Renowned Medical Research

The University of Minnesota is internationally recognized for its research programs in basic and translational cardiovascular medicine and science. Below is a summary of those programs as well as resources available particularly relevant to the success of our graduate program.

1) Cardiovascular Sciences and the Lillehei Heart Institute (LHI):
The LHI is a premier heart institute focused on cardiovascular genomics, cardiogenesis, cell therapies, personalized medicine, heart failure, vascular biology, myocardial regeneration, and device design for treatment of cardiovascular diseases. The University of Minnesota has made an outstanding institutional investment in infrastructure and faculty support for the LHI totaling more than 20 million dollars for faculty support, faculty recruitments, and core research facilities. The LHI currently has more than 20,000 square feet of contiguous laboratory space in a new research building (in addition to an adjacent administration area with 22 offices for faculty and staff). These core facilities include newly purchased flow cytometers, Zeiss META confocal microscopes, histopathology core facilities, a robotic qRT-PCR machine, and a VEVO 700 echocardiographic machine. Moreover, an additional 20,000 square feet of space is allocated to the LHI and houses a state-of-the-art LHI Cardiovascular Clinical Trials Center. In the past 18-month period, the LHI has recruited 11 new faculty members in the fields of cardiogenesis, stem cell biology, vascular biology, and molecular genomics. As a further investment and commitment to this program, the University of Minnesota has committed to the construction of a new 120,000-square-foot building that will house the cardiovascular programs.

2) Integrative Biology and Physiology and the new Animal Physiology and Behavioral Phenotyping and Imaging Core Facility (APBPI):
The University of Minnesota Medical School has a long and distinguished record of achievement and support of integrative biology and physiology. As a recent commitment to expand and further embrace integrative biomedical sciences the university has committed over 20 million dollars for faculty recruiting with emphasis in cardiovascular biology, obesity, diabetes and metabolism, as these fields are merging. These faculty recruitments coupled with those above for the LHI represent a
a tremendous surge in funds and focus on cardiovascular biology making this an exiting and vigorous environment for research.

The APBPI facility was awarded by an ARRA Federal grant was completed in the summer of 2011 (7,023 SF). It includes state-of-the-art core facilities for learning/memory, exercise/activity, aversion/pain assessment, cardiovascular, and muscular and metabolic monitoring in living rodents over periods of days to months. The facility, located on the first floor of Jackson Hall, North and South Wings, also accommodates physiological monitoring in rabbits and includes surgical suites for both acute and recovery procedures for all core functions of both the North and South Wings.

3) Regenerative biology and the Stem Cell Institute:
The objective at the Stem Cell Institute is to further our understanding of the potential of stem cells to improve human and animal health. In recognition of the seemingly unlimited potential of stem cells in the treatment of human and animal diseases, the University of Minnesota established the Stem Cell Institute and has provided the Institute with nearly $15 million in capital investments. We are proud to be one of the nation's leaders in the field of stem cell research. Institute researchers are making great strides in this emerging field of stem cell biology. Faculty throughout the Academic Health Center and across the University are committed to pursuing the frontiers of stem cell and gene therapy research, which we know is only in its infancy.
The Stem Cell Institute interacts closely with the LHI to foster regenerative medicine therapies to the heart.

4) Institute for Engineering in Medicine (IEM):
The IEM is a research organization that connects and amplifies research efforts between engineering and health sciences faculty members. It funds interdisciplinary, goal-oriented research to create new medical devices and solve clinical problems. In addition to its research efforts, the IEM promotes collaborative programs with industry and strives to serve the educational needs of the University and the Corporate Biomedical Communities in the area of Engineering in Medicine. More than 120 university faculty members in the health sciences and engineering disciplines are members of the Institute for Engineering in Medicine.
5) Center for Chemical Design and Minnesota Supercomputing Institute:
The Center for Drug Design (COD) is a distinctive, cutting edge research facility in the Academic Health Center of the University of Minnesota. The center is dedicated to:
Providing a research environment for leading scientists; Sharing unique strategies within the scientific community; novel drug therapies; Vigorously pursuing an academic research agenda; scientific knowledge; Designing and developing new medicines to benefit people worldwide; Supporting the interaction of many disciplines and areas of study including the cardiovascular system. The mission of the Institute is supercomputing research, which is defined broadly to include a variety of research activities from many disciplines. This research involves the use of high-performance computing environments to address problems in the physical, biological, medical, mathematical, and computing sciences and engineering as well as other fields that use computers in their research. The goal is to promote successful attacks on problems that could not otherwise be attempted.

The Supercomputing Institute promotes its mission concretely in several ways. It facilitates all aspects of high-performance computing and scientific modeling and simulation as well as graphics, visualization, high-performance network communications, informatics, and data mining by means of computer resource allocations, laboratories, and user support. Research efforts often result in domain-specific algorithms and codes that exploit the available computing environments as well as visualization techniques to enhance insight, make displays more informative, and add multimedia values to communications and work environments. In many other cases, research may involve activities aimed at the design or evaluation of high-performance computing hardware, operating systems, networking, and general-purpose algorithms and software.

6) Center for Magnetic Resonance Research (CMRR):
The CMRR is considered by many as the world’s premier MRI research facility. The CMRR was established in 1991 as a result of the rapidly growing and successful in vivo magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) research effort at the University of Minnesota. CMRR is an interdepartmental and interdisciplinary research laboratory that provides state-of-the-art instrumentation, expertise,
and infrastructure to carry out biomedical research utilizing the unique capabilities provided by high field MRI and MRS methodology. The central aim of the research conducted in CMRR is to non-invasively obtain functional, physiological, and biochemical information in intact biological systems, and use this capability to probe biological processes in health and disease. Funded by NCRR/NIH as a Biotechnology Research Resource for High field Magnetic Resonance Imaging and Spectroscopy, and supported by numerous governmental and private foundations, CMRR core faculty have made significant and pioneering contributions to biological applications of magnetic resonance techniques, and possess unique expertise in very high field uses of this methodology. The CMRR magnets are state of the art and provide a unique setting to pursue critical problems in cardiovascular biology and medicine.

7) Experimental Surgical Services (ESS):
Experimental Surgical Services provides expertise in designing and conducting the appropriate research to determine the safety and efficacy of your device - and determine if it's ready for regulatory submission. They have 25 years experience in pre-clinical assessment for the medical industry. In fact, ESS is the industry leader in researching and testing cardiac devices and surgical techniques. ESS has completed over 500 open heart procedures a year and over 1,500 procedures annually. This is a tremendous facility to pursue questions of clinical relevance in small and large mammalian models of heart disease.