium.

**Core Facilities and Services**

To enhance our collaborations and productivity, and to enhance the visibility of the Feinberg CV Research Institute locally and worldwide, we are expanding our innovative and cutting-edge core facilities and services. These cores are crucial resources to our scientists and to
increase the impact of discoveries being performed at the Institute and by our collaborators both at Northwestern and throughout the world.

**Cardiac and Vascular Phenotyping Center:** Comprehensive phenotyping and cardiac disease models are available, which include small animal 2D-Echo, blood pressure, and heart attack disease models, as well as heart and kidney transplantation. Our opportunities for growth include adding high technology approaches to the study of heart and kidney disease (telemetry, MRI, and optical tomography imaging for heart and vasculature, histology and pathology cores, and exosome isolation.

**Designer Mouse Facility:** Currently, the Feinberg Cardiovascular Research Institute houses more than 100 ‘high tech’ mouse lines with specially designed genes. We are negotiating collaboration with a pharmaceutical company to develop a range of humanized mice for the development and testing of new treatments for cardiovascular disease, eye disease, and diabetic complications that will ultimately be valuable for patients.

**Creative Solutions in Proteomics:** Our downtown Chicago campus has suffered from the absence of a robust, local (downtown) program to study and manipulate proteins (proteomics). Proteomics allow precise detection and characterization of proteins in wellness and disease—so we can diagnose and understand disease processes. Through the Feinberg CV Research Institute, we have established exciting collaborations with the Proteomics Center on Northwestern’s Evanston campus. In addition, the Institute has joined forces with the Ken and Ruth Davee Department of Neurology to expand proteomics on the medical school campus.

At the Feinberg Cardiovascular Research Institute, we recognize that every positive contribution we have made to the fields of clinical care, research, and education has been made possible by donors who have entrusted us with their philanthropic support. We invite our loyal donors and interested friends to join us in establishing the next, exciting chapter of the Institute and ensuring our success through gifts of outright support and endowment.

**THROUGH NORTHWESTERN MEDICINE, WE ARE CREATING A NATIONAL EPICENTER FOR HEALTHCARE, EDUCATION, RESEARCH, COMMUNITY SERVICE, AND ADVOCACY.**

**NORTHWESTERN MEDICINE**

Northwestern Memorial HealthCare and Northwestern University Feinberg School of Medicine are seeking to impact the health of humankind through Northwestern Medicine. We aspire to be the destinations of choice for people seeking quality healthcare; for those who provide, support, and advance that care through leading-edge treatments and breakthrough discoveries; and for people who share our passion for educating future physicians and scientists. Our commitment to transform healthcare and to be among the nation’s top academic medical centers will be accomplished through innovation and excellence. As part of the Heart Institutes at Northwestern Medicine, the Feinberg Cardiovascular Research Institute is partnering with the world-class Northwestern Bluhm Cardiovascular Institute to put Northwestern’s talent under one tent with a singular focus to impact heart disease in a big, bold, and disruptive manner. Through the Feinberg Cardiovascular Research Institute at Northwestern Medicine, we are forging ahead with our ambitious plans to develop new, high-impact research programs in Heart, Translational Vascular Biology, and Kidney Diseases and Cardiovascular Health. Our success will depend on robust, multidisciplinary scientific collaborations and training programs, the development of innovative core facilities and services, and the generous support of committed individuals and organizations.