STEM Research Priorities Report
LSUHSC-Shreveport

Submitted to the Louisiana Board of Regents
July, 2013

I. Identification and Definition of Priority Research Areas

A. Identify the campus's top priority research areas aligned with Core Industry S&T Sector and High Growth Target Industry elements of FIRST Louisiana.

The Core Industry S&T Sector and High Growth Target Industry elements that are identified as priority research areas for LSUHSC-S are (1) Health Care and (2) Biomedical.

The top priority research areas in these two areas are (1) cardiovascular diseases, (2) cancer/virology and (3) neuroscience. These areas manifest the following strengths in the identified stages of the FIRST Louisiana Framework is Biomedical Science:

Translational Research Domains – Biomedical
Core Enabling S&T Research – Biosciences, Biotechnology
21st Century Building Blocks – Nucleic & Amino Acids
Foundational Sciences – Biomedical Science

The attached table shows the breakdown of extramural funding for these three priority research areas.

B. Provide a brief narrative for each priority which:

1. Describes its particular research agenda and how the area reflects investment across all appropriate levels for the FIRST Louisiana framework.

All the research at LSUHSC-S is related to the FIRST Louisiana framework as described above. All three priority research areas incorporate both Health Care and Biomedical areas.

<u>Cardiovascular Diseases:</u>
The area of cardiovascular research is supported by funds from the Malcolm Feist endowment. The Institute of Cardiovascular Disease and Imaging (ICVDI) was initiated and developed on this endowment. As described below, ICVDI supports several intramural projects, including student/postdoctoral fellowships and grants to faculty who are involved in cardiovascular research. Seed packages for newly recruited faculty are also supported by the ICVDI. In addition, the ICVDI has purchased major clinical equipment that supports care for patients with cardiovascular diseases. Over the past several years, the ICVDI has provided more than $17M for cardiovascular research.

Cancer/Virology:
The area of cancer research is supported by funds from the Louisiana Center of Excellence in Cancer Research as well as the Carroll Feist endowment. The Feist-Weiler Cancer Center (FWCC) has provided support for cancer research over the past 15 years through the purchase of major research equipment, awarding of research grants to faculty and predoctoral awards to Ph.D. students and providing seed packages for new faculty.
The Center for Molecular and Tumor Virology (CMTV) was initiated from an NIH COBRE grant awarded to Dennis O'Callaghan for a total of $18.2M. During past 10 years of grant support, the CMTV has supported 43 graduate students, 40 postdoctoral fellows and 11 junior faculty. At least 300 manuscripts were published in peer-reviewed journals based on the productivity of the CMTV investigators.

Neuroscience:
Research in the neuroscience area is not supported by a specific endowment or designated funds. However, institutional support in the form of seed packages for new faculty and predoctoral fellowships for Ph.D. students involved in neuroscience research has been provided and is available. LSUHSC-S has developed two endowed chairs in the neuroscience area, both are in the Department of Neurosurgery. The Schumpert Chair was previously filled with a productive NIH-funded investigator. An offer has currently gone out to refill this position with an epidemiologist/statistician to assist in the expansion of neuroscience productivity. Nicholas Goeders, Ph.D., Head of the Department of Pharmacology, Toxicology and Neuroscience, received a $3.9M award in 2010 from the NIH for developing a new treatment for cocaine addiction. These funds provide support for Embera Pharmaceuticals, a start-up company based on the basic research findings from Dr. Goeders laboratory, to develop formulations of the drug that will be used to treat patients. Research continues in Dr. Goeders lab for treatment of other addictions such as tobacco and alcohol.

3. Include data detailing research productivity for 2011-2012

Biomedical (basic research - cardiovascular, cancer, neuroscience)

i. 39 principle investigators, with extramural funding

ii. Active awards and amount of funding
Federal - 36 awards for $12,129,963
State - 3 awards for $37,000
Foundation - 13 awards for $874,741
Pharmaceutical Companies - 5 awards for $187,789

iii. Additional data from these funded investigators
publications - 155
editorships - 48
national officerships – 7

iv. Graduate student enrollment/completion – 80/21

HealthCare (clinical trials/clinical research - cardiovascular, cancer, neuroscience)

i. 33 principle investigators with extramural funding

ii. Federal - 9 awards for $1,333,390
State - 0 awards
Foundation - 1 award for $10,000
Pharmaceutical Companies - 85 awards for $1,576,912

iii. Additional data from these funded investigators
publications - 85
editorships - 22
national officerships – 6

C. Success stories

Biomedical/Health Care

1. Cardiovascular Disease Research

In 2008, Chris Kevil, Ph.D., Professor in the Department of Pathology at LSUHSC-Shreveport reported a seminal finding in the Proceedings of the National Academy of Sciences (PNAS) where they discovered that nitrite anion (NO_2), a metabolic by product of nitric oxide metabolism, could act as a selective prodrug for nitric oxide delivery to ischemic tissues to stimulate new blood vessel growth and repair. The impact of this discovery was immediately recognized by the scientific community and profiled in the journal Nature as "A lifeline for suffocating tissues". Knowing the potential impact of these findings, Dr. Kevil filed patents for the therapeutic use of nitrite before publication of key findings and in 2009 along with Dr. Tony Giordano, Assistant Dean of Business Development and Technology Transfer, co-founded the company TheraVasc Inc that is focused on developing nitrite based therapeutics for the treatment of peripheral arterial disease and unmet medical needs of vascular disease.

Since its foundation, TheraVasc Inc has had a trail of success and accomplishments including: 1) $4.5 million financing raised to date through initial seed money and a series A financing round, 2) completion of phase I and phase IIa multicenter clinical trials demonstrating safety and biological effects of nitrite based therapy in peripheral arterial disease patients with diabetes, 3) established a patent portfolio (8 patents thus far) for use of nitrite therapeutics in cardiovascular disease, 4) completed sponsor research projects identifying new therapeutic uses and pharmacological/chemical compositions of nitrite based compounds. At present, the company is raising series B financing and in the planning phase of a IIb multicenter trial for nitrite therapeutic efficacy in peripheral arterial disease patients and a phase IIa for nitrite safety and biological effects in congestive heart failure. TheraVasc in also currently engaged in partnership discussions with large pharma to advance therapeutic initiatives of mutual interest.

2. Cancer Research

INLET Program:
The Feist-Weiller Cancer Center's (FWCC) Innovative North Louisiana Experimental Therapeutics program (INLET) consists of a multi-institutional partnership between Louisiana State University Health Sciences Center in Shreveport (LSUHSC-S) and a variety of Louisiana Universities, including Louisiana State University Shreveport (LSUS), University of Louisiana at Monroe (ULM), Louisiana University of Technology (LaTech), University of New Orleans (UNO), and Louisiana State University Health Science Center in New Orleans (LSUHSC-NO). INLET has also partnered with the Southern Research Institute (SRI), a not-for-profit scientific research organization in Birmingham, Alabama, who has a history of the development, patenting and use of a wide assortment of drugs. INLET originated in 2005 and was formally known as CECaT (Dr. Tony Giordano Director)

The primary mission of INLET is focused on drug repurposing. The goal of INLET is to discover and utilize drugs that are used to treat one human disease and reposition them to treat other diseases in humans including (but not limited to): cancer, diabetes, fungal infection and neurological disorders. The INLET mission also involves: 1) aiding researchers in acquiring federal grants involving drug discovery, 2) discovering, developing and commercializing drugs to treat human disease and 3) subsequently increasing economic development primarily along the I-20 corridor.
Accomplishments of the INLET Program:

- Developed a number of sophisticated high through-put screens;
- Involved in over ten different drug discovery and development research projects with 5 state institutions;
- Generated preliminary data and/or will support research of 6 grants awarded to investigators at three state universities totaling $2.72 Million. Additional grant submissions are ongoing.
- Secured a patent on an anti-cancer drug (LA122) which inhibits metastasis in animal models. European patents are pending.
- Acquired the most sophisticated imaging-based screening and assay platforms in State of Louisiana.
- Maintains the most extensive set of chemical libraries in the State of Louisiana, including the development of the "First in Louisiana" chemical library consisting of compounds made by Louisiana chemists.

II. Institutional and External Support for Priority Research Areas

A. How do identified priority areas reflect the mission and vision of the campus?

The primary missions of Louisiana State University Health Sciences Center Shreveport (LSUHSC-S) are to provide education, patient care services, research, and community outreach. Thus, the FIRST Louisiana areas of biomedical research and health care are perfectly aligned with the institutional missions. Biomedical Research includes research in the basic sciences of biochemistry, virology, microbiology, physiology, pharmacology, cell biology, anatomy, molecular biology, neuroscience and toxicology. Research in these areas leads to advances in health care in areas of, for example, cancer, cardiovascular diseases, diabetes, neurodegenerative diseases, and drug abuse.

Health Care research includes clinical trials funded by pharmaceutical companies as well as clinical research funded by the National Institutes of Health and other agencies. These human subjects research projects provide critical information about new drugs and treatments for diseases such as cancer, diabetes, cardiovascular diseases, Alzheimer's disease, multiple sclerosis and other diseases that affect the Louisiana population.

B. How do/will the institution's internal funding structures reflect and manifest these priorities?

LSUHSC-S is investing funding in support of the three major research priority areas in the following ways:

i. Cluster hiring. The Malcolm Feist endowment supports recruiting of new faculty who have expertise in cardiovascular research and will continue their research in this area. The recently hired Head of the Department of Cell Biology and Anatomy, William Mayhan, Ph.D., is an example of institutional investment in cardiovascular research. Subsequently, Dr. Mayhan has hired 3 new faculty members who are continuing their cardiovascular research projects. The endowment has provided more than $5M in seed package support for new faculty. Similarly, the Carroll Feist endowment provides seed package funds for recruiting faculty who are involved in cancer research. Also, LSUHSC-S is currently actively recruiting/hiring several faculty in the clinical neurosciences; a functional neurosurgeon with research experience, a Schumpert Chair in the Department of Neurosurgery who will be actively involved in research, and an Ph.D. neuroscientist in the Department of Neurology who will be actively engaged in research.

ii. Strategic investments. The Institute for Cardiovascular Disease and Imaging (ICVDI) supports funding for several new initiatives that focus on cardiovascular disease research. (1) Partners Across Campuses. This new program provides seed funding for new interdisciplinary collaborative research projects that involve faculty at LSUHSC-S who partner with faculty at another north Louisiana institution. The first award was recently approved between faculty at LSUHSC-S and Louisiana Tech. (2) Translational Grant in Cardiovascular Disease. This award is targeted to clinical trainees and junior faculty whose research is directed toward extending a biomedical paradigm developed in a basic

laboratory to the clinical setting. Two of these grants have recently been awarded. (3) Cardiovascular Research Fellowship. This award is available to basic science postdoctoral fellows and medical resident/clinical fellows who are involved in cardiovascular research. Since the beginning of this initiative, 37 fellowships have been awarded for a total of more than $2.5M.

Similarly, the Feist Weiller Cancer Center (FWCC) supports funding for IDEA Awards for faculty who are performing cancer research. These intramural awards are particularly important for new faculty, allowing them to collect data that will provide the basis of applications for funding from other agencies such as the National Institutes of Health.

iii. Infrastructure development. During the past 15 years the FWCC has purchased major research equipment and instruments that are included in the Research Core Facility that is available to all faculty in all areas of research. The most recent addition to the Research Core Facility is a micro DNA/RNA sequencing system that will be used for both basic and clinical research and is particularly useful in cancer research.

The institution has provided funds for construction of a Biosafety Level-3 facility that is used for research on highly infectious agents and a state-of-the art confocal microscope that is used by investigators in a number of research areas. In addition, the institution recently invested in a new cage washing system for the Animal Resource Facility, a major purchase that is essential in supporting research in cardiovascular diseases, cancer and neuroscience. In addition, the institution provides salary support for personnel in the Research Core Facility. This support is essential in providing assistance to the faculty and has assured the continuing success of the facility. These and other institutional investments in infrastructure will ensure that the research by LSUHSC-S faculty will continue to advance.

iv. Graduate fellowships. Recently, both the ICVDI and the FWCC initiated funding for predoctoral stipend awards. These awards are provided on a competitive basis to Ph.D. students who have passed their qualifying exams and submitted a research proposal. These awards support research in the cardiovascular disease and cancer research areas, respectively. In addition, students who are involved in neuroscience research may apply for stipend support from the institution. These predoctoral fellowships are very desirable and because they are competitive, funding for the more meritorious proposals is assured. In addition, the LSUHSC-S Foundation will provide one graduate student stipend ($26,000) for each of the 5 basic science departments, beginning July 1, 2013.

C. How does existing and/or potential external funding relate to these priorities?

More than 90% of extramural research funding in 2011-2012 was related to the three priority areas of cardiovascular, cancer/virology and neuroscience. Research in all three areas is related to Biomedical Research and Health Care. With the hiring of new faculty who are involved in research in these three areas, it in anticipated that new extramural funding will also be focused in these areas.

III. Research and Economic Development Data - past 5 years (see attached table)

A. # invention disclosures = 55
B. # patents filed = 40, # patents issued = 3
C. # License/options signed = 11
D. Amount of licensing income generated = $1,096,225
E. # start-up companies formed = 4
F. # industry sponsored research grants
    Biomedical (basic research) = 31
    Healthcare (clinical trials) = 600
G. Industry-generated R&D expenditures = $13.48M