

Proposal to Establish A University Center for the **Center for Regenerative Medicine and Cell Based Therapies**

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 - B. The interdisciplinary nature of the center.
 - C. The goals of the center that cannot be met within existing academic units.

- II. **Faculty:** Describe the level of faculty interest and commitment to the center. In particular, provide, describe or explain the following.
 - A. The criteria for selecting the center's faculty membership.
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 - C. The extent to which staff and students will be involved and how they will be supported.
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- III. **Administration:** Describe the administrative structure and responsibilities of the director and oversight committee. In particular, describe or explain the following.
 - A. The name of the director or interim director of the center.
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 - E. The main components of a pattern of administration for the center (to be formally completed/approved within a year of center establishment).

- IV. **Budget/Funding:** Specify budget and funding sources for the center. In particular, describe or explain the following.
 - A. The expected budget for the first year of operation.
 - B. Funding sources and one-time and recurring costs.
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- V. **Evaluative Criteria and Benchmarks:** Propose and define specific criteria and benchmarks against which the center will be measured.

- VI. **Supporting Materials:** Solicit and include letters of support from
 - A. Relevant department chairs, school directors, deans, and vice presidents from within the university.
 - B. Interested parties outside the university.
 - C. Entities with similar emphases at other universities.

Introduction and Overview

The Center for Regenerative Medicine and Cell Based Therapies (CRMGBT), a multi-disciplinary, multi-college research center at The Ohio State University (OSU), was an idea initiated in 2011 by Dr. Chandan K. Sen. A working group established with Dr. Sen included Chris Ellison, MD, Mike Miller, MD, and Gayle Gordillo, MD. Extensive planning efforts have occurred, including development of a strategy plan by the office of Gayle Marsh. The CRMGBT originated in the College of Medicine and focuses collaboration between seven different colleges across the University's campus, who are aimed at advancing research and outcomes in the field of regenerative medicine. There are currently 117 faculty with membership in the CRMGBT. The collective CRMGBT faculty is involved in and represents the fields of Medicine, Engineering, Arts and Sciences, Dentistry, Veterinary Medicine, Pharmacy and Nursing. Investigation by these researchers includes, but is not limited to Cell-Based Therapies, Imaging, Tissue Engineering and Wound, Burn and Trauma. The College of Business is also engaged with the Center. These areas leave extraordinary opportunities on the table for OSU to aggressively pursue and have direct relevance to the research, education and service mission of the university. Dr. Steven Gabbe officially announced the Center on March 23, 2012 at the 5th Annual Translational to Clinical (T2C) Regenerative Medicine Wound Care Conference.

Emergence of Regenerative Medicine as a New Discipline in Healthcare

With aging and disease, tissues and organs fail. Regenerative medicine is the process of creating living, functional tissues to repair or replace this lost function. It includes the injection of stem cells or progenitor cells also known as cell-based therapies and the induction of regeneration by biologically active molecules, and transplantation of in vitro grown organs and tissues. The field of regenerative medicine includes tissue engineering, because of its focus on how the body can use cells, biomolecules and supporting structures to heal it.¹ However, the multi-faceted nature of regenerative medicine requires that its reach is broad and multidisciplinary in nature with the potential to involve all colleges in the Office of Health Sciences. It is imperative to note that success in this field is measured by solutions brought to healthcare.

The Ohio State University is significantly behind nationally and internationally in the field of regenerative medicine research and outcomes. As an example, all of the Wexner Medical Center's benchmark top 20 Academic Medical Centers have developed some programmatic approaches to regenerative medicine. Successful programs have been able to further their research through government funding, some private foundation and in large part industry partnerships.

Furthermore, long-standing programs such as Stanford and Pittsburgh have developed educational programs that will attract and build a population of students and expertise in this emerging discipline. We must make great strides in education programming to stay not only competitive, but relevant by building a Curriculum of Regenerative Medicine. This provides an opportunity to build educational programs that would bring to one classroom, to one forum, students from Engineering, Medicine, Biology, Veterinary Medicine, Pharmacy, Dentistry, Arts & Sciences, Nursing and Business where they can all come together towards a common cause. We would develop an innovative curriculum and engage multiple colleges, such as students coming from engineering to teach college of medicine students. Expertise from different colleges will be used to develop one curriculum, which is applicable to all of the students represented by the Center. This will be the future for training scientists, clinicians and educators and it is critical for OSU to become a leader in the field and not a follower or worse a non-participant.

While there is activity in this field at Ohio State, it is currently fragmented across multiple programs, departments and even colleges with no one unifying approach. A branded Center for Regenerative Medicine and Cell-Based Therapies will create an inter-college forum for faculty and students to identify opportunities to participate and collaborate in this field of study, where before the opportunities were not available. The Center for Regenerative Medicine and Cell-Based Therapies can "de-fragment" this activity by creating awareness of a central place supporting these activities.

¹ *Advancing Tissue Science and Engineering*, MATES, http://www.tissueengineering.gov/advancing_tissue_science_&_engineering.pdf

Since the Center for Regenerative Medicine and Cell Based Therapies inception in March 2012, strides have been started to close the gaps of identified in this proposal but much work and resources are needed. Some examples include:

- Multi-college fund raising to a central fund to support multi-college PI projects,
- Linking and fostering multi and inter-college research collaborations,
- Bridge building for industry partnerships (such as Nanofiber Solutions, StemMed, Inc., All India Institute of Medical Science),
- Pursuing multi-patient clinical trial for stem cell seeded, artificial trachea,
- August 2012 Center Annual retreat with 40+ speakers from OSU, Akron and Cleveland's National Center for Regenerative Medicine,
- Key recruiting of Chris Breuer (first in human vascular grafts), Jianjie Ma (wound healing breakthroughs), Jose Otero (pathology research), and
- Securing top regenerative medicine industry experts for the March 2013 Translational to Clinical Regenerative Medicine Wound Care Conference, including Mahendra Rao, MD, PhD, Director, NIH Center for Regenerative Medicine.

The biggest opportunity of a program focused on regenerative medicine is to revolutionize health care delivery, quality of life for patients and deliver on the promise of personalized medicine. The goal of reconstructing cancer defects with engineered tissues, of creating bone and cartilage for patients with osteoarthritis and for developing organs that eradicate the need for life support while patients wait for transplantable organs to become available, will drive forward this field at Ohio State. We will work to leverage knowledge in engineering (such as tissue engineering, material sciences, etc.) towards novel healthcare solutions. The mission for this Center is to create an environment that would foster interdisciplinary interactions, advance and disseminate knowledge in this emergent field, with the final goal to deliver solutions in health care through effective public-private partnership.

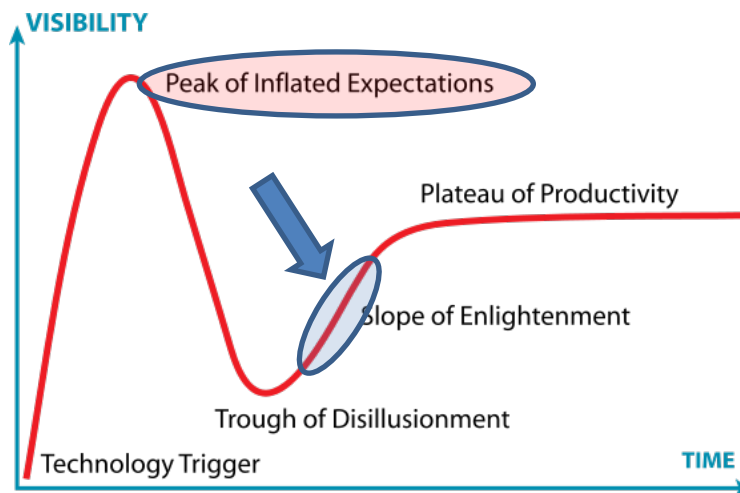
The current proposed structure will be organized under four key priority areas or pillars:



Given the complexity and interdisciplinary nature of this program, this is not an extensive list of all areas that participate. In support of these priorities, OSU has at least 5 key differentiators:

- 1) Access to large animal surgical expertise and facilities and naturally occurring models of disease at the College of Veterinary Medicine,
- 2) The Wright Center for Imaging,
- 3) Rapidly expanding comprehensive wound center
- 4) Proximity and partnership with Battelle Memorial Institute and
- 5) Unique strengths in the Colleges of Engineering, Dentistry and Arts and Sciences.

Now is the time for OSU to make aggressive efforts in resource allocation in support of regenerative medicine within patient care, education and talent retention/recruitment. We are on the upswing of the mature wave and this is the time to actively engage and participate.



A Hype Cycle (by Gartner, Inc., 2005) represents the maturity, adoption and social application of specific technologies.

The initial hype is now gone, represented above by the Peak of Inflated Expectations. Numerous start-up companies, health providers and academic settings raced to enter the market. They were plagued by not delivering on inflated promises to an eager recipient population (patients, stockholders, practitioners and media). The ideas, potential and technology were too new, and it was unrealized the complex nature and need for multi-disciplinary collaboration to actually produce solutions. The industry is now on the Slope of Enlightenment, and we must get on track or we will never catch up. We learned from the trough of disillusionment where regenerative medicine failed to meet expectations and quickly became unfashionable. Currently, real strides of success are occurring, such as Chris Breuer our new OSU recruit, successfully tissue engineering vascular grafts in children.

At the current point of regenerative medicine at OSU, we are playing catch up in a highly innovative, technology heavy, high barrier of entry, research and clinically driven expertise field. The Center for Regenerative Medicine and Cell Based Therapies established as a University Center with full commitment of university and medical center leadership will serve as a catalyst to becoming a leader not only nationally, but internationally in regenerative medicine. Without this commitment, we will continue to fall behind in patient care, education and our ability to attract the very best in all fields related and unrelated.

- I. Mission: Explain the mission of the center and how it is aligned with the university's Academic Plan and strategic goals. In particular describe or explain the following.
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I. Mission: The missions of the university (research, teaching, service or outreach) most relevant to the center.

The mission of the Center for Regenerative Medicine and Cell-Based Therapies is to advance life sciences research and education at The Ohio State University and throughout the State of Ohio by creating a multi-college environment that would foster interdisciplinary interactions, advance and disseminate knowledge in this emergent field, with the final goal to deliver solutions in health care through effective public-private partnership.

The mission aims to address areas of the Six Strategies and Initiatives of The Ohio State University's Academic Plan and elements of them can be found throughout this document:

- Build a World-Class Faculty
- Develop Academic Programs that Define Ohio State as the Nation's Leading Public Land-Grant University
- Improve the Quality of the Teaching and Learning Environment
- Enhance and Better Serve the Student Body
- Create a More Diverse University Community
- Help Build Ohio's Future

Furthermore, the mission of the center is well aligned with the Health and Wellness Discovery Theme, which is part of the three themes planned to drive the university forward over the next ten years.

Rationale for the development of a Center focused on Regenerative Medicine on the OSU campus.

Regenerative medicine is the vanguard of 21st century healthcare. It is the emergence of a new discipline in healthcare. We are on the cusp of a worldwide explosion of activity in this rapidly growing field of biomedicine that will revolutionize health care treatment. Regenerative medicine will lead to the creation of fully biological or biohybrid tissues and organs that can replace or regenerate tissues and organs damaged by disease, injury, or congenital anomaly. Because of the economic potential of this industry (the worldwide market for regenerative medicine was conservatively estimated to be \$500 billion in 2010), initiatives to capture significant shares of this market are multiplying around the world and competition is mounting.

The time has arrived (described above as the *Slope of Enlightenment*) for the university to embrace and aggressively pursue regenerative medicine as the future of its success in healthcare and related academic fields. This center will help position the University for national prominence. Conversely, left unaddressed it will diminish our ability to compete in education and research as well as provide the best healthcare treatments to our patients. Also with the diminishing reimbursement trends, the university can look to intellectual property revenue returns as a subsidy and be positioned to win small and large federal research grants in the field.

Regenerative medicine is an applied field of tissue engineering that holds the realistic promise of regenerating damaged tissues in vivo (in the living body) and externally creating "tissues for life" available for implantation. Through research and products developed from this field, patients may achieve better clinical outcomes with less risk and gain access to new treatment strategies for conditions that were previously untreatable.

Regenerative medicine uses the application of tissue science, tissue engineering, and related biological and engineering principles to restore the structure and function of damaged tissues and organs. This new field encompasses many novel approaches to treatment of disease and restoration of biological function through the following methods:

1. Using therapies that prompt the body to autonomously regenerate damaged tissue, and
2. Using tissue engineered implants to prompt regeneration and direct transplantation of healthy tissues into damaged environments.

Collectively, these treatments allow for two substantial advances over current medicine:

1. Potential to regenerate currently irreparably damaged tissues in situ, so that they return to full functionality.
2. Be able to produce tissues in vitro (in the laboratory) to be used for transplantation purposes when regeneration is not possible.

Why now must The Ohio State University actively pursue Regenerative Medicine?

- **Revolutionizing Healthcare through Research and Outcomes**
- **Reputation and Competitiveness**
- **Education and Research Competitiveness**
- **Industry Partnerships**
- **Commercialization and Intellectual Property (IP)**
- **Funding Opportunities**
- **Building Ohio's Future**
- **One University: Multi-College Collaboration**

Revolutionizing Healthcare through Research and Outcomes

The biggest opportunity is the possibility to revolutionize health care delivery, reduce treatment costs, improve quality of life for patients and deliver on the promise of personalized medicine. Patients, for whom we are driven to succeed, are the obvious beneficiaries of this emerging field and our involvement. The current clinical applications in practice are in bone marrow transplants, chondrocyte transplantation, and limited wound care. Expanding the products and the ability to deliver engineered tissues requires an investment in the infrastructure, especially for cell-based therapies and scaffold development. Such an investment would expand the products for these services achieving the vision for this Center which is aligned with the university.

This technology has the potential to cure diseases ranging from diabetes (through regeneration of pancreatic islet cells) to the repair of cancerous tissues (by replacing the removed cancerous tissue with externally grown healthy tissue). Regeneration of skin and bone using dermal fibroblasts and stem cells, respectively, is already into clinical trial practice as a cell delivery. By creating these "tissues for life," regenerative medicine treatments will undoubtedly lead to a tremendous improvement in quality of life and healthcare. We should not sit idly on the side, but help push forward the breakthroughs and be in the limelight for the discoveries.

Reputation and Competitiveness

The CRMCBT will serve to enhance the national and international reputation of the University in comparison to our peers with success stories. In terms of OSUs competitiveness nationally, all top 20 academic health centers have some type of center dedicated to this venture. Given the limited clinical applications to date, the primary focus at other regenerative medicine centers around the country is research and leaves open opportunity for OSU to produce not only research, but put the findings to animal and patient clinical trials, ultimately with end-of-day deliverables. We are positioned well to succeed with the central campus resources such as the College of Medicine, Engineering and Veterinary Medicine, coupled with the Wexner Medical Center on one campus within walking distance. Other competitors lack the complete package we provide.

The promise that regenerative medicine holds makes it a highly-publicized field garnering significant public interest. Since CRMCBT's launch, we have received public calls asking about specific regenerative medicine treatments or to be part of clinical studies to find solutions for their health issue. Creating new developments in this field could make headway in ongoing efforts to improve and uphold Ohio State's national reputation.

Growth of the CRMCBT is occurring by effectively assembling interested investigators on the OSU campus and through targeted recruitment of researchers whose goals are within the themes of the Center. Taking internal collaboration to the national and international stage for industry partnerships and co-investigator opportunities builds OSU's case as a leader in education and healthcare. As an example, matching funds for collaboration projects between OSU and Akron have occurred and internationally,

CRMCBT has partnered with All India Institute of Medical Sciences and OSU India Gateway to identify cross education and research opportunities.

Education and Research Competitiveness

By not engaging in regenerative medicine, our educational curriculum is at a detriment and will hold back our advancement towards its goal of being the nation's leading public land-grant university. OSU has a large number of trainees on campus who have an interest in performing research related to regenerative medicine. These include undergraduate students, graduate students, medical students, and post-doctoral fellows. There have been limited opportunities for these individuals to pursue research in regenerative medicine and a paucity of courses for these trainees. The establishment of a Center with a specific focus on development of products or technologies as important new health care solutions to previously difficult clinical problems will provide a structure for students and enhance interactive learning in regenerative medicine.

Many examples exist of other universities being ahead of the curve. Two dedicated Veterinary Medicine Regenerative Medicine Programs currently exist at the University of Georgia, Veterinary Teaching Hospital and the UC Davis, Veterinary Medicine Regenerative Medicine Laboratory. Attracting the best and brightest candidates interested in regenerative medicine will prove difficult when other options are available.

Industry Partnerships

Industry's involvement in regenerative medicine can be viewed as a significant opportunity as companies are looking to academic institutions to help support their research efforts. Below are some examples of corporate partnerships dedicated to the field of regenerative medicine:

- GlaxoSmithKline (GSK) and the Harvard Stem Cell Institute (HSCI) entered a five-year, \$25 million-plus collaborative agreement (2008)
- Pfizer invested more than \$100 million in Pfizer Regenerative Medicine, which is based at two facilities in the UK (2009)
- Roche Venture Fund, Novartis Venture Fund and Ysios Capital Partners have invested \$38 million in Cellerix, a Madrid company testing stem cells from fat to treat rare skin conditions (2007)
- California Stem Cell, Inc has invested in Johns Hopkins University, Keio University, and University of California to support stem cell research

OSU would be leaving money on the table for others to take and improve their organizations outcomes. Presently, the biotechnology sector remains largely unconsolidated even though there have been limited mergers and acquisitions. This could open the door to partnership opportunities with dedicated regenerative medicine companies, medical device manufacturers and pharmaceutical companies.

Ohio State's existing partnerships with Battelle and other industry partners such as Healogic (formerly National Healing Corporation) provide the start this program needs to build support. In addition, the University's commitment to technology and commercialization and the dedicated resources in this area could facilitate connections with outside industry support. The medical center and University have a vast scope of expertise, pool of resources and patient volume in a centralized location that is beyond the capabilities of any single company. This makes the Center an attractive partner to companies.

The Center will be pursuing a Business Incubator concept to attract Biotechnology Industry Partners to work side-by-side with Ohio State scientists. Industry will benefit from having rare concierge access to expertise and core resources towards product development. Faculty and the University will benefit from research funding opportunities and direct commercialization avenues and expertise from the industry partners.

Commercialization and Intellectual Property (IP)

Reaping the financial rewards of the goal of taking solutions to market is an obvious reason to engage in regenerative medicine. We can capitalize on the commercialization of our faculty patents on devices and new inventions on cell or other regenerative applications. CRMCBT is already working with companies like

Nanofiber Solutions and StemMed, Inc. as well as internal IP projects to receive the return on investment to fund more regenerative medicine work or as we grow other areas of the university.

Funding Opportunities

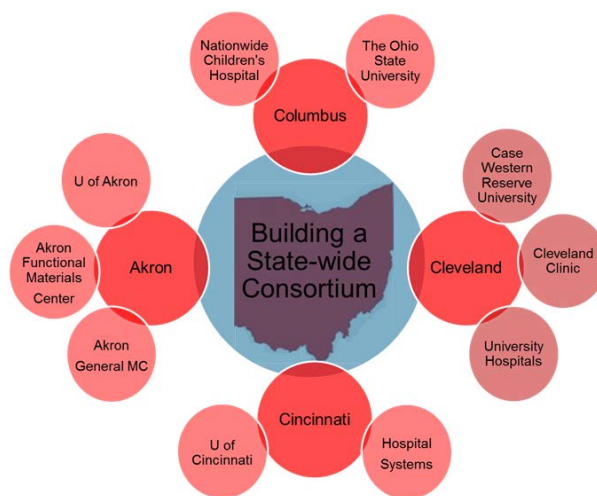
In addition to private industry partnership funding, the Federal Government is acknowledging the need for advancement. According to the U.S. Department of Health and Human Services document, 2020: A New Vision, A Future for Regenerative Medicine, it is projected that a large amount of Federal funding will be allocated to this initiative. We have already seen this occur with programs such as AFIRM where multi-PI and locations have received \$35 million for regenerative medicine research. The Ohio State University with its past course was not positioned to attract competitive partners and win these style awards.

The following excerpt from an article regarding public stem cell research funding best represents the multitude of opportunities for funding in this field:

There is little risk that stem cell research will go unfunded. Biotech companies, philanthropic organizations, and individuals have already invested billions of dollars in such research, and they show no sign of stopping. Private sector investment in the biotechnology industry and generous philanthropic contributions from charitable foundations and individual donors have already pumped hundreds of millions of dollars into stem cell research in the United States alone.²

Building Ohio’s Future

The Ohio State University can be part of building state-wide consortium with specific focus on regenerative medicine. Currently, the state has the critical mass of interdisciplinary expertise to capitalize on connecting programs in four of its major cities. Working together will not only ensure efficient use of limited resources, but also can serve as an economic catalyst for job creation in a new emerging field. By acting now, the State of Ohio can benefit and not have a missed opportunity lost to other more aggressive states pursuing advances in technology and science.



One University: Multi-College Collaboration

Lastly, institutional collaboration will be realized by the CRMCBT and is directly aligned with the One University concept. Defragmenting the current research in order to expedite product development and increase funding represents the largest potential for the creation of a programmatic approach to regenerative medicine. We will be providing a central place for researchers to share ideas, opportunities and work together offers the largest opportunity for Ohio State in the field of regenerative medicine. The CRMCBT would enrich the interdisciplinary environment for students and researchers that have a focus on regenerative medicine. The environment would facilitate learning, research productivity, and collaborations internally and externally that lead to increased extra-mural funding. It is anticipated that the CRMCBT will serve as a hub for regenerative medicine research on the OSU campus.

In the spirit of ingenuity, regenerative medicine is a collaborative effort as evidenced by CRMCBT's approach to building bridges. Leadership in this field will come from people who are willing to work across disciplinary lines and Federal and private sector boundaries. A successful regenerative medicine initiative requires the expert knowledge of scientists, engineers, physicians, researchers, and many others in a multidisciplinary effort that provides the framework and resources to fully realize the potential of this revolutionary new field.

² Fry-Revere, Elgin: *Public Stem Cell Research Funding: Boon or Boondoggle?; Alliance for Regenerative Medicine Economic Impact*

A. The interdisciplinary nature of the center.

Interdisciplinary nature of the Center in the areas of research, education and service

The CRMCBT has been working diligently since its inception in developing new academic programs and in forming new interdisciplinary efforts internally and externally to the OSU campus. The following section summarizes accomplishments of the CRMCBT, available resources with ties to regenerative medicine and ongoing programs/ projects/proposals which demonstrate the interdisciplinary nature of the Center.



B1. Collaborative research efforts among Colleges and Units and accomplishments of the CRMCBT

The accomplishment of starting the center revolved around generating interest of the seven colleges and bringing them to the table to fund collaborative research. Dr. Chandan Sen organized the contributions of the colleges along with securing funds from other university entities and outside partners. A small portion of the funds will be used for administrative expense and the rest will provide research tracks that promote collaboration. Additional amounts will be committed from a College of Medicine Gift in the amount of \$1.5 million and industry partners are being cultivated for gift and contract research. The colleges have a vested financial interest in the success of the center. The center announced the Request for Funding (RFA) in June 2012. The following tracks were approved by the Operations Committee.

- Program Project
- Program RFA
- Industry Partnership
- Publications and Productivity Track (Conference Travel Awards or Core Fee)
- Inter-College Partnership
- CCTS
- Pelotonia Cancer
- Akron FMC Track
- IP Track

Once applications have been received the Operations Committee conducts a stringent approval process based on the merit of the proposal and definitive outcomes.

CRMCBT has partnered with The Center for Clinical & Translational Science (CCTS) Institute to co-fund research tracks under CRMCBT RFA. Two awards totaling \$50,000 each were given under this track in 2012, where teams from engineering and medicine came together to work towards a common goal.

CRMCBT plans to participate in the Integrative Graduate Education and Research Traineeship (IGERT) program that is being proposed by Samir Ghadiali from the Department of Biomedical Engineering. The

NSF-sponsored. IGERT opportunity has been developed to meet the challenges of educating U.S. Ph.D. scientists and engineers with interdisciplinary backgrounds, deep knowledge in chosen disciplines, and technical, professional, and personal skills. The program is intended to establish new models for graduate education and training in a fertile environment for collaborative research that transcends traditional disciplinary boundaries. It is also intended to facilitate diversity in student participation and preparation, and to contribute to a world-class, broadly inclusive, and globally engaged science and engineering workforce. The proposal from OSU focuses on “implementation science” training for graduate students to complement their research focus in tissue engineering.

To facilitate the research of regenerative medicine, CRMCBT is pursuing a Stem Cell Core. Space has been allocated in the basement of the Biomedical Research Tower to serve as a Human Stem Cell Core. As part of the Stem Cell Core initiative, the College of Veterinary Medicine has renovated space to serve as an Animal Stem Cell Core that will process animal stem cells Good Laboratory Practice to be used by investigators. The College of Veterinary Medicine will serve as a cryopreservation biorepository for characterized animal stem cells for use by investigators in the CRMCBT. The purpose of the Stem Cell Core will be to provide internal and external researchers with immediate access to stem cells to enhance research efforts and outcomes. The translational component of this core will be further enhanced as the new human transplantation cell therapy laboratories are completed along the clinical medical corridor and with OSU’s unique ability to have ready access to characterized animal stem cells from multiple species of animals processed under regulatory conditions for the FDA submissions expected with industry partnerships. Feedback is being sought from OSU faculty to help shape the core for the best utilization. A Tissue Engineering Core has also been discussed for development.

Prof William Marras from the College of Engineering and member of the NAE is working on the development of a Spine Research Institute in the college and will be partnering with CRMCBT. There is a natural match in spinal injury and repair areas. CRMCBT would like to closely work with Bill Marras and Rich Hart of Biomedical Engineering towards a hire of someone specializing in pro-inflammatory cytokine responses between BME and the College of Medicine. The center will look to engage OSU Neuroscience leadership as well. It is proposed to setup the Spine Research Institute as an institutional “sister” of the Center for Regenerative Medicine and Cell-Based Therapies (CRMCBT).

The center is fostering a relationship with Jim Lee, OSU faculty, to promote his lab’s innovative abilities across the other six colleges. His lab, OSU NSEC-CANPBD, has developed various novel nanotechnologies for non-viral gene transfection for cell reprogramming, biodegradable and biocompatible cell based drug delivery devices, and advanced tissue engineering scaffolds. A planned Request for Application (RFA) for pilot project funding will be issued in March 2013 to foster regenerative medicine nanotechnology collaborations.

CRMCBT is partnering with The James for a second year to solicit proposals to for cancer-specific research relating to regenerative medicine and/or stem cells (etiology, carcinogenesis, treatment, prognosis, rehabilitation etc.). Proposals will have clear cancer endpoints.

The College of Veterinary Medicine (CVM), represented by Dr Alicia Bertone, is partnering with the CRMCBT to use animal models in stem cell work and other cell therapies in collaboration with tissue engineering, cancer, orthopedic, and spine initiatives and will support cell therapy components to larger collaborative projects or preclinical projects. Dr Valerie Bergdahl, as Director of ULAR, will support preclinical studies for translational work as well as industry sponsored research.

CRMCBT members have published extensively in peer-reviewed journals with a collective total of 193 papers just in 2012 ([Wound](#) and [Burn](#) – 83, [Stem Cell](#) – 79, [Tissue Engineering](#) – 31). Members of the CRMCBT have contributed to books/book chapters and have participated in numerous lectures and poster presentations.

Currently, there are isolated pockets of regenerative medicine activity taking place in the College of Medicine and in other Colleges around Ohio State. Below are some examples of areas where such research is taking place but the fragmentation of this field and the fact that there is no central place universally recognized makes it problematic in understanding the true breadth and depth of research currently taking place.

OSU Medical Center

Aligning significantly with most of the signature programs at the Medical Center the areas below represent a sample of some of the programmatic efforts already taking place in this field. One anticipated outcome of creating a Center for Regenerative Medicine and Cell-Based Therapies is to bring internal awareness to the activities and create a place for investigators and clinicians to connect with one another in hopes of advancing technologies and project opportunities.

Cancer

With its blood and marrow transplant program, this cancer signature program has the most robust activity in the field of regenerative medicine. The Medical Center performed its first bone marrow transplant in its one-bed, inpatient bone marrow transplant unit in 1984. The program now has 24 inpatient beds and in 2009 performed over 200 transplants. This robust, well-developed clinical program can provide unique insight and support into clinical, laboratory and regulatory aspects of cellular therapy.

From a research standpoint, the OSU BMT Program is involved in several National Institutes of Health (NIH) supported clinical trials designed to make transplants better tolerated and more successful overall. It is one of a select group of transplant centers involved in the NIH sponsored Blood and Marrow Transplant Clinical Trials Network (BMT CTN) and is also a main member of the National Cancer Institute (NCI) sponsored Cancer and Leukemia Group B (CALGB).³

Critical Care

Regenerative medicine in the realm of critical care is primarily focused around wound care at the Comprehensive Wound Center. A research and evidence-based center that treats patients with chronic, non-healing wounds, the CWC is a hub for wound sciences and care, a place where National Institutes of Health (NIH)-funded basic research leads to clinical trials as the fundamental principles of wound healing, starting at the genetic level, are translated from the lab to the bedside. The program also has pre-clinical studies in burn research funded by the Department of Defense and Veterans Affairs funded clinical research with lower limb amputees and thus has an expanding focus on acute traumatic injuries. The recent development of an inpatient wound consult service and the commitment of plastic and orthopaedic surgeons will pave the way for this mature program to serve as the clinical outlet in developing off-the-shelf tissue-engineered solutions for patients.

Heart

The Cardiovascular Stem Cell Research Laboratory rests within the Davis Heart and Lung Research Institute and is led by Vince Pompili, MD, Periannan Kuppusamy PhD, Zhenguo Liu, Nicanor Moldovan and Hiranmoy Das, PhD. Here they are researching stem cell therapies for cardiovascular diseases with ongoing clinical trials and technology development in this field. Among other projects and trials, their research has led to a specialized nanofiber substance that will play a key role in a study involving umbilical cord blood-derived stem cells.

Imaging

The Wright Center of Innovation in Biomedical Imaging funded by a \$9.1 million Third Frontier Grant and an \$8 million Biomedical Research and Technology Transfer award from the state of Ohio along with the Small Animal Imaging Center can provide critical enabling tools for research in regenerative medicine. The technology and expertise in imaging can provide a key point of differentiation for Ohio State. To date, research efforts have only been able to identify that cells are not living at the expected rate once injected into live subjects. Technology at Ohio State can allow the cells to be “tagged” and tracked throughout the body, lending critical support for research efforts in this field to understand the fate of cells injected to

³http://cancer.osu.edu/patientsandvisitors/cancerinfo/tests/treatment/blood_and_marrow_transplant/clinical_research/pages/index.aspx

repair or regenerate tissues. Again the infrastructure and GMP facility to provide the cells is critical and that's what this program hopes to develop to support enhanced research in this field.

Neurosciences

While the studies being conducted by faculty at Children's in the Center for Gene Therapy focus on neurodegenerative repair other work is being done in the field of Neurosciences. Included is work that is being done in the Center for Brain and Spinal Cord Repair. This Center received two contracts totaling \$5 million from the National Institutes of Health (NIH)/National Institute of Neurological Disorders and Stroke (NINDS). The contracts focus on performing replication studies and training in traumatic spinal cord injury. In the long term, this work could represent a competitive advantage for the Medical Center.

Other

Orthopaedics

The field of orthopedics has been a leader in cell based therapy with the first autologous chondrocyte transplantations performed in people several decades ago. These cell based transplantations have grown into several chondrocyte based products currently available for cartilage restoration. The Department of Orthopedics and the Comparative Orthobiologics Research Laboratory (CORL; College of Veterinary Medicine) have been working together to develop a basic and clinical cartilage program, recently identified as The Ohio State University Medical Center's Cartilage Restoration Program. Dr. David Flanigan, Director of the program, has performed several cartilage restoration procedures, including one called autologous chondrocyte implantation that uses the patient's own tissue, which is one of a few such programs in the country. Dr. Flanigan is also involved in clinical trials for other cartilage restoration procedures, including one that grows the patient's cartilage in a collagen scaffold, a tiny mesh frame that shapes the cartilage to the patient's need.⁴ Dr Bertone, Director of CORL, has developed several engineered scaffold-free constructs that contain a chondrogenic gene and could be implanted into cartilage defects. Using naturally occurring cases of cartilage erosion in animals, these chimeric engineered allogeneic stem cell constructs have been transplanted into clinical patients. Other translational studies in use of cells for acceleration of bone regeneration have been a focus of the lab

Plastic Surgery

In the field of reconstructive plastic surgery, Ohio State researchers are working with researchers at the University of Illinois to develop custom-made bone replacements optimized to restore both form and function for facial reconstruction patients.⁵ Bone regeneration using vascularized bone grafts has been an area of focus in applied research. The collaboration of experts in microsurgery, large animal models of bone regeneration, and molecular and cell regeneration of bone will be an area of strength in this field.

College of Engineering

The College of Engineering has multiple areas of interest in the field of regenerative medicine including the Departments of Biomedical Engineering, Chemical and Biomolecular Engineering, Materials Science and Engineering, Electrical and Computer Engineering, Mechanical and Aerospace Engineering as well as the Center for Cell Engineering and the Nanoscale Science and Engineering Center. In the realm of tissue engineering the University provides unique capabilities including a well-defined internal scaffold geometry in a relatively new area for which preliminary data suggests that mechanical properties can be maintained. In the Center for Cell Engineering researchers are creating cylinders that reproduce the biological environment found within human blood vessel walls so they can grow cells in a way that more faithfully represents conditions in the body. The overall structure can then be sewn into place to provide a replacement for damaged or diseased blood vessels.

More broadly, there is active research in engineering in areas crucial for advancing the field of tissue engineering and regenerative medicine including: measurement and instrumentation, imaging, modeling and numerical simulation, and design and fabrication.

⁴ http://sportsmedicine.osu.edu/patientcare/cartilage_restoration_program/

⁵ <http://www.sciencedaily.com/releases/2010/07/100712154432.htm>

Engineering and medicine have a mutual interest in working together. Working together could create the disease models to provide a convenient 'bridge' between the relatively distant (for many organs) goals of tissue engineering and nearer-term (e.g., more reimbursable) medical treatments.

College of Veterinary Medicine

Given the strong medical and basic science programs at veterinary schools nationwide, their receptive markets, limited FDA regulatory controls, acceptable preclinical models for human disease and the relative ease of introducing new therapies or technologies in a clinical setting in animals; the field of veterinary medicine lends itself to playing a leading role in this emerging field. Our Health Center is one of few that have a College of Veterinary Medicine on campus resulting in uniqueness for animal modeling and animal stem cell developments.

Ohio State's College of Veterinary Medicine has several active programs in regenerative medicine focused in the areas of cell transplantation, comparative orthopedics, Parathyroid Hormone Related Protein (PTHrp) in bone regeneration and metastasis as well as an experimental surgery laboratory. Some recent clinical trials in the College involve the use of bone morphogenic protein-2 cell-based gene therapy for bone healing, use of intra-articular platelet concentrate to improve lameness in dogs with osteoarthritis and the evaluation of a prototype need to concentrate and isolate stem cell from bone marrow aspirates.

Technologies & Intellectual Property

Technology Licensing and Commercialization Office at Ohio State performed an initial inventory of all existing intellectual property and was able to identify more than 75 technologies that may have relevance in the field of regenerative medicine and cell-based therapies. The technologies were grouped into 4 different categories: Regeneration and tissue engineering, cell generation and related systems, fluids and therapies and vaccines.

Facilities

Laser Dissection Core

Led by Sashwati Roy, PhD, this facility contains a robotized PALM MicroLaser system with PALM MicroBeam and PALM RoboStage/RoboMover for high throughput sample collection. Procurement of another device, specifically directed at community service, is in process. The facility enables molecular analyses of laser captured tissue material including stem/progenitor cells from tissue injury sites. Services include standardization of novel techniques related to tissue processing, staining, fixation and capture, with the goal of preserving nucleic acid and protein integrity of the laser-captured tissue. Capture and analysis of tissue down to the resolution of a single cell population (cutting precision 0.6 micron) from in vivo tissue sections is routinely performed. In addition, the facility has developed a way to rapidly identify and capture human blood vessels from clinical samples in a manner that makes high-density screening of the transcriptome possible.

Cell Therapy Laboratory

Working under the direction of Lynn O'Donnell, PhD, a nationally recognized leader in cell therapy laboratories, the Blood and Marrow Transplant/Cell Therapy Laboratory has established quality systems and active quality assurance program compliant with both current good tissue practices (cGTPs) and current good manufacturing practices (cGMPs). As an established cellular therapy lab, there is expertise of the regulatory environment necessary in cell therapies in regards to internal and external audits, device regulations. However, these labs are currently limited in that they currently do not have the expertise to be able to modify cells only transplant them. The Center for Regenerative Medicine would bring this expertise to the organization.

There are currently three open, industry-sponsored, Investigational New Drug (IND) clinical trials for cell therapy, one OSU-investigator sponsored IND, one trial near implementation and two translational development trials, both at initial stages in development.

Small Animal Imaging Core

A multidisciplinary resource, directed by Periannan Kuppusamy, PhD, and Michael Knopp, MD, PhD, is provided through the Small Animal Imaging Center, which includes high-resolution imaging equipment, personnel trained in the operation of each imaging modality and small-animal-handling procedures, and

analytical software support for quantitative image analysis. The facility supports micro magnetic resonance imaging, micro positron emission tomography, micro single photon emission computed tomography and electroparamagnetic resonance imaging systems.

Animal Stem Cell Core

Currently working under the direction of Alicia L. Bertone, DVM, PhD, the Animal Stem Cell Laboratory has been designed to provide quality systems and a quality assurance program compliant with both current good tissue practices (cGTPs) and current good laboratory practices (cGLPs) for industry contracts requiring FDA regulatory specifications. As an established animal research and preclinical cell therapy laboratory, there is expertise of the regulatory environment necessary in animal models of cell therapy. In collaboration with the CVM Clinical Trials Office, this core offers cryopreservation of animal cells for future research or industry contracts. This laboratory team has extensive experience modifying cells for engineered transplantation. The Center for Regenerative Medicine would bring this expertise to the organization.

There are currently open, industry-sponsored, animal clinical trials on going at the CVM for bone marrow derived stromal cell therapy, platelet therapy, dendritic immunotherapy, islet cell therapy and scaffold seeded stem cell therapy.

Industry Partnerships

Industry and Government Partnerships are a key component to the success of CRMCBT and regenerative medicine research. The center will not be able to realize its vision without fostering strong relationships with these partners. As mentioned previously, the biotechnology sector remains largely unconsolidated even though there have been limited mergers and acquisitions. This could open the door to partnership opportunities with dedicated regenerative medicine companies, medical device manufacturers and pharmaceutical companies seeking to ensure revenue channels. They may be willing to collaborate should regenerative medicine provide an opportunity for partnership.

Ohio State's existing partnerships with Battelle and other industry partners such as National Healing Corporation provide the start this program needs to build support. In addition, the University's commitment to technology and commercialization and the dedicated resources in this area could facilitate connections with outside industry support. The medical center and University have a vast scope of expertise, pool of resources and patient volume in a centralized location that is beyond the capabilities of any single company. The Center provides a portal to access all these resources, which makes it an attractive partner to companies.

Battelle, the world's largest, independent research and development organization, is also a partner. Battelle has a long history of science and technology leadership in health research and extensive experience in helping private companies and government agencies develop new treatments. Battelle will lend their translational science expertise to this collaboration. Carol Sabourin, Senior Research Leader/Chief Scientist, Center for Life Sciences Research, Health and Life Sciences Global Business and Herbert Bresler, Chief Scientist, Health and Life Sciences Global Business will be the leadership of Battelle working with the center. The partnership will build on each other's strengths and enable the center to seek large programmatic grants otherwise unavailable to the university alone.

CRMCBT is in talks with Nanofiber Solutions, an OSU based company that started out of the College of Engineering. Nanofiber Solutions manufactures revolutionary 3D nanofiber technologies for cell culture, cancer research and stem cell expansion. Nanofiber Solutions uses a technology platform that provides researchers with more biologically realistic cell culture leading to more effective biomedical research, earlier breakthroughs, faster and cheaper time to market for drug development and improved stem cell expansion rates. Their technology uses aligned and randomly oriented polymer nanofibers integrated into standard multi-well cell culture dishes and can be easily scaled up for larger bioreactor systems. The products facilitate high-throughput tests involving cell migration/invasion, drug discovery, stem cell expansion and directed differentiation, and in vitro diagnostics, provide a 3-D topography that mimics the in vivo topography, are optically transparent to allow for live-cell imaging and real time quantification of cell mobility and have the same general size and shape of standard cell culture dishes allowing ease of

acceptance and compatibility with automated systems and current equipment. The company was first in human with an adult stem cell populated trachea performed in Sweden in November 2011, performed two additional procedures in Russia in June 2012, and they are working on other research areas with CRMCBT. Preliminary areas of exploration include a wound healing scaffold model, intestine, breast and abdominal reconstruction scaffold, sternum scaffold. CRMCBT is actively working to facilitate a novel stem cell seeding process for the trachea procedure, which is planned to occur through The Ohio State University Global Gateway connection in India at the All India Institute of Medical Science. The project will be done in consultation with the Food and Drug Administration (FDA) and result in a multi-patient FDA approved trachea clinical trial to be performed at the Wexner Medical Center.

National Center for Regenerative Medicine has been engaged by OSU leadership to develop a formal strategic relationship whereby both organizations will leverage resources and expertise for mutual programmatic achievement. At the time of this document being written, a memorandum of understanding is in process, which would create the United States largest membership based regenerative medicine partnership.

The University of Akron and CRMCBT have partnered to identify areas of strength and share these resources. The university specializes in polymers and advanced materials that can be used in regenerative medicine applications. The Akron Functional Materials Center (AFMC) is a highly collaborative public-private research consortia with both industrial and academic members focused on accelerating the commercialization of research innovations and measurement solutions in the areas of polymers and advanced materials. The Akron Functional Materials Center (AFMC) is a joint initiative between the College of Polymer Science and Polymer Engineering at the University of Akron and the Austen Bioinnovation Institute in Akron (ABIA). The new Akron Functional Materials Center (AFMC), dedicated to assisting industry, researchers and innovators with the design, fabrication and optimization of polymers and advanced materials. Dr. Matthew Becker, associate professor of polymer science will be leading the collaborative effort with OSU. This relationship started with Dr. Chandan Sen making a visit to the university. Dr. Becker reciprocated with a visit to OSU, met with key faculty in the College of Engineering and provided a lecture to faculty and students titled "Accelerating the Clinical Translation of Biomaterials using Combinatorial Methods". The University of Akron has pledged \$50,000 and CRMCBT will match that amount for \$100,000 to set up a pilot funding opportunity for our investigators to work together.

Through meetings coordinated by CRMCBT with top OSU and Akron General Hospital leadership, a memorandum of understanding has been signed to foster reciprocal relations in wound healing research and a pilot funding mechanism established between the two organizations.

Website

The center website (www.medicine.osu.edu/regenerativemedicine) was developed and launched at the 5th annual Translational to Clinical Regenerative Medicine Wound Care Conference on March 23rd 2012. The website will be the main information dissemination tool of the center. Content will be ever-changing and used as a resource internally and externally. The website provides information about the centers organizational structure and members, including industry partnerships. The most important component will be to assist in fostering collaboration. Member's research and outcomes will be continuously updated along with center event promotion and center industry news about regenerative medicine. Funding opportunities, both intramural and extramural will be highlighted with the intent to bring collaborators together. The website will act as a catalyst of action and not only be informational in nature.

B2. Interdisciplinary programs in Education

In addition to their research focus, members of the CRMCBT are currently both participating in and developing educational programs. Further development of CRMCBT educational activities will contribute to an intellectual atmosphere that will enhance both trainee experiences and retention of high quality faculty. Seminars and conferences that bring OSU faculty together with outstanding visitors will stimulate faculty and students alike, while serving to make better known the quality of the University among our peers. Although the Center will not be a degree-granting unit, it will facilitate relevant academics in this

area. The courses developed by the CRMCBT will be formed in conjunction with the relevant graduate training program. Long-standing programs in regenerative medicine, such as Stanford and Pittsburgh, have developed educational programs that will attract and build a population of students in this realm. As a training ground for future scientists, clinicians and educators, it is critical for The Ohio State University create a multidisciplinary approach not only to advance the future of medicine but to train future scientists and eventually physicians as the field progresses.

As an example of other colleges actively pursuing this trend, NC State University posted a [Cluster Hire in Translational Regenerative Medicine](#) in August 2012.

NC STATE UNIVERSITY COLLEGE OF VETERINARY MEDICINE

Cluster Hire in Translational Regenerative Medicine

As part of the Chancellor's Faculty Excellence Program, North Carolina State University (NC State) seeks faculty scholars with diverse disciplinary skills to enhance the University's faculty expertise and excellence. We invite applications and nominations for faculty positions at the Assistant or Associate Professor rank to partner with faculty in the area of Regenerative Medicine. We seek innovative and transformative academic leaders whose scholarship will further NC State's position as one of the premier universities of its kind in the nation. Appointments will begin in August 2012 and continue until the positions are filled. Inclusiveness and diversity are academic imperatives and thus, university goals. The University is particularly interested in candidates with experience in working with students from diverse backgrounds and who have a demonstrated commitment to improving access to higher education for students from underrepresented groups.

CRMCBT faculty leadership and/or participation in education

Currently regenerative medicine educational components in the College of Medicine are limited to IBGP 880.04, as part of a graduate program. Dr. Sashwati Roy plans to establish a stand-alone graduate level course with long term plans to include undergraduate courses. Dr. Charles Hitchcock will be writing a curriculum on wound healing for the medical students and Dr. Roy will plan to contribute a regenerative medicine aspect. Tissue engineering and related topics are already addressed in a variety of undergraduate and graduate courses in the College of Engineering. Included are topics in mechanotransduction, tissue scaffolds, cell engineering, bioimaging, biosensors, modeling and simulation, micro- and nano-device design and fabrication, biomaterials, tissue mechanics, and biomedical transducers.

CRMCBT Annual Retreat

CRMCBT will hold an annual research day and retreat. The research retreat will allow further dissemination of scientific ideas and foster collaboration through lectures and small group discussion. Networking will occur, as members of CRMCBT from the seven colleges and industry and academic experts will have opportunities to meet and share ideas. OSU faculty, key current and potential collaborators and guest speakers (distinguished faculty) will be invited to give lectures and participate in the retreat. We will work with presenters to ensure topics are broad and of interest to a large audience. Members of an External Advisory Board will be invited during a review year to the retreat and will be asked to evaluate the CRMCBT as part of the 4 year review.

Annual Regenerative Medicine Wound Care Conference

The Annual Translational to Clinical (T2C) Regenerative Medicine Wound Care Conference discusses cutting-edge aspects of the different (translational and clinical) disciplines in regenerative medicine wound care that need to be addressed in tandem to improve delivery of wound care as a whole. Top level national experts are assembled in an academic medical center setting such that participants may include a large

number of students and clinicians who practice wound care, as well as researchers. The conference has grown in scope and content over the last five years. Networking and collaboration opportunities are encouraged and approximately 16.5 Continuing Medical Education (CMEs are credits that physicians must receive by attending educational seminars to keep his/her medical credentials active) are offered to attendees. The 2013 6th T2C conference will be expanded to three days with a new day added for Ohio State University faculty and post docs to present topics. Current top presenters include: Mahendra Roa, Director of NIH Center for Regenerative Medicine, Steve Badylak – McGowan, Tony Mikos – Rice, Gerry Melino – UK, Geoff Gurtner – Stanford, Andrew Baird – UCSD, Lynn Allen-Hoffmann, Wisconsin, Alex Meissner – Harvard, Richard Lee – Harvard, Gary Hammer – Michigan, Chris Breuer, Yale, Nicole Gibran – UW-Seattle, Bob Diegelmann – UV.

Strategic Partnerships with Regenerative Medicine Industry

Partnerships with industry leading experts, such as Battelle and other universities, will be fostered to allow collaboration and educational opportunities. Avenues for lectures and educational series between partners will occur. Collaboration on research projects and partnering to allow for application on large grant programs are a goal.

Educational Goals in Development

This provides an opportunity to build educational programs that would bring to one classroom, to one forum, students from Engineering, Medicine, Biology, Veterinary Medicine, Pharmacy, Dentistry, Arts & Sciences, Nursing and Business where they can all come together towards a common cause. We would develop an innovative curriculum and engage multiple colleges, such as students coming from engineering to teach college of medicine students. Expertise from different colleges will be used to develop one curriculum, which is applicable to all of the students represented by the Center. This will be the future for training scientists, clinicians and educators and it is critical for OSU to become a leader in the field and not a follower or worse a non-participant. The following are some areas in discussion for development:

- **CRMCBT Outside Speaker Seminar Series**
The goal of the Seminar Series is to bring Regenerative Medicine industry experts and potential collaborators to campus to enhance visibility, collaboration and scientific discovery in the area of Regenerative Medicine at OSU. In addition to presenting research data and potential collaboration areas, visitors meet with faculty and students from different programs and Colleges across campus. The scheduled seminars are hosted by the CRMCBT in conjunction with other Colleges across campus that participates in the CRMCBT vision. Brent Toto directs this program. Matthew Becker from the University of Akron was the first invited speaker for the month of April and guests will be planned for every two months.
- **CRMCBT Internal Speaker Seminar Series**
Collaboration among the Colleges at the university is essential to the growth and success of CRMCBT. To foster relationships, a monthly seminar series will be planned with internal speakers representing the seven colleges involved with the Center. Hour long seminars will be planned with Regenerative Medicine experts and promoted across the campus to faculty and students. The goal will be to raise awareness of current work being performed and assist with identifying collaboration opportunities among and across colleges. Speakers will present research data, innovative, approaches and opportunities for collaboration.
- **CRMCBT Multi-Disciplinary Education Program in Regenerative Medicine**
The center will work with the leadership of the colleges to formulate joint regenerative medicine tracks. An example would be a joint, College of Medicine and College of Engineering tract that provides complimentary courses.
- **T32 Training Grant**
This proposal seeks new funding for a training program in regenerative medicine at the Ohio State University. This program will be the primary mechanism for a coordinated and integrated training experience in all aspects of regenerative medicine research for pre- and post-doctoral MD and PhD trainees.

The regenerative medicine training program will enrich existing training programs at OSU in several ways by emphasizing 1) a highly interactive scientific community, 2) a multidisciplinary approach to science, 3) exposure to the biomedical research community of a large academic health sciences center, 4) integration of the clinical and basic sciences, 5) the link between basic science discovery and the application to human disease, and 5) exposure to experienced and talented PhD, MD, and MD/PhD scientist educators and mentors.

The **GOALS** of the T32 Training Grant program are:

1. To make available state of the art laboratory-based training in studies of regenerative medicine for four pre-doctoral and 2 post-doctoral trainees while increasing their familiarity with the clinical aspects of regenerative medicine by facilitating regular interactions between PhD and MD scientists and trainees.
2. To provide post- doctoral trainees, including physicians wishing to pursue careers in laboratory-based investigation, with a strong foundation in basic sciences as well as the direct laboratory experience needed to conduct state of the art basic science research in regenerative medicine. This will be done in part through joint course work, presentations, and conferences.
3. To optimize interactions among investigators in studies of regenerative medicine at OSU in order to create the ideal environment for research and education of trainees.

- **Regenerative Medicine Journal Club**

Medicine fosters a relationship between basic research and clinical science. A biweekly journal club is planned which would offers a forum for the discussion of both clinical and basic science topics within Regenerative Medicine. Faculty, Graduate and Post-Docs will be the focused audience of the Journal Club.

- **Weekly CRMCBT Work in Progress Discussion Group**

A weekly CRMCBT Work in Progress Discussion Group Meeting will be established. The discussion group enables scientists and trainees to present preliminary data to their peers. The Work in Progress medium serves as a sounding board for scientists to obtain critique of their work from colleagues while often still at preliminary stages of concept development. The Work in Progress environment facilitates the development of new research strategies, pools knowledge, and fosters collaboration amongst regenerative medicine investigators at OSU. All levels of trainees including Graduate students, post- doctoral researchers, and research scientists are encouraged to participate. The weekly CRMCBT Work in Progress Discussion Group meeting may later be converted to a 1 credit hour course for Graduate students.

B.3 Service and Reputation commitment of CRMCBT

The CRMCBT will focus on the following areas:

- Provide investigators with support to deliver conference presentations in a national platform
- Through coordinated efforts increase the number of prominent guest visitors
- Improve clinical outcomes for patients treated with innovative solutions provided by the Center
- Attract corporate partners and sponsored clinical trials

B. The goals of the center that cannot be met within existing academic units.

The goals of the proposed Center cannot be achieved within existing academic units. The current model of fragmented individual or departmental research funding is to be augmented by deeper and more focused funding of targeted research areas and interdisciplinary teams. The Center will encourage faculty to channel their effort into interdisciplinary collaborations both internally and externally.

Creating the goal of an environment that would foster interdisciplinary interactions, advance and disseminate knowledge in this emergent field, with the final goal to deliver solutions in health care through effective public-private partnerships can only be achieved by innovative approaches. The following goals have an overarching theme that supersedes individual academic units and transcends the campus' physical borders.

Goals:

The following goals and strategies have been developed to help this program achieve its vision.

Goal 1: BUILD INFRASTRUCTURE

Build the infrastructure to enable investigators to do research in regenerative medicine.

- Strategy 1.1: Create core facilities for researchers at the Medical Center and campus wide.
 - 1.1a: Develop a 900-square foot stem cell core located in the basement of the Biomedical Research Tower in close proximity to the expanded GMP clinical facility planned in Project One
- Strategy 1.2: Use technology to connect individuals internally to one another and external opportunities.
 - 1.2a: Create an intranet site where individuals can learn about the activities
 - 1.2b: Develop a databank of investigators and center members, cataloging activities
- Strategy 1.3: Provide critical support services to support and maintain an effective infrastructure
 - 1.3a: Connect investigators with institutional and industry partners and opportunities and national and international agencies forming strategic partnerships
 - 1.3b: Appoint programmatic leaders to facilitate and oversee areas in imaging, wound care, tissue engineering and cell-based therapies.

Goal 2: INTERNAL COLLABORATION

Through strategic investment, empower leading investigators to form interdisciplinary teams directed at achieving funding from large programmatic grants.

- Strategy 2.1: *Create a governance structure that reinforces collective distribution among enabling programs.*
 - 2.1a: Create an external advisory council of national and regional government, academic and industry experts.
 - 2.1b: Appoint an internal executive committee including OSU departmental and programmatic leaders representing the contributing members.
 - 2.1c: Select leadership teams for the pillars and initiatives such as tissue engineering, imaging, wounds and cell therapy
- Strategy 2.2: *Leverage the strengths and resources in other programs at Ohio State.*
 - 2.2a: Partner with the CCTS to avoid duplication of key support services
 - 2.2b: Work with the Cell Therapy Laboratories and Stem Cell Core to understand appropriate protocols, regulation and process
 - 2.2c: Continue to work with Office of Technology and Commercialization at Ohio State to identify existing technologies and opportunities to build upon in the field of regenerative medicine
 - 2.2d: Explore possible technological infrastructure with Ohio Supercomputing Center
- Strategy 2.3: *Improve communication internally*
 - 2.3a: Develop an internal communications plan for all registered members.
 - 2.3b: Use technology and support staff to coordinate forums and meetings.
- Strategy 2.4: *Provide programmatic pilot funding in designated priority areas*
 - 2.4a: Identify opportunities based on need in the field and in priority areas
 - 2.4b: Create a streamlined and transparent process for awarding funding to investigators

Goal 3: FACILITATE FUNDING

Foster the development of funding for research technology and commercialization opportunities for Ohio State.

Funding will be a major focus of the center by assisting with funding, process, collaboration, connecting researchers/organizations and filling expertise voids (internally/externally).

- Strategy 3.1: Strengthen relationships with industry partners by leveraging existing strengths of Ohio State.*
- 3.1a: Work with Battelle Memorial Institute to assist in developing good manufacturing processes for treatments/technologies created in the lab – a significant pitfall in the commercialization process
 - 3.1b: Leverage the existing relationship with Vomaris, Healogic, Inc., Nanofiber Solutions, StemMed, Inc. etc.
 - 3.1c: Other companies as strategically identified through programmatic directors; and incentivize industry partnership
- Strategy 3.2: Create complementary arrangements with other regenerative medicine entities in Ohio to strengthen the status of the State of Ohio and garner Ohio Department of Development funding.*
- 3.2a: National Center for Regenerative Medicine in Cleveland
 - 3.2b: Cincinnati's emerging Center for Regenerative Medicine
 - 3.2c: Work with Akron Functional Materials Center (AFMC) to redirect some of their research interests toward regenerative medicine
- Strategy 3.3: By building the infrastructure and enhancing collaboration, improve outcomes of process for seeking major programmatic grants from the following entities*
- 3.3a: Department of Defense
 - 3.3b: National Institutes of Health
- Strategy 3.4: Work with development officers to generate private and foundation funding opportunities.*
- 3.2a: Create a physical administrative presence with visibility to elevate awareness.
 - 3.2b: Provide naming opportunities for benefactors

Goal 4: CREATE EDUCATIONAL PROGRAMS

Develop a regenerative medicine educational program for researchers, faculty and students at Ohio State.

- Strategy 4.1: Develop an annual symposium for faculty, researchers and students.*
- 4.1a: Work with other colleges to ensure topics are broad and of interest to a large audience
- Strategy 4.2: Create a multi-disciplinary education program in regenerative medicine*
- 4.2a: Create a joint, College of Medicine, College of Engineering, College of Business tract and explore other opportunities for innovative education tracts
 - 4.2b: Seek a training grant
- Strategy 4.3: Identify industry partners who can support educational efforts such as Battelle*

- II. Faculty: Describe the level of faculty interest and commitment to the center. In particular, provide, describe or explain the following.
 - A. The criteria for selecting the center's faculty membership.
 - B. A list of faculty expressing interest in associating with the center
 - C. The extent to which staff and students will be involved and how they will be supported.

II. Faculty

A. The criteria for selecting the center’s faculty membership.

A1. CRMCBT Faculty Member

Faculty will be recognized on the basis of their notable interests in Regenerative Medicine interactions, and their research interests should be focused on the goals of the Center. All are OSU faculty. Faculty may request CRMCBT membership in writing to the Center. CRMCBT member appointments will be made by the Director with approval by the Executive Committee. Criteria for membership, as well as for active members to maintain membership, are:

1. Involvement in teaching activities related to the goals of the Center,
2. Participate in the collaboration efforts to raise awareness of his/her work to other members,
3. Attending other Center activities including seminars and retreats,
4. Service to the University (e.g. student committees, department/division and OSU-wide committees),
5. Maintain an active, collaborative, funded research program closely aligned with the goals of the Center, and
6. Participate in the training of PhD, MD, MD/PhD students and post-doctoral fellows as appropriate. The CRMCBT will not serve as a Tenure- initiating unit.

A2. Staff/Research personnel

Staff and research personnel in CRMCBT member laboratories will be expected to provide research and/or administrative support to further the mission of the Center. CRMCBT staff involved in research will be expected to participate in progressing the science of a CRMCBT faculty member. Research staff will be expected to present their research and attend seminars/lectures.

A3. Trainees

OSU has a large number of trainees on campus who have an interest in performing research related to Regenerative Medicine. These include Undergraduate students, Graduate students, medical students, and post-doctoral fellows. The CRMCBT will offer training opportunities (both bench and classroom) for individuals with interest in the field of regenerative medicine. Trainees will be expected to participate in research in a laboratory of a CRMCBT faculty member and to present their research and attend seminars/lectures. Although the Center is not envisioned as a degree-granting unit, it will facilitate relevant academics in this area. Trainees will be supported by their sponsoring CRMCBT faculty member or by extramural or intramural training grants.

A4. Private Industry and Academic Partners

Because of the true nature of collaboration in the success of regenerative medicine, individuals outside of OSU can become members of CRMCBT. OSU alone does not have all the resources and expertise necessary to achieve exponential outcomes that partnering can provide. Private Industry and Academic Partners will be expected to participate in the collaboration efforts to raise awareness of his/her work to other members, attend other Center activities including seminars and retreats and participate in collaboration with OSU faculty members.

B. A list of faculty expressing interest in associating with the center

B1. Participants in the CRMCBT

There are 117 participants in in CRMCBT from various departments and colleges across the OSU campus that have established themselves as regular participants in the regenerative medicine activities or expressed interest. Such individuals are potential CRMCBT Members. These members will play an active role in the CRMCBT by attending seminars, collaborating on projects and grants, and otherwise acting in a positive role in all Center activities.

Alan S Litsky
Alicia Bertone
Allard Dembe

Alok Sutradhar
Altaf Ahmad Wani
Arthur J. Epstein

Arthur Joseph Epstein
Avner Friedman
Bernadette Melnyk

Bharat Bhushan	Hiranmoy Das	Qinghua Sun
Binnaz Leblebicioglu	Ichiro Nakano	R. Lawrence Moss
Brian Kaspar	Jason G Harb	Rami N. Khayat
Cameron L. Rink	Jed Johnson	Randy Moses**
Carlo Maria Croce	Jessica O. Winter	Rebecca Jackson
Carmen Cantemir	Jianjie Ma	Richard Hart
Charles Howard Cook	Jianjun Guan	Rita Alevriadou
Charles Lockwood	Jim Lee	Rob Lee
Christopher Breuer	Jodi C. McDaniel	Robert J. Lee
Cynthia Carnes	Joel L Mayerson	Robert R Seghi
D. Bradley Welling	John C Byrd	Robert W. Brueggemeier
Dana Marie McTigue	John M Nusstein	Ronald Xiaorong Xu
Daniel Scott Eiferman	John Sheridan	Ronney Abaza
Daniel Wozniak	Jon R. Parquette	Samir N. Ghadiali
Daren Lee Knoell	José Javier Otero	Sandeep Soni
David Benjamin Renton	Karen L Wood	Sanjay Rajagopalan
David Mess	Kathleen Ham	Sarah Beidelschies
David Williams	Keith Gooch	Sashwati Roy
Dean Jiro Mikami	Keith O Yeates	Savita Khanna
Denis C. Guttridge	Kurt B Stevenson	Scott Schricker
Derek J Hansford	L James Lee	Scott Scrape
Don Hayes, Jr.	Larry Charles Lasky	Sidney F. Miller
E. Christopher Ellison	Lonnie King	Steven M Devine
El Hodiri, Heithem	Lyn B Jakeman	Steven Michael Steinberg
Elizabeth Drotleff	Lynn O'Donnell	Stuart L Cooper
Elliott David Crouser	Michael Go	Sudha Agarwal
Erin Bender	Michael Knopp	Thomas Frederick Mauger
Esther Maria Chipps	Michael Miller	Tracey L. Papenfuss
Gayle Gordillo	Naeem Akhtar Ali	Traci A. Wilgus
Gregg Allen Hadley	Nicanor Ilie Moldovan	Valerie Bergdall
Gunjan Agarwal	Patrick Lloyd	Vincent Pompili
Gustavo W. Leone	Periannan Kuppusamy	Vish Subramaniam
Hayam Ahmed Galal	Peter March	Xiaoming (Shawn) He
Hamzah Hussein	Peter Martin Anderson	Yehia Mohamed Saif
Heather Megan Powell	Peter Mohler	Zongyang Sun
Heithem El-Hodiri	Peter Shields	
Herb Bresler	Phillip G. Popovich	

Once the CRMCBT is established as an official University Center, the Director and the Operations Committee will convene to discuss and vote on membership for those on the above list as well as other faculty on campus that request membership in the CRMCBT. A majority vote is required for membership.

C. The extent to which staff and students will be involved and how they will be supported.

Increasing staff and student involvement in the center will be key to long-term success. All undergraduate students, graduate students, and postdoctoral research associates in laboratories associated with the CRMCBT will benefit from attending all center activities.

The goal is to continue to build a strong sense of community among the students, postdocs and faculty, and to increase sharing of technical expertise among regenerative medicine laboratories. Specific examples include:

- Educational program development whereby students will have access to regenerative medicine focused curriculum and cross-college tracts. An example would be a joint College of Medicine and Engineering tract.

- While there are post docs participating in the research efforts, to date there are no dedicated programs for undergraduate or graduate students interested in the field of regenerative medicine.
- Access to educational events such as the internal and external seminar series covering a vast array of regenerative medicine themes.
- Participation in research meetings such as the annual T2C Regenerative Medicine Wound Care Conference, a CME event, and the Annual Retreat at Mohican.
- Encourage co-mentoring of students by multiple center PI's across colleges. As an example, the center would facilitate a co-mentorship with involvement of a faculty member from Biomedical Engineering and Dentistry.
- T32 training grants will be pursued to foster student involvement in the center.
- Fellowship support for exceptional graduate students will be available through the Center, and the Center will be considering support for undergraduate students to work during the summer in member labs.
- Involvement and participation with center industry partnerships. Students and staff can benefit from interactions with the partners through research opportunities, interning or more formal embedding for longer periods of time. One resulting aspect would be exposure to the commercialization of regenerative medicine solutions. Battelle is a key partner and has expressed interest in students and faculty involvement.

- III. Administration: Describe the administrative structure and responsibilities of the director and oversight committee. In particular, describe or explain the following.
- A. The name of the director or interim director of the center.
 - B. The proposed responsibilities of the director.
 - C. The function(s) and composition of the oversight committee.
 - D. The reporting line—the dean, group of deans, or vice president to whom the center will report.
 - E. The main components of a pattern of administration for the center (to be formally completed/approved within a year of center establishment).

- III. **Administration:** Describe the administrative structure and responsibilities of the director and oversight committee. In particular, describe or explain the following.
- A. The name of the director or interim director of the center.

Chandan Sen is the director of CRMGBT.

- B. The proposed responsibilities of the director.

Center Director

The Center Director will lead the CRMGBT and serve on the External Advisory, Executive and Operations Committee. This individual will have a nationally recognized reputation with an active, funded research program. He/She will be an expert in a primary area of regenerative medicine and have the capability and motivation to run an internationally competitive program in regenerative medicine at Ohio State. He/She will continue to shape the mission and policies of the CRMGBT, initiate and monitor interdisciplinary research and teaching efforts, identify funding sources and facilitate research. The Director will encourage collaborative activities to fulfill the Center's mandate and may form committees of members to advise and assist on any CRMGBT matter deemed appropriate, including programs, development, and resources. The Director will develop day-to-day policies in consultation with the Center Members and the CRMGBT Operations Committee. The CRMGBT Operations Committee will work with the Center Director in establishing policies for the Center. The Center Director reports to the Dean of the College of Medicine. As research is the primary goal of the Center, the Vice President for Research will be regularly informed of the progress of the CRMGBT. The term will be 4 years, whereby the individual will be re-evaluated by the CRMGBT Operations Committee and the External Advisory Committee.

- C. The function(s) and composition of the oversight committee.

Executive Committee

The Executive Committee will be comprised a small group college representatives from each college giving the center minimum annual funding of \$50,000. The college funding is requested in cash, but limited in-kind contributions will be considered towards the \$50,000 requirement. The Center Director and Administrative Director will be on the Executive Committee. Additionally, Nationwide Children's Hospital and Battelle will have one representative on this committee.

Internal Advisory Board

The Internal Advisory Board will be comprised of invited members representing Institutes, Centers, Department Chairs and possible Deans of the various involved colleges and will have 10 members. The committee will be informed of the Center's progress and provide input toward key decisions as needed and formally meet on an annual basis. The meeting will be considered to occur in conjunction with the Annual Mohican Retreat.

External Advisory Board

The External Advisory Board shall be composed of four representatives from existing centers or institutes of regenerative medicine around the United States and two representatives from industry. Members of the Board will visit the Center and provide consulting services at least once a year. The visit will be suggested to occur at the same time as the T2C Regenerative Medicine Wound Care Conference. The External Advisory Board will evaluate the Center and its progress every four years. External Advisory board expenses will be budgeted for the fourth year of operations and taken from the college contributions to the center.

CRMGBT Operations Committee

The Center will have an Operations Committee, whose members will be nominated and approved by the dean of the nominee's respective college. Other individuals will be nominated by the Director and approved by the Executive Committee. The committee will monitor and provide voting input to the activities of the CRMGBT, its Director, Co-Chair, associated Faculty and programs. This committee will meet quarterly.

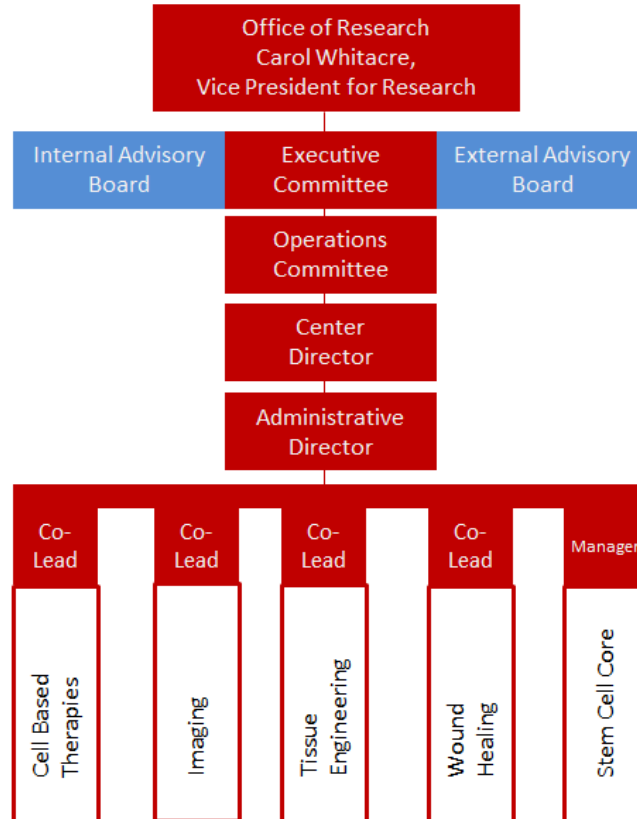
The Operations Committee will work closely with the Director to develop the goals of the Center. The activities of the Operations Committee will be broad and encompass all aspects of the CRMCBT function including education, CRMCBT membership, potential joint equipment purchases, progress of seminar series, and all administrative aspects of the Center. The Operations committee will inform/discuss pertinent aspects of the Center with the CRMCBT members via the website and email. An acting CRMCBT Operations Committee has been in place since March 2012 and currently consists of the following members:

Jeffery Aluletta	Medicine/Children's
Alicia Bertone	Veterinary Med
Herb Bresler	Battelle
Christopher Breuer	Medicine/Children's
Cynthia Carnes	Pharmacy
Avner Friedman	Arts & Sciences
Gayle Gordillo	Medicine
Denis C. Guttridge	Medicine
Richard Hart	Engineering
Brian Kaspar	Medicine/Children's
Michael Knopp	Medicine
James Lee	Engineering
Rob Lee	Engineering
Jianjie Ma	Medicine
Peter March	Arts & Sciences
Jodi C. McDaniel	Nursing
Michael Miller	Medicine
Peter Mohler	Medicine
Randy Moses**	Engineering
Lynn O'Donnell	Medicine
Vincent Pompili	Medicine
Chandan Sen*	Medicine
Peter Shields	Medicine
John Sheridan	Dentistry
Vish Subramaniam	Engineering
Brent Toto	Administrative Director

Active Member List as of: 3/29/13

D. The reporting line—the dean, group of deans, or vice president to whom the center will report.

Due to the cross-college nature of the center with involvement of 7 colleges, the center will report to the Vice President for Research in the Office of Research for the University. The organizational chart follows:



E. The main components of a pattern of administration for the center (to be formally completed/approved within a year of center establishment).

Hierarchy of Administration following the Center Director

- Co-Director**
The Co-Chair of the CRMCBT will aid the Director in day-to-day activities of the Center and will co-chair the Operations Committee. In addition to close consultation with the Center Director, the Co-Chair will perform administrative and other duties of the Director in his/her absence from campus. This Co-Chair will be appointed by the Director and confirmed by the CRMCBT Executive Committee. The term will be 4 years, whereby the individual will be re-evaluated by the CRMCBT Executive Committee.
- Administrative Director**
The Administrative Director will manage the day-to-day operations of the Center and work closely with the CRMCBT Director. She/he will leverage existing internal resources and act as a catalyst for connecting investigators with institutional and industry partners and opportunities. A key function will be to connect the new Center with the national and international agencies forming strategic partnerships.

Brent Toto, MHA was hired in March 2012 as the Administrator Director.

- **Pillar Co-Lead**
Each of the four pillars of the center will have a joint leadership represented by two different colleges. The pillars will be Cell Based Therapies, Imaging, Tissue Engineering and Wound, Burn and Trauma. The programmatic leaders will facilitate and oversee these areas.

- **CRMCBT Stem Cell Core Manager**
The Stem Cell Core Manager will provide oversight of the day to day operations of the stem cell core. He/she will facilitate the procurement and distribution of the stem cells for internal and external research use.

- **CRMCBT Administrative Assistant**
The CRMCBT will require an administrative assistant to provide clerical support for faculty, students and staff involved in the CRMCBT. As the CRMCBT grows, we anticipate the need for a full-time secretary that would be funded 100% from the Center.



Evaluation and meeting timetable:

- CRMCBT Pillar Meetings: Quarterly
- CRMCBT Operations Committee meeting: Quarterly
- CRMCBT Executive Committee meeting: Quarterly
- CRMCBT faculty member meeting: Annually
- CRMCBT Internal Advisory Committee meeting: Annually
- Formal evaluations of Director and CRMCBT progress by the External Advisory Board and the CRMCBT Leadership Committee: every 4 years

- IV. Budget/Funding: Specify budget and funding sources for the center. In particular, describe or explain the following.
- A. The expected budget for the first year of operation.
 - B. Funding sources and one-time and recurring costs.
 - C. Existing or new equipment, space, and facilities needed to establish the center.
 - D. The sustainability of the center—possibilities for external funding, and details of related funding proposal submissions.

IV. Budget/Funding: Specify budget and funding sources for the center. In particular, describe or explain the following.

A. The expected budget for the first year of operation.

The College of Medicine has provided an annual budget of \$500,000 and the other six colleges have contributed \$515,000 to cover initial operating costs including office equipment and personnel for a total of \$1,015,000. A commitment of a large gift of \$1,500,000 will be made to the center in 2013.

Ten percent of the total funds will be allocated for administrative overhead. It will be the responsibility of the Center Director and Administrative Director to pursue funding opportunities past the initial first year commitment of the colleges. The College of Medicine and College of Engineering have already committed to a second year of funding and the other five colleges will review results of the centers efforts and faculty benefit before making a second commitment. The time and effort of Center leadership is a cost-sharing with home departments.

Research activities for the program are housed across the campus within their respective colleges.

B. Funding sources and one-time and recurring costs.

Center leadership will continue to pursue extramural funding and identifying external partners to provide matching funds. As noted above, the University of Akron is one example of this already occurring by contributing \$50,000 to establish a funding track in biomaterials.

Regenerative Medicine	FY12/13 Budget
<i>Sources</i>	
<i>University Funding</i>	
Support from College of Medicine	\$500,000
Support from College of Engineering	\$250,000
Support from College of Arts and Sciences	\$100,000
Support from College of Dentistry	\$75,000
Support from College of Veterinary Medicine	\$30,000
Support from College of Pharmacy	\$50,000
Support from College of Nursing	\$10,000
2013 Gift to Center	\$1,500,000
Total	\$2,515,000

<i>Expenses</i>		
<i>One time purchases</i>		
Two -80 Freezers, Two -20 Freezers, One Cryo S		\$54,543
Six Desktop Computers		\$5,000
One Laptop Computer		\$2,200
Presentation Projector		\$640
Rees Monitoring System for Freezers/Cryo		\$3,132
Signage for Center		\$90
Camera and Video Camera		\$797
Total		\$66,402
<i>Reoccurring</i>		
	Monthly	Annually
Staff Salary	\$5,478	\$65,740
Staff Benefits	\$1,912	\$22,943
T2C Conference Support		\$25,000
Phone/Cell Phone/Communications	\$150	\$1,800
Office Supplies	\$75	\$900
Printing	\$200	\$2,400
Annual Mohican Retreat		\$15,000
Meetings		\$2,400
Parking Passes (visitors/guests)		\$180
CCTS Pilot		\$50,000
Pilot Funding for new projects		To be Determined
Total		\$186,363

C. Existing or new equipment, space, and facilities needed to establish the center.

Since researchers will continue to use their current facilities only administrative space will be needed aside from the Stem Cell Core.

The 10th floor of the Biomedical Research Tower (BRT) will be the administrative home of the Center, although the centers presence canvases the majority of the campus with seven colleges involved. Tenth floor administrative space will include Administrative Director's office, principal investigator office and multiple work stations available for member faculty and visiting or sabbatical professors. Space has been allocated for a Stem Cell Core in the basement of the BRT in room 015.

Two minus 80 freezers, two minus 20 freezers and a cryo storage system have been purchased for the Stem Cell Core and member usage

A desktop and a laptop computer have been purchased for the Administrative Director. Five additional desktop computers have been purchased for work stations in the administrative suite for researcher and staff use.

D. The sustainability of the center—possibilities for external funding, and details of related funding proposal submissions.

Sustainability of the center will be met through multiple channels of focus and include the following:

- Secure funding from the planned increase Governmental funding focused on regenerative medicine.
 - Funding for regenerative medicine is forecasted to continue to grow from a governmental standpoint and is well documented. The center will position itself to successfully complete for these new large programmatic funding opportunities and have planned indirect costs to support the centers operation.
- Target State of Ohio funding opportunities such as the Ohio 3rd Frontier funding platform aimed at boosting Ohio's presence and advancement of technology.
- Fostering and leveraging Industry Partnerships.
 - Accurately positioning the center with key strategic industry partners towards contract research and development gifts with an end goal of shared IP and commercialization returns.
 - CRMCBT has already established a relationship with StemMed, Inc. who is submitting an SBIR grant and Vomaris, who is currently in process of setting up contract research and a gift.
- Building Academic partnerships to leverage resources.
 - CRMCBT has already shown its ability to secure small funding sources with the University of Akron (\$50,000 matching funds for pilot funding) and Akron General Hospital (\$50,000 matching funds for pilot funding). Organizations understanding the landscape of regenerative medicine know that partnerships will be necessary to successfully compete for large programmatic funding.
- Development and Gift funding.
 - CRMCBT is actively working with OSU development (Point of Contact: Sarah Rooney) to foster private funding for center research and activities.

The following are the financial strategic expectations of the CRMCBT for the next five years.

- Increase NIH funding by capturing 3 R01 awards and at least 1 PPG by FY15.
- Increase Department of Defense funding and other government funding by \$10million
- Achieve \$1M in funding through State of Ohio support earmarked for technological advancements
- Bring in development funding of \$500K to create an endowment guaranteeing the longevity of the program
- Increase Central Ohio market share and regional and national referrals by providing access to innovative healthcare solutions such as comprehensive wound care, or cell based therapies for non-malignant disease.

To date the CRMCBT has not submitted any funding proposals but is actively identifying sources and taking inventory of its resources to apply shortly. Pilot research projects are currently underway which it is anticipated resulting data should be parlayed into grant applications. Once at University Center status, the center will seek indirect cost recovery grant dollars pursuant to university policies from those CRMCBT faculty grants which were supported by the Centers efforts and resulted in extramural funding. Indirect cost recovery dollars will be used to fund Center administration overhead and further pilot opportunities for CRMCBT faculty.

- II. Evaluative Criteria and Benchmarks: Propose and define specific criteria and benchmarks against which the center will be measured.

III. Evaluative Criteria and Benchmarks: Propose and define specific criteria and benchmarks against which the center will be measured.

A Short-term review

A1. Six month internal review by the Operations Committee

Members of the operations committee will assist in guiding the center along mutually beneficial and aligned interests in support of the goals of the center and the member's college. Input will be solicited from committee members regularly, both informally and formally and acted upon by center leadership. The Operations Committee will formally review the progress of the Center every six months during time set aside at a committee meeting. Operations Committee reports will be reported to the Executive Committee.

A2. Annual Stewardship Report

The Director will submit an annual stewardship report to the Operations, Executive and External Advisory Committee. The goals for the Center elaborated in Section I.C. of this proposal and the Expectations and Benchmarks below will provide the criteria for ongoing evaluation of the Center's performance in research and training. The annual report will also be submitted to the Operations and Executive Committee.

A3. Executive Committee

The Executive Committee will be informed of the Center's progress and provide input toward key decisions on a bi-annual basis.

B Long-term evaluation

B1. Third year internal review

At the end of the third year the Center Director will prepare and submit an internal report to the Operations Committee. This self-study will form the basis for potential adjustments to the Center policy and structure according to the recommendations of the Operations Committee. The third year review will provide a frame-work for the submission of an extensive review in year four which will be submitted to the Office of Academic Affairs. The level and quality of annual scholarly and research activity of the CRMCBT and its faculty will be measured against levels achieved in the years preceding its establishment.

Specific criteria for evaluation are;

1. Quality and quantity of peer reviewed publications
2. Extramural funding
3. Number of classes taught, and courses initiated, by CRMCBT personnel (Evaluated as an indirect measure)
4. Public Service (service to the University/College and the scientific community)
5. Participation in local, national, and international meetings
6. Patents and Technology Licensing

B2. Four year External evaluation

Every four years the Office of Academic Affairs will request from the Director, the Operations Committee, and the Dean, recommendations concerning reporting lines, governance, performance and effectiveness, and the continuation of the Center. The purpose of this review will be to assure that Center programs and activities are not only consistent with the Center mission but also with research in regenerative medicine. The criteria to be considered in an external review of the Center will be The Ohio State University's land-grant mission, the goals of a research-orientated Center, and the specific goals and mission of the CRMCBT. A formal review will be orchestrated by the CRMCBT Operations Committee and conducted by the External Advisory Board.

The External Advisory Board will perform the review of the Center. Reviewers will be invited to a site visit at OSU six months preceding the submission of the fourth year report. The site visit will coincide with the CRMCBT Retreat to facilitate the awareness of scientific progress within the Center. The external review board will evaluate the proficiency of the CRMCBT Director, members of the Faculty

Operations Committee, and progress of the Center based upon interviews with Faculty and staff and observations of scientific collaboration and progress. Evaluation criteria will include those listed above.

C. Continued evaluation

An external review of the CRMCBT and submission of a progress report will be executed every four years. Progress will be measured against the preceding three year evaluation period.

D. Center Expectations and Benchmarks

Organized by OSU Medical Center's key result areas, the following are the strategic expectations and benchmarks for CRMCBT over the next five years.

Financial

- Increase NIH funding by capturing 3 R01 awards and at least 1 PPG by FY15.
- Increase Department of Defense funding and other government funding by \$10million
- Achieve \$1M in funding through State of Ohio support earmarked for technological advancements
- Bring in development funding of \$500K to create an endowment helping to sustain the longevity of the program
- Increase Central Ohio market share and regional and national referrals by providing access to innovative healthcare solutions such as comprehensive wound care, or cell based therapies for non-malignant disease.

Innovation & Strategic Growth

- Facilitate increasing the number of patents in regenerative medicine by at least one per year
- Attract at least 4 corporate partners, one for each pillar of regenerative medicine to sponsor activities with Ohio State
- Become a site for clinical trials in regenerative medicine and cell based therapy by assisting investigators in setting up and accruing patients to trials
- Give patients access to innovative products developed in the Center that support tissue repair and advanced surgical reconstructive procedures.

Productivity & Efficiency

- Create a membership framework that encourages development of interdisciplinary teams and attract at least 100 investigators as members in the first year
- Ensure core lab utilization
- Produce F&A recovery of \$150K in year 3, \$300K in year 4 and \$450K in year 5
- Increase the volume and productivity of existing services that support Center activities, e.g. increased utilization of the CWC will generate more radiology referrals and operative cases. Increased scope of cell based therapy treatments will increase utilization of the GMP facility planned for Project One

Service & Reputation

- Provide investigators with support to deliver conference presentations in a national platform
- Through coordinated efforts increase the number of prominent guest visitors
- Improve clinical outcomes for patients treated with innovative solutions provided by the Center
- Attract corporate partners and sponsored clinical trials

Workplace of Choice

- Ensure investigator satisfaction by facilitating access to tools and support
- Lower the barriers for collaboration between individual investigators, clinicians and scientists, and between Colleges to support faculty recruitment and retention

Other outcome measures of success include:

- An increase in the number of submitted and acquired extramural grants, including program grants;
- Increased research and classroom training opportunities;
- Increased recognition at the national and international level, evidenced by an increase in the number of invited lectureships, and by an increase in new programs by CRMCBT faculty aimed at increasing linkages between the basic and clinical sciences;
- Assessment of clinical impact for any treatment or technology developed by the Center and tested on patients based to measure restoration of patient form or function

- IV. Supporting Materials: Solicit and include letters of support from
- A. Relevant department chairs, school directors, deans, and vice presidents from within the university.
 - B. Interested parties outside the university.
 - C. Entities with similar emphases at other universities.

V. Supporting Materials: Solicit and include letters of support from
A. Relevant department chairs, school directors, deans, and vice presidents from within the university.

Deans/Senior Leaders-	Associate Deans/Chairs	Center Directors
Steven Gabbe, MD Senior Vice President for Health Sciences, OSU and CEO, Wexner Medical Center	Rebecca Jackson, MD Associate Dean for Clinical Research and Director, CCTS	Valerie Bergdall, PhD Director, University Laboratory Animal Resources Veterinary Medicine, Representing Department of Veterinary Preventative Medicine
Charles Lockwood, MD Dean, College of Medicine Vice President for Health Sciences, Professor, Obstetrics and Gynecology, Leslie H. and Abigail S. Wexner Dean's Chair in Medicine	John Sheridan, PhD The George C. Paffenbarger Alumni-Endowed Chair in Research Associate Dean for Research, College of Dentistry	
David Williams, PhD Dean, College of Engineering	Cynthia Carnes, PhD Associate Dean for Research and Graduate Studies Pharmacy	
Peter March, PhD Divisional Dean, Natural Mathematical Sciences, College of Arts & Sciences	Richard Hart, PhD Chair, Biomedical Engineering Engineering	
Patrick Lloyd, DDS, MS, Dean, College of Dentistry	Rudolph G. Buchheit, Chair Materials Science and Engineering	
Lonnie King, DMV, MS, MPA, ACVPM, Dean College of Veterinary Medicine	Rustin Moore, DVM, PhD, DACVS, Chair, Veterinary Clinical Sciences, Associate Dean, Clinical and Outreach Programs	
Robert Brueggemeier, PhD, Dean College of Pharmacy	Michael Oglesbee, Chair for Veterinary Biosciences	
Bernadette Melnyk Dean, College of Nursing	Randy J. Nelson Chair, Neuroscience	
	Robert Lee, Chair, Electrical and Computer Engineering	
	Ahmet Selamet, Chair, Mechanical and Aerospace Engineering	
	Luis Casian, Chair, Mathematics	

Deans and Center Directors whose faculty are impacted by the creation of the Center were asked to provide letters of support. These are provided in the indicated appendix.

B. Interested parties outside the university.

Nationwide Children's Hospital, William Smoyer, MD, FASN, C. Robert Kidder Chair, Vice President, Clinical and Translational Research, Director, Center for Clinical and Translational Research, The Research Institute at Nationwide Children's Hospital, Professor of Pediatrics, The Ohio State University Battelle, Herbert Bresler, PhD, Senior Research Leader

C. Entities with similar emphases at other universities.

University of Akron, Matthew Becker, PhD, Director, Akron Functional Materials Center (AFMC), Associate Professor, Department of Polymer Science, University of Akron

Appendix

- A. CRMGBT Peer-reviewed Publications Links and Example Publications
- B. Letters of Support
- C. Member List by Department/College

APPENDIX A

CRMCBT Peer-reviewed Publications Links and Example Publications

Follow the links on the headings to a full listing of the current publications.
A few examples are provided below.

Stem Cell Publications

[Impairment of Glioma Stem Cell Survival and Growth by a Novel Inhibitor for Survivin-Ran Protein Complex.](#)

Guvenc H, Pavlyukov MS, Joshi K, Kurt H, Banasavadi-Siddegowda YK, Mao P, Hong C, Yamada R, Kwon CH, Bhasin D, Chettiar S, Kitange G, Park IH, Sarkaria JN, Li C, Shakhparonov MI, Nakano I. Clin Cancer Res. 2013 Jan 18.

[Tumor-specific Activation of the c-JUN/MELK Pathway Regulates Glioma Stem Cell Growth in a p53-dependent Manner.](#)

Gu C, Banasavadi-Siddegowda YK, Joshi K, Nakamura Y, Kurt H, Gupta S, Nakano I. Stem Cells. 2013 Jan 17. doi: 10.1002/stem.1322.

[Kidney Complications of Hematopoietic Stem Cell Transplantation.](#)

Singh N, McNeely J, Parikh S, Bhinder A, Rovin BH, Shidham G. Am J Kidney Dis. 2013 Jan 3. doi:pii: S0272-6386(12)01475-8. 10.1053/j.ajkd.2012.09.020.

Tissue Engineering Publications

[In vitro endothelialization of electrospun terpolymer scaffolds: evaluation of scaffold type and cell source.](#)

Heath DE, Kobe C, Jones D, Moldovan NI, Cooper SL. Tissue Eng Part A. 2013 Jan;19(1-2):79-90. doi: 10.1089/ten.TEA.2011.0655. Epub 2012 Sep 4.

[Plant-derived Human Collagen Scaffolds for Skin Tissue Engineering.](#)

Willard JJ, Drexler JW, Das A, Roy S, Shilo S, Shoseyov O, Powell HM. Tissue Eng Part A. 2013 Jan 9.

[Influence of hydration on fiber geometry in electrospun scaffolds.](#)

Ebersole GC, Paranjape H, Anderson PM, Powell HM. Acta Biomater. 2012 Dec;8(12):4342-8. doi: 10.1016/j.actbio.2012.07.028. Epub 2012 Jul 27.

Burn Publications

Wound Publications

APPENDIX B
Letters of Support



Steven G. Gabbe, MD
Senior Vice President for Health Sciences
CEO, OSU Medical Center

200 Meiling Hall
370 West 9th Avenue
Columbus, OH 43210
Phone: 614.247.4477
Fax: 614.292.1301
E-mail: Steven.Gabbe@osumc.edu

December 7, 2010

Chandan Sen, MD
The Ohio State University
513 DHLR1
473 West 12th Avenue
Columbus, Ohio 43210

Dear Chandan,

As you and I discussed at the Senior Leadership Retreat on November 30, 2010, the Medical Center's Executive Cabinet enthusiastically supports the establishment of the Center for Regenerative Medicine and Cell Based Therapy. In your e-mail of that same day, you raise several important issues concerning this new program. I discussed your e-mail with our Executive Cabinet on December 6, and I want to provide this information on the requests that you have made.

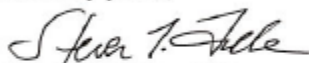
First, this letter recognizes the unanimous approval of our Executive Cabinet for the establishment of the center. Next, as I explained during our conversation, it will be necessary for us to defer establishing funding for the center until we have a better understanding of our financial situation in the coming academic year. We do hope to establish a budget for the new center for the academic year beginning July 1, 2011. Until we are able to provide a budget for your center, we prefer that we not make a University-wide announcement.

In your e-mail, you have requested \$100,000 of support so that you can hire an Administrative Director for the Stem Cell Core. Until we have established your budget, we would prefer that no new personnel be hired. Perhaps, in the interim, you could meet these needs with existing staff. We would support your plans to have national experts visit with us for seminars or consultations. In addition, we will support your efforts to build a web site for the center and ask that you work with Ms. Beth Necamp, our Chief Communications Officer, on this. We would also support a retreat for the new center in the spring. As funding is needed for each of these three initiatives, please contact my office so that we can provide the support for you at that time.

Again, let me emphasize how excited we are about the important work that you have done to establish the new Center for Regenerative Medicine and Cell Based Therapy. We do hope you understand the financial challenges we will face in the coming academic year and, while supporting your new center will be a high priority for us, we want to be sure we can provide the resources you need. Please feel free to contact me should you have any questions about the information in this letter.

Pat and I send our best wishes to you and your family for a very happy and healthy holiday season.

Sincerely yours,



Steven G. Gabbe, MD

Senior Vice President for Health Sciences, The Ohio State University

Chief Executive Officer, The Ohio State University Medical Center

cc: Medical Center Executive Cabinet

Caroline Whitacre, PhD, Vice President for Research

DATE: March 26, 2012
TO: Medical Center Faculty, Staff and Students
FROM: Steven G. Gabbe, MD
Senior Vice President for Health Sciences, The Ohio State University
Chief Executive Officer, The Ohio State University Wexner Medical Center
SUBJECT: Ohio State University Center for Regenerative Medicine and Cell-Based Therapies

Every day, we work together toward our common mission of improving people's lives through innovation in research, education and patient care.

With this in mind, it is my pleasure to let you know about a new and exciting endeavor -- the creation of The Ohio State University Center for Regenerative Medicine and Cell-Based Therapies. This Center embodies our mission.

It is a collaboration of seven different colleges -- the College of Medicine, the College of Engineering, the College of Dentistry, the College of Nursing, the College of Veterinary Medicine, the College of Arts and Sciences, and the College of Pharmacy.

And joining us in this endeavor is our neighbor, Battelle, the world's largest, independent research and development organization.

This partnership of experts will work to discover new treatments that will speed wound healing and rehabilitation for so many patients.

The Center's mission is to build partnerships by utilizing the expertise of the local community to develop research programs on regenerative medicine and cell-based therapies. By working with the biomedical industry, we will deliver innovative health solutions to our patients.

Many people have been involved in the creation of the Center and that effort has been led by Chandan Sen, PhD, the Center's director. The leadership of the Center includes key faculty from all seven of the colleges listed above and Nationwide Children's Hospital.

Please [visit the Center's website](#) to learn more. The website was unveiled during last week's Translational to Clinical Regenerative Medicine Wound Care Conference held here on campus. On this website, you'll be able to learn about our progress in imaging, tissue engineering, and technology and commercialization.

Please join me in congratulating Dr. Sen, his staff and the entire leadership of The Ohio State University Center for Regenerative Medicine and Cell-Based Therapies on their important work and their commitment to improve people's lives.



Charles J. Lockwood, MD, MHCM
Dean, College of Medicine
Vice President for Health Sciences
Professor, Obstetrics and Gynecology
Leslie H. and Abigail S. Wexner Dean's Chair in Medicine

254 Melling Hall
370 West 9th Avenue
Columbus, OH 43210
Phone: 614.292.2600 Fax: 614.292.4254

March 4, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Director, Center for Regenerative Medicine &
Cell-Based Therapies
Associate Dean, College of Medicine
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based
Therapies (CRMCBT) to become a University Center

Dear Dr. Sen:

I wish to communicate my enthusiastic support for your application to be granted University Center status for the College of Medicine's Center for Regenerative Medicine and Cell Based Therapies (CRMCBT). The College of Medicine realizes that many of the advances in medicine likely to occur in the next decade will be driven by this field and such a Center would offer a strong platform to promote current faculty and recruit new talent, while further supporting the University's mission of research, education and patient care.

The faculty and leadership, which make up this Center application, have already garnered impressive achievements. You have established an infrastructure to foster interdisciplinary team building and funding mechanisms that did not exist prior to the center's formation. Limited resources were leveraged by garnering support from seven colleges for start-up funding. Moreover, funding relationships have also been established outside of OSU. I am particularly impressed by the Center's two annual signature events which bring together OSU, state, regional, national and international talent to foster education and team building. Academic and industry relationships have been developed with the University of Akron, Akron General Medical Center, Vomaris, Stem Med, Inc. and Nanofiber Solutions. International associations have also been created through the OSU Global Gateway in India, where a stem cell seeded trachea developed by the OSU College of Engineering will be used in human clinical trials at the prestigious All India Institute of Medical Science before coming being introduced here at the OSU Wexner Medical Center. Most notable is our growing affiliation with the

National Center for Regenerative Medicine in Cleveland, which could propel the State of Ohio into national prominence in regenerative medicine.

I am very confident that your cross-college, multidisciplinary center membership, resources and infrastructure established and planned, will result in the Center's overall success. The College of Medicine has previously provided startup funding of \$500,000 which reflects our commitment to the success of the Center. In addition, as you know, we are nearing the completion of a large gift (\$1.5 million) that will support the CRMCBT. The Center for Regenerative Medicine and Cell Based Therapies will be a point of pride that will have broad institutional impact, enhance our international reputation, and help recruit top talent to our organization. The College of Medicine again offers our full support of the University Center status application.

Sincerely,



Charles J. Lockwood, M.D.
Dean, College of Medicine
Vice President for Health Sciences
Professor, Obstetrics and Gynecology
Leslie H. and Abigail S. Wexner Dean's Chair in Medicine



College of Engineering

Office of the Dean
142A Hitchcock Hall
2070 Neil Avenue
Columbus, OH 43210-1278

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Fax (614) 292-3244

March 1, 2013

Dr. Chandan Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research), Department of Surgery
Associate Dean (Research), College of Medicine
Executive Director, OSU Comprehensive Wound Center
Deputy Director, Davis Heart and Lung Research Institute

Dear Dr. Chandan:

I am pleased to support your efforts to establish the Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) as a new University Institute. The College of Engineering, specifically its Department of Biomedical Engineering, is currently very active in CRMCBT functions that include committee memberships, professional conferences, collaborative projects, interdisciplinary team building, and research promotion, all of which span domains that include Biomaterials, Biomechanics, Biotransport, Micro- and Nano-biotechnology, and device design.

Your initiative to create a University Institute for CRMCBT would allow us to strengthen these interdisciplinary collaborations, and we look forward to that opportunity once your efforts to create this institute reach fruition. In the meantime, please let me know how I can best help advance your mission.

Sincerely,

A handwritten signature in blue ink, appearing to read "David B. Williams".

David B. Williams
Monte Ahuja Endowed Deans Chair
Executive Dean, Professional Colleges
Dean, College of Engineering



College of Arts and Sciences

186 University Hall
230 N. Oval Mall
Columbus, OH 43210

Phone (614) 292-8908
Fax (614) 292-8666

February 27, 2013

Chandan K. Sen, PhD, FACN, FACS
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Dear Dr. Sen,

I strongly support establishment of the Center for Regenerative Medicine and Cell Based Therapies at The Ohio State University as a University Center. The advancement of regenerative medicine offers promise to revolutionize the future of medicine and the College of Arts and Sciences has synergistic interest in the field's success at OSU.

The multi-faceted nature of regenerative medicine requires that its reach is broad and multi-disciplinary in nature with the potential to involve many colleges on campus. The CRM/CBT has brought together outstanding faculty in multiple forums such as the Annual CRM/CBT Mohican Retreat and its Annual Translational to Clinical Regenerative Medicine Wound Care Conference. Considerable value is created by the team building, educational opportunities and pilot funding infrastructure now provided at the University. Within the Division of Natural and Mathematical Sciences, we have faculty active in the field within Biochemistry, Chemistry, Mathematics, Microbiology, Physics and Statistics.

The establishment of the center will strengthen opportunities to attract and retain top faculty within the field, as well as recruit outstanding graduate students. The College of Arts and Sciences strongly supports application for full status of University Center for CRM/CBT.

Sincerely,

Peter March
Divisional Dean, Natural and Mathematical Sciences
College of Arts and Sciences



COLLEGE OF DENTISTRY

OFFICE OF THE DEAN
1159 Postle Hall
305 W. 12th Avenue
Columbus, OH 43210-1267

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Fax (614) 292-0333
<http://www.dent.osu.edu>

March 6, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies
(CRMCBT) to become a University Center

Dr. Sen:

I write to enthusiastically express support for the creation of the Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) as a formal University Center at The Ohio State University.

I note with pride that Ohio State has a large concentration of regenerative medicine focused faculty, many of which are located within our College of Dentistry. Our faculty has already been active in center activities, such as the Annual Mohican Retreat and the T2C Regenerative Medicine Wound Care Conference. Novel team formation has occurred around pilot applications and we envision long-term involvement of faculty and support in the future of the center.

In summary, a formal Center for Regenerative Medicine and Cell Based Therapies will enhance life sciences research at Ohio State, and connecting synergies between the seven currently active colleges will enhance our mission of moving discoveries in the laboratory to patient care. I look forward to your continued success and further development of interactions between faculty members in our college.

If you need additional information to support this recommendation, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Patrick M. Lloyd".

Patrick M. Lloyd, DDS, MS
Professor and Dean, College of Dentistry



College of Veterinary Medicine

Office of the De
125/127 Veterinary Medicine Academic Buildi
1900 Coffey R
Columbus, OH 432

Phone (614) 292-11
Fax (614) 292-71

April 1, 2013

Chandan K. Sen, PhD, FACN, FACS
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine & Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) to become a University Center

Dear Dr. Sen:

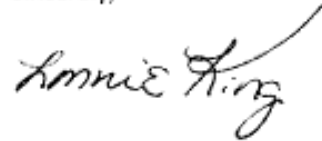
I wish to communicate my strong support to your application for University Center status of the OSU Center for Regenerative Medicine and Cell Based Therapies. The College of Veterinary Medicine currently has many new and long-standing faculty with involvement and advancement in the field of regenerative medicine. Our College of Veterinary Medicine has several early clinician scientist investigators and translational scientists actively engaged in the regenerative medicine fields of transplantation biology, cell therapy, gene therapy, preclinical models, and clinical models of natural occurring disease, including but not limited to; Comparative Orthobiologic Research Laboratories (Dr. Alicia Bertone, Director), Surgical Research and Teaching Laboratories (Dr. Matthew Allen, Director), Comparative Pathology and Mouse Phenotyping Shared Resource (Dr. Krista La Perle, Director), Comparative Clinical Trials Shared Resource (Dr. Cheryl London, Director), Biospecimen Repository (Dr. Bill Kisseberth, Director), Comparative Transplantation Laboratory (Dr. Christopher Adin, PI), and the Experimental Surgical Core within the University Laboratory Animal Resources (ULAR) (Dr. Valerie Bergdall, Director). Several other faculty are new young investigators with active programs in cell immunity and cell immunotherapy. These faculty represent all three departments in our college, which are chaired by Dr. Rustin Moore (Veterinary Clinical Sciences), Dr. Michael Oglesbee (Veterinary BioSciences) and Dr. Bill Saville (Veterinary Preventative Medicine). The College of Veterinary Medicine plays an important role in the translational science necessary to push forward the science in regenerative medicine and looks to the center to help facilitate research, education and growing funding opportunities to the benefit of our faculty. The CRMCBT represents an important mechanism for facilitating campus-wide collaborations in research, as regenerative medicine requires interdisciplinary team formation across colleges for success. In addition, regenerative medicine has rich opportunities for commercialization and spin-off opportunities.

In closing, I reiterate my support for the Center for Regenerative Medicine and Cell Based Therapies to

be elevated to University Center status and expect that my faculty will be an integral part of this new initiative. This is an opportunity to formalize interactions between an outstanding group of faculty working at the forefront of an exciting research field and it has my total support. This move comes at an opportune time and will afford further national and international prominence to regenerative medicine research at OSU.

My best wishes to you and all those affiliated with this new center.

Sincerely,

A handwritten signature in black ink that reads "Lonnie King". The signature is written in a cursive, flowing style with a prominent flourish at the end of the last name.

Lonnie J. King, DVM, MS, MPA, ACVPM
Dean, College of Veterinary Medicine
The Ohio State University



College of Pharmacy

Office of the Dean
217 Parks Hall
500 West 12th Avenue
Columbus, OH 43210-1291

Phone (614) 292-5711
Fax (614) 292-3113
E-mail Brueggemeier.1@osu.edu

March 29, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine & Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMCBT)
to become a University Center

Dear Dr. Sen,

I strongly support establishment of the Center for Regenerative Medicine and Cell Based Therapies as a University Center at The Ohio State University. The advancement of regenerative medicine offers excellent opportunities for interdisciplinary and translational research which will impact human health. The College of Pharmacy has faculty active in CRMCBT activities, and we see enhanced opportunities for faculty involvement in research and education advancements.

The establishment of a University Center for CRMCBT will enable further growth in these interdisciplinary collaborations, and we look forward to these efforts. The OSU College of Pharmacy supports application for full status of University Center for CRMCBT.

Sincerely,

A handwritten signature in cursive script that reads "Robert W. Brueggemeier".

Robert W. Brueggemeier, Ph.D.
Dean, College of Pharmacy
Professor, Medicinal Chemistry



College of Nursing

Office of the Dean
Newton Hall
1585 Neil Ave
Columbus, OH 43215

Phone (614) 292-8900
Fax (614) 292-4535
E-mail nursing@osu.edu
Web nursing.osu.edu

March 1, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMCBT)
to become a University Center

Dear Dr. Sen,

Please accept my endorsement of your application to establish the Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) as a formal University Center at The Ohio State University. Regenerative medicine requires interdisciplinary team formation for successful outcomes in patient care and we here at the College of Nursing see opportunities for faculty involvement in research and education advancements.

The establishment of the center will provide continued intellectual momentum to attract and retain top faculty and recruit outstanding graduate students. I am very confident that your multidisciplinary team building and the resources and infrastructure at OSU for regenerative medicine research and education will provide an excellent opportunity for students and faculty to establish the university as a leader in the regenerative medicine field.

The OSU College of Nursing supports application for full status of University Center for CRMCBT.

Sincerely,

A handwritten signature in black ink that reads "Bernadette Melnyk".

Bernadette Mazurek Melnyk, PhD, RN, CPNP/PMHNP, FNAP, FAAN
Associate Vice President for Health Promotion
University Chief Wellness Officer
Dean and Professor, College of Nursing
Professor of Pediatrics & Psychiatry, College of Medicine



Center for Clinical and Translational Science

376 West Tenth Avenue
Suite 205
Columbus, OH 43210

Phone (614) 293-4041
Fax (614) 293-4039
<http://ccts.osu.edu/>

September 27, 2010

Chandan Sen, PhD, FACN, FACSM
Professor & Vice Chairman (Research), Department of Surgery
Associate Dean (Research), College of Medicine
Executive Director, OSU Comprehensive Wound Center
Deputy Director, Davis Heart & Lung Research Institute

Dear Chandan:

The Center for Clinical and Translational Science (CCTS) extends its strong support to the Center of Regenerative Medicine and Cell-Based Therapies (CRMCBT). The scope of CRMCBT is directly aligned with the goal of the CCTS "to speed the translation of new scientific discoveries to enhance patient outcomes". I applaud your collaborative efforts in successfully engaging five different Colleges at OSU, Nationwide Children's Hospital, Battelle Memorial Institute and State Government in this translational initiative.

The CCTS was funded in 2008 via the NIH Clinical and Translational Science Award (CTSA) with the goal of improving the quality and care of the patients in our community. This goal will be achieved by providing investigators with access to a comprehensive research infrastructure in support of basic, clinical, and translational research projects. Such infrastructure includes access to various research services such as regulatory expertise, study design and biostatistical support, comprehensive biomedical informatics and data management, pilot funding programs, and toolkits to support community engagement. These programs are designed to support new research teams and extensions of multi-disciplinary work such as yours. The CCTS is committed to collaborating with you and the Center's senior leadership to contribute to the success of the CRMCBT by providing a one-time allocation of \$25,000 in funds to help support the start up of a stem cell core, facilitating access to CCTS research infrastructure support such as Biomedical Informatics, and working with the CRMCBT to develop a pilot grant initiative for cost-shared awards to principal investigators utilizing the new core resources similar to the successful initiative utilized in the development of the laser capture micro-dissection core, pending approval by the CCTS Executive Committee.

Thanks again for leading this initiative and we look forward to working with you on this effort.

Sincerely,

A handwritten signature in black ink, appearing to read "Rebecca D. Jackson".

Rebecca D. Jackson, MD
Associate Dean for Clinical Research, College of Medicine
Director, Center for Clinical and Translational Science
Principal Investigator, Clinical and Translational Science Award



COLLEGE OF DENTISTRY

3179 Postle Hall
305 W. 12th Avenue
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Phone (614) 688-4629
Fax (614) 292-4820
E-mail Sheridan.1@osu.edu

April 1, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMGBT) to become a University Center

Dear Dr. Sen:

I wish to communicate my strong support for your application for the Center for Regenerative Medicine and Cell Based Therapies to be established as a formal University Center at The Ohio State University.

The College of Dentistry has many faculty members actively involved in regenerative medicine research in the core areas of Tissue Engineering and Wound, Burn and Trauma. The creation of this center will jointly facilitate the advancement of these areas of research. Our faculty have already benefited from center activities including the Annual Mohican Retreat and the T2C Regenerative Medicine Wound Care Conference. I believe that CRMGBT represents an important mechanism for facilitating campus-wide collaborations in research, as regenerative medicine requires interdisciplinary team formation across colleges. Our college has already benefited from these collaborations and will continue to do so in the future.

In closing, I give my strong support for the Center for Regenerative Medicine and Cell Based Therapies to be elevated to University Center status and expect that our faculty will be an integral part of this new initiative. This is an opportunity to formalize interactions between an outstanding group of faculty working at the forefront of an exciting research field and it has my full support.

Sincerely,

A handwritten signature in cursive script that reads "John Sheridan".

John Sheridan, PhD
The George C. Paffenbarger Alumni-Endowed Chair in Research
Associate Dean for Research, College of Dentistry



Cynthia Carnes, PharmD, PhD
College of Pharmacy

Parks Hall
500 W. 12th Avenue
Columbus, OH 43210

Phone (614) 292-1715
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E-mail carnes.4@osu.edu

March 1, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMGBT)

Dear Dr. Sen,

I wish to communicate my strong support to your application for University Center status of the OSU Center for Regenerative Medicine and Cell Based Therapies. The College of Pharmacy currently has faculty members with evolving research interest in the field of regenerative medicine. The CRMGBT represents an important mechanism for facilitating campus-wide collaborations in research, as regenerative medicine requires interdisciplinary team formation across colleges.

I give my strong support for the Center for Regenerative Medicine and Cell Based Therapies to move to University Center status and I expect that some of our faculty members will be interested in participating in this new initiative. This is an opportunity to formalize interactions between an outstanding group of faculty working at the forefront of an exciting research field and it has my full support. This move comes at an opportune time and will afford further national and international prominence to regenerative medicine research at OSU.

Sincerely,

A handwritten signature in blue ink, appearing to read "C. Carnes".

Cynthia A. Carnes, PharmD, PhD
Professor and Associate Dean for Research and Graduate Studies



Richard T. Hart, Ph.D.
Edgar C. Hendrickson Professor and Department Chair
Department of Biomedical Engineering
402 Bevis Hall
1080 Carmack Road
The Ohio State University
Columbus, OH 43210-1002
Phone (614) 292-9733
Fax (614) 292-7301
mail: hart.322@osu.edu

May 19, 2012

Chandan Sen, PhD, FACN, FACS
Professor and Vice Chairman (Research) Department of Surgery
Associate Dean (Research), College of Medicine
Executive Director, OSU Comprehensive Wound Center
Deputy Director, Davis Heart and Lung Research Institute

Dear Chandan:

As you know, I am fully in support of your efforts to establish the Center for Regenerative Medicine and Cell Based Therapies as a new University Center.

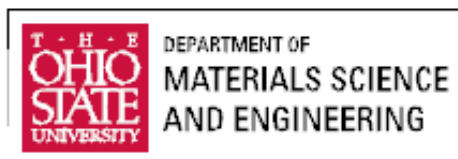
Faculty members in Biomedical Engineering are active in the domains of Tissue Engineering and Bioimaging – two of the four pillars for the Center. In addition, faculty expertise extends to closely related areas, including Biomaterials, Biomechanics, Biotransport, Micro- and Nano-biotechnology, and device design. Our activities span research and undergraduate and graduate education programs in all of these domains, and we are excited by the prospect of increased collaborations, larger projects, and – ultimately – their application to human health.

I fully support the involvement of faculty and students from the Department to work with you and Center members on projects in regenerative medicine and cell based therapies, and I am excited by the potential and opportunities that will be opening under the new Center's umbrella.

Thank you for your efforts to bring this vision to fruition. Please let me know how we can best help advance the mission of the Center.

Sincerely,

Richard T. Hart, Ph.D.



Rudolph G. Buchheit
Professor and Chair
177 Watts Hall
2041 College Rd.
Columbus, OH 43210
phone: 614-292-6085
fax: 614-292-9857

March 29, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies
(CRMGBT) to become a University Center

Dear Dr. Sen,

I wish to communicate my strong support to your application for University Center status of the OSU Center for Regenerative Medicine and Cell Based Therapies.

The Department of Materials Science and Engineering has a cluster of faculty in the area of biomaterials whose research focus is on synthesis and utilization of inorganic materials for tissue scaffolds applicable to a range of medical therapies. Their work falls within the domain of regenerative medicine and our collaborative work has and is expected to continue to facilitate advancement in both engineering and medicine.

The CRMGBT represents an important mechanism for facilitating campus-wide collaborations in research, as regenerative medicine requires interdisciplinary team formation across colleges.

In closing, I give my strong support for the Center for Regenerative Medicine and Cell Based Therapies to be elevated to University Center status and expect that our faculty will be an integral part of this new initiative. This is an opportunity to formalize interactions between an outstanding group of faculty working at the forefront of an exciting research field and it has my full support.

Sincerely,



Rudolph G. Buchheit
Professor and Chair
Materials Science and Engineering



Department of Veterinary Clinical Sciences

Veterinary Medical Center
College of Veterinary Medicine
The Ohio State University
601 Vernon L. Tharp Street
Columbus, OH 43210-1089

Telephone: (614) 292-7105
Fax: (614) 292-0895

March 7, 2013

Chandan K. Sen, PhD, FACN, FACS
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMCBT)
to become a University Center

Dear Dr. Sen,

I would like to express my support for the Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) to be recognized as a formal University Center at The Ohio State University.

The research conducted by regenerative medicine-focused faculty often involves animal models as part of the translational approach, and many of our faculty members in Veterinary Clinical Sciences are involved with animal model disease research as well as in clinical trials. I am pleased to be able to support this with the interest and expertise of our faculty. Our faculty members have already been active in center activities, such as the Annual Mohican Retreat and the T2C Regenerative Medicine Wound Care Conference and involved with other activities of the group, as well as in regenerative and cell-based therapy research and clinical application in veterinary patients. I anticipate continued involvement of our faculty as well as opportunities for graduate training for our residents in this field.

In summary, a formal Center for Regenerative Medicine and Cell Based Therapies will benefit biomedical research at Ohio State and enhance interdisciplinary synergies between the seven currently active colleges thereby capitalizing on the broad expertise to help move discoveries in the laboratory to patient care. It will also help with build a strong foundation for the Health and Wellness discovery theme and promote a One Health Initiative. I look forward to your continued success and further development of this Center. Please let me know how our department and faculty can continue to assist and participate in moving this exciting initiative and program forward.

Sincerely,

A handwritten signature in black ink that reads "Rustin M. Moore".

Rustin M. Moore, DVM, PhD, DACVS
Bud and Marilyn Jenne Professor
Chair, Department of Veterinary Clinical Sciences
Associate Dean, Clinical and Outreach Programs
& Executive Director, Veterinary Medical Center

RMM/lal



College of Veterinary Medicine

Department of Veterinary Biosciences
207 Goss Laboratory
1925 Coffey Road
Columbus, Ohio 43210-1093
Phone 614-292-4489
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www.vet.ohio-state.edu/biosciences.htm

March 13, 2013

Chandan K. Sen, PhD, FACN, FACS
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
473 West 12th Avenue
Columbus, OH 43210

Dear Dr. Sen,

I would like to indicate my support for your efforts to create a University Center for Regenerative Medicine and Cell Based Therapies (CRMCBT). A major focus of our department is comparative pathology and we are home to the Comparative Pathology and Mouse Phenotyping (Comprehensive Cancer Center) Shared Resource. The resource plays a vital role in the phenotypic analysis of animal models in a variety of fields, including cell/tissue transplantation research, and thus represents a key component of investigatory efforts that would be part of a CRMCBT. In addition to these support functions, there is potential for active participation by research intensive faculty in the Department of Veterinary Biosciences. These faculty are primarily focused on microbial infection and immunity and cancer biology. Investigations focused upon dendritic cell therapy in both cancer and infectious disease is highly relevant to a CRMCBT, but there are also more basic areas of investigation that have relevance. This would include stem cell implantation in mice for the expression of human leukocytes ("humanized mice") that are used to study virus-induced leukemias. While not focused upon therapeutics per se, such studies can yield of wealth of data that may inform effort in regenerative medicine/cell based therapies.

I look forward to your success in this endeavor.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Oglesbee".

Michael Oglesbee
Professor and Chair



Department of
Neuroscience

Randy J. Nelson, Ph.D.
Dr. John D. and E. Olive Brumbaugh
Chair in Brain Research and Teaching
Department Of Neuroscience
Professor and Chair
4084 Graves Hall
333 West 10th Avenue
Columbus, OH 43210
Phone: 614-688-8327
Fax: 614-688-8742

31 March 2013

Chandan K. Sen, PhD, FACN, FACS
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based
Therapies (CRMCBT) to become a University Center

Dear Chandan:

I am writing to provide my strong support for your application for University Center status of the OSU Center for Regenerative Medicine and Cell Based Therapies.

The College of Medicine has many faculty members in Neuroscience who are actively involved in research within the domain of regenerative medicine. Some related areas include spinal cord and brain injury repair, neuroregeneration, and stroke treatment.

The CRMCBT represents an important mechanism for facilitating campus-wide collaborations in research, as regenerative medicine requires interdisciplinary team formation across colleges.

Thus, I fully support the elevation of the Center for Regenerative Medicine and Cell Based Therapies to University Center status and expect that our Neuroscience faculty will be an integral part of this new initiative. This is an opportunity to formalize interactions among an outstanding group of faculty working at the forefront of an exciting research field.

Sincerely,

Randy J. Nelson
Brumbaugh Professor of Brain Research and Teaching
Professor and Chair, Department of Neuroscience
Distinguished Professor, College of Medicine



Department of Electrical and Computer Engineering

205 Drees Laboratory
2015 Neil Avenue
Columbus, OH 43210

Phone (614) 292-2571
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E-mail Lee.146@osu.edu
Web <http://www.ece.osu.edu>

April 2, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies
(CRMCBT) to become a University Center

Dear Dr. Sen,

I would like to offer my unqualified support for the Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) to be recognized as a formal University Center at The Ohio State University. Over the past year, I have become aware of the great collaborative work being done by faculty and researchers involved in the center.

As Chair of the Department of Electrical and Computer Engineering, I see great potential for faculty in my department to get involved in the center. We have a number of faculty members who work in the area of medical imaging, and this center would be a great collaborative mechanism for them to interact with medical researchers from the College of Medicine.

Having a University-level center with the appropriate support would be greatly beneficial to my department's goals to have greater research activity in the Health and Wellness Discovery Theme area.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert Lee".

Robert Lee
Professor and Chair



Department of Mechanical and Aerospace Engineering

College of Engineering
N350C Peter L. and Clara M. Scott Laboratory
201 West 19th Avenue
Columbus, OH 43210-1142

Phone (614) 292-4143
Fax (614) 292-3163

April 6, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research), Department of Surgery
Associate Dean, College of Medicine
Director, Center for Regenerative Medicine & Cell-Based Therapies
513 Heart and Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Dear Prof. Sen:

On behalf of the Department of Mechanical and Aerospace Engineering (MAE), I am providing my enthusiastic support to elevating the Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) to University Center status.

The MAE Department has several faculty members, including Professors V. Subramaniam, C.H. Menq, R. Siston, and C. Castro, whose current research interests align well with the Center efforts on regenerative medicine and cell based therapies. Our research and educational activities (both at the undergraduate and graduate levels) involve a number of areas within the broader domain of regenerative medicine. Hence, we look forward to a variety of collaborative efforts between the Center members and our faculty and students.

I am strongly supportive of interdisciplinary efforts across the campus, leading to unique practical discoveries. I believe CRMCBT as a University Center in particular will provide a solid foundation and opportunity toward such knowledge production as applied to human health. Hence, I offer my strong support to raising the status of CRMCBT to University Center. We are excited about the possibilities such a distinction will render.

Sincerely,

A handwritten signature in black ink that reads "A. Selamet". The signature is stylized and includes a long horizontal flourish at the end.

Ahmet Selamet
Professor and Chair
Fellow, SAE and ASA



College of Arts and Sciences

Department of Mathematics

100 Math Building
231 W. Eighteenth Avenue
Columbus, OH 43210

614-292-7173

April 5, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMGBT) to become a University Center

Dear Dr. Sen,

I wish to communicate my strong support to your application for University Center status of the OSU Center for Regenerative Medicine and Cell Based Therapies.

The Mathematics Department has several faculty members actively involved in research within the domain of regenerative medicine such as Dr. Chin-Shan Chou, Dr. Avner Friedman and Dr. Chuan Xue.

The CRMGBT represents an important mechanism for facilitating campus-wide collaborations in research, as regenerative medicine requires interdisciplinary team formation across colleges.

In closing, I give my strong support for the Center for Regenerative Medicine and Cell Based Therapies to be elevated to University Center status and expect that our faculty will be an integral part of this new initiative. This is an opportunity to formalize interactions between an outstanding group of faculty working at the forefront of an exciting research field and it has my full support.

Sincerely,

Luis Casian
Professor and Chair



University Laboratory Animal Resources

Valerie Bergdall, DVM, DACLAM
Professor, Clinical Veterinary Preventive Medicine
Director, University Lab Animal Resources
The Ohio State University
111 Wiseman Hall
400 West 12th Avenue
Columbus, OH 43210

Phone (614) 292-1561
E-mail Bergdall.1@osu.edu
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March 1, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMCBT)
to become a University Center

Dear Dr. Sen,

I would like to express my highest support for the Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) to be recognized as a formal University Center at The Ohio State University.

The research conducted by regenerative medicine focused faculty often involves animal models as part of the translational approach, many of which are located within the University Laboratory Animal Resources facilities. I am pleased to be able to support this Center not only with our core animal facilities, but also with the expertise of our veterinary faculty. Our faculty has already been active in center activities, such as the Annual Mohican Retreat and the T2C Regenerative Medicine Wound Care Conference. I anticipate continued involvement of the faculty as well as opportunities for graduate training for our residents in this field.

In summary, a formal Center for Regenerative Medicine and Cell Based Therapies will benefit biomedical research at Ohio State, and enhance interdisciplinary synergies between the seven currently active colleges thereby capitalizing on the broad expertise to help move discoveries in the laboratory to patient care. I look forward to your continued success and further development of this Center.

Sincerely,

A handwritten signature in cursive script that reads "Valerie Bergdall".

Dr. Valerie Bergdall



March 11, 2013

Chandan K. Sen, PhD, FACN, FACS
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMGBT) to become a University Center

Dear Dr. Sen:

I am writing to express my enthusiastic support for your application to establish a University Center for the Center for Regenerative Medicine and Cell Based Therapies (CRMGBT). I firmly believe the Center would further enhance the research mission and reputation of Ohio State University and provide benefit to Nationwide Children's Hospital faculty and patient population.

Currently, Nationwide Children's Hospital faculty Christopher Breuer, MD, Brian Kaspar, MD, and Jeffrey Auletta, MD are actively involved in the operations committee of the center. The hospital sees value in leveraging expertise and resources in the regenerative medicine field across the two campuses. We look forward to more opportunities in this area and growing the relationship.

The CRMGBT is another strong example of the interconnected nature of The Ohio State University and Nationwide Children's Hospital towards our research missions and successfully impacting patient outcomes. In summary, elevation of the CRMGBT to University Center Status would benefit Ohio State University, our strategic partnership and the entire state of Ohio.

Sincerely,

William E. Smoyer, M.D., F.A.S.N.
C. Robert Kidder Chair
Vice President, Clinical and Translational Research
Director, Center for Clinical and Translational Research
The Research Institute at Nationwide Children's Hospital
Professor of Pediatrics
The Ohio State University
Email: William.Smoyer@Nationwidechildrens.org



March 8, 2013

Chandan K. Sen, Ph.D.
Director, OSU Comprehensive Wound Center
473 West 12th Avenue, 512 DHLRI
Columbus, OH 43210

Reference: **The Ohio State University Center for Regenerative Medicine and Cell Based Therapies**

Dear Dr. Sen:

Battelle is pleased to learn of intent of The Ohio State University to create a permanent Center for Regenerative Medicine and Cell Based Therapies. We are delighted to have this opportunity to collaborate with OSU scientists on the next generation of solutions to important health problems.

Our clients have come to expect scientific expertise appropriate to their project. Our past and current collaborations with OSU have enabled us to access experts in many fields, imaging technologies, safety pharmacology and physiology among them. We are happy to add Regenerative Medicine and Cell Based Therapies to the list of collaborations.

As you are aware, Battelle has a long-standing history of work in the area of scale-up of cell-based therapies. We believe that highly interdisciplinary Centers like this one will lead to the greatest advances.

We look forward to working alongside our OSU colleagues to translate promising new cell-based therapies into clinical and commercial realities. We welcome the opportunity to work with you and your staff on this important area of research that will bring additional talents, opportunities and collaboration to Central Ohio.

Sincerely,

Herbert S. Bresler, Ph.D.
Senior Research Leader



The Department of Polymer Science
Goodyear Polymer Center
Akron, OH 44325-3909
(330) 972-8594 Office
(330) 972-5290 Fax

March 5, 2013

Chandan K. Sen, PhD, FACN, FACSM
Professor and Vice Chairman (Research)
Department of Surgery
Director, Center for Regenerative Medicine &
Cell-Based Therapies
513 Heart & Lung Research Institute
473 West 12th Avenue
Columbus, OH 43210

Re: Letter of Support for Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) to become a University Center

Dr. Sen,

I am writing in support for your application to formally establish the Center for Regenerative Medicine and Cell Based Therapies (CRMCBT) as a University Center at The Ohio State University. This is a critical step which expands the mission and visibility of the CRMCBT at The Ohio State University, within the state of Ohio, nationally and internationally.

The growing international reputation and productivity that the center faculty, many of which have been recruited from other institutions specifically to participate in the CRMCBT would leverage the substantial investment OSU has made in these efforts. The symbolic and synergistic benefits of establishing a formal center around the CRMCBT would result in enhanced recognition; enhanced scholarly discoveries (including those with translational opportunities for the biotechnology industry); and, exceptional educational opportunities for graduate students and postdoctoral scholars from around the world.

As the Director of the industrially focused Akron Functional Materials Center (AFMC) and an active researcher in biomaterials and regenerative medicine at The University of Akron, I am very excited about the opportunities the CRMCBT would bring to regenerative medicine research in the state of Ohio in general. Potential consultation and collaborations with center faculty would benefit scholars at The University of Akron and help to bridge institutional barriers between institutions. As you know regenerative medicine is increasingly utilizing polymeric materials to provide solutions to unmet medical needs. As one of the leading institutions of polymer research and education globally, we look forward to expanding our work with you to benefit our institutions and the citizens of Ohio. This is already occurring with the T2C Regenerative Medicine Wound Care Conference, where I will be participating this year. In support of this effort the AFMC and The University of Akron has established a Pilot Funding mechanism to promote collaboration among faculty. This is a critical mechanism to leverage our expertise in the polymers area with The Ohio State University's expertise in regenerative medicine.

I believe that the CRMCBT will have significant financial and educational impact as a "center of excellence" nationally. This recognition leads to multiple industrial and commercial opportunities thereby enhancing Ohio's reputation as a growing technology state. The Center's training and mentoring of scholars at all stages would increase the ecosystem of innovation and bolster the state's reputation as an educational powerhouse. In summary, elevation of the CRMCBT to University Center Status would benefit Ohio State University and the entire state of Ohio.

Respectfully,

A handwritten signature in blue ink that reads "Matthew L. Becker".

Matthew L. Becker, Ph.D.
Associate Professor
Department of Polymer Science
The University of Akron
Akron, OH 44325-3909
becker@uakron.edu

Member list by Department/College (Primary listing)

Name	Title	Department 1	College 1
Arthur Joseph Epstein	Distinguished University Prof	Physics	Arts and Sciences
Avner Friedman	Distinguished University Prof	Mathematics	Arts and Sciences
Jon R. Parquette	Professor	Chemistry and Biochemistry	Arts and Sciences
Peter March	Dean	ASC Administration	Arts and Sciences
Herb Bresler	Chief Scientist		Battelle
Binnaz Leblebicioglu	Associate Professor	Periodontology	College of Dentistry
John M Nusstein	Associate Professor	Endodontics	College of Dentistry
John Francis Sheridan	Professor	Oral Biology	College of Dentistry
Patrick M. Lloyd	Dean	Dentistry Admin	College of Dentistry
Periannan Kuppusamy	Adjunct Professor	Cardiovascular Medicine	College of Dentistry
Robert R Seghi	Professor	Restorative/Prosthetic	College of Dentistry
Scott Raymond Schricker	Associate Professor	Restorative/Prosthetic	College of Dentistry
Sudha Agarwal	Professor	Oral Biology	College of Dentistry
Zongyang Sun	Assistant Professor	Orthodontics	College of Dentistry
Bharat Bhushan	Professor	Mechanical & Aerospace Engr	College of Engineering
David B. Williams	Dean	COE Dean's Office	College of Engineering
Derek J Hansford	Associate Professor	Biomedical Engineering	College of Engineering
Gunjan Agarwal	Associate Professor	Biomedical Engineering	College of Engineering
Heather Megan Powell	Assistant Professor	Materials Science Engineering	College of Engineering
Jessica Odelia Winter	Associate Professor	Chemical & Biomolecular Eng	College of Engineering
Jianjun Guan	Assistant Professor	Materials Science Engineering	College of Engineering
Keith J Goch	Associate Professor	Biomedical Engineering	College of Engineering
L James Lee	Professor	Chemical & Biomolecular Eng	College of Engineering
Peter Martin Anderson	Professor	Materials Science Engineering	College of Engineering
Randy Moses	Associate Dean	COE Research	College of Engineering
Richard Hart	Chair	Biomedical Engineering	College of Engineering

Barbara Rita Alevriadou	Associate Professor	Biomedical Engineering	College of Engineering
Ronald Xiaorong Xu	Associate Professor	Biomedical Engineering	College of Engineering
Samir N. Ghadiali	Associate Professor	Biomedical Engineering	College of Engineering
Stuart L Cooper	Chair	Chemical & Biomolecular Eng	College of Engineering
Vish Subramaniam	Professor	Mechanical & Aerospace Engr	College of Engineering
Xiaoming (Shawn) He	Associate Professor	Biomedical Engineering	College of Engineering
Alan S Litsky	Associate Professor	Orthopaedics	College of Medicine
Alok Sutradhar	Assistant Professor	Plastic Surgery	College of Medicine
Altaf Ahmad Wani	Professor	Radiology	College of Medicine
Brian K Kaspar	Associate Professor	Pediatrics	College of Medicine
Cameron L Rink	Assistant Professor	Vascular Surgery	College of Medicine
Carlo Maria Croce	Chair	SBS-Molec Vir, Imm & Med Gen	College of Medicine
Carmen Cantemir	Research Scientist	Pulm, Allergy, Crit Care & Sleep	College of Medicine
Charles Howard Cook	Associate Professor	Critical Care, Trauma & Burn	College of Medicine
Charles Joseph Lockwood	Dean	ADM-Medicine Administration	College of Medicine
Christopher Kane Breuer	Professor	Surgery	College of Medicine
D Bradley Welling	Chair	Otolaryngology	College of Medicine
Dana Marie McTigue	Associate Professor	SBS-Neuroscience	College of Medicine
Daniel Scott Eiferman	Assistant Professor	Critical Care, Trauma & Burn	College of Medicine
Daniel John Wozniak	Professor	SBS-Microbial Infectn/Immunity	College of Medicine
Dean Jiro Mikami	Associate Professor	General Surgery	College of Medicine
Denis Christian Guttridge	Professor	SBS-Molec Vir, Imm & Med Gen	College of Medicine
Don Hayes Jr.	Associate Professor-Clinical	Pediatrics	College of Medicine
Elliott David Crouser	Associate Professor	Pulm, Allergy, Crit Care & Sleep	College of Medicine
Gayle Marietta Gordillo	Associate Professor	Plastic Surgery	College of Medicine
Gregg A Hadley	Professor	SBS-Microbial Infectn/Immunity	College of Medicine
Gustavo W. Leone	Professor	SBS-Molec Vir, Imm & Med Gen	College of Medicine
Heithem El-Hodiri	Associate Professor	Pediatrics	College of

			Medicine
Hiranmoy Das	Associate Professor	Cardiovascular Medicine	College of Medicine
Ichiro Nakano	Associate Professor	Neurological Surgery	College of Medicine
Jianjie Ma	Professor	Surgery	College of Medicine
John C Byrd	Professor	Hematology	College of Medicine
Jose Javier Otero	Assistant Professor	Pathology	College of Medicine
Karen L Wood	Assistant Professor-Clinical	Pulm,Allergy,Crit Care & Sleep	College of Medicine
Keith O Yeates	Professor	Pediatrics	College of Medicine
Kurt B Stevenson	Professor	Infectious Diseases	College of Medicine
Lyn B Jakeman	Associate Professor	SBS-Physiology & Cell Biology	College of Medicine
Lynn Carley O'Donnell	Associate Professor-Clinical	Hematology	College of Medicine
Michael R Go	Assistant Professor	Vascular Surgery	College of Medicine
Michael Knopp	Professor	Radiology	College of Medicine
Michael Miller	Chair	Plastic Surgery	College of Medicine
Naeem Akhtar Ali	Associate Professor-Clinical	Pulm,Allergy,Crit Care & Sleep	College of Medicine
Nicanor Ilie Moldovan	Research Associate Professor	Cardiovascular Medicine	College of Medicine
Peter John Mohler	Professor	Davis Heart & Lung Institute	College of Medicine
Peter G Shields	Professor	Cancer Prevention and Control	College of Medicine
Phillip Gordon Popovich	Professor	SBS-Neuroscience	College of Medicine
R Lawrence Moss	Professor	Surgery	College of Medicine
Rami N. Khayat	Associate Professor-Clinical	Pulm,Allergy,Crit Care & Sleep	College of Medicine
Rebecca Dorothy Jackson	Professor	Endo, Diabetes & Metabolism	College of Medicine
Ronney Abaza	Associate Professor	Urology	College of Medicine
Sandeep Soni	Associate Professor-Clinical	Pediatrics	College of Medicine
Sanjay Rajagopalan	Professor	Cardiovascular Medicine	College of Medicine
Sashwati Roy	Associate Professor	Surgery	College of Medicine
Savita Khanna	Assistant Professor	Surgery	College of Medicine
Scott R Scrape	Assistant Professor-Clinical	Pathology	College of Medicine

Sidney Frederick Miller	Professor	Critical Care, Trauma & Burn	College of Medicine
Steven M Devine	Professor	Hematology	College of Medicine
Steven Michael Steinberg	Professor	Critical Care, Trauma & Burn	College of Medicine
Thomas Frederick Mauger	Chair	Ophthalmology	College of Medicine
Traci Ann Wilgus	Assistant Professor	Pathology	College of Medicine
Vincent John Pompili	Professor-Clinical	Cardiovascular Medicine	College of Medicine
Joel L Mayerson	Associate Professor-Clinical	Orthopaedics	College of Medicine
Bernadette Melnyk	Dean	College of Nursing	College of Nursing
Jodi C. McDaniel	Assistant Professor	College of Nursing	College of Nursing
Cynthia Ann Carnes	Professor	Pharm CBO/Coll	College of Pharmacy
Daren Lee Knoell	Professor	Pharm CBO/Coll	College of Pharmacy
David Benjamin Renton	Assistant Professor-Clinical	General Surgery	College of Pharmacy
Robert J. Lee	Professor	Pharm CBO/Coll	College of Pharmacy
Robert Wayne Brueggemeier	Dean	Pharm CBO/Coll	College of Pharmacy
Allard Dembe	Professor	COPH - Hlt Srvs Mgmt & Policy	College of Public Health
Qinghua Sun	Associate Professor	COPH - Environmental Health Sci	College of Public Health
Hayam Ahmed Galal Hamzah Hussein	Student	Comparativ&VetMed	College of Veterinary Med
Alicia Louise Bertone	Professor	Veterinary Clinical Sciences	College of Veterinary Med
Kathleen Marie Ham	Assistant Professor-Clinical	Veterinary Clinical Sciences	College of Veterinary Med
Lonnie James King	Dean	Vet Med Administration	College of Veterinary Med
Tracey L Papenfuss	Assistant Professor	Veterinary Biosciences	College of Veterinary Med
Yehia Mohamed Saif	Faculty Emeritus	Veterinary Preventive Medicine	College of Veterinary Med
Sarah Beidelschies	Program Director		Comprehensive Wound Center
Jed K Johnson	Chief Scientific Officer		Nanofiber Solutions
David Steven Mess	Senior Tech Licensing Officer	Technology Licensing	Ofc of Business and Finance
Elizabeth Drotleff	Senior Tech Licensing Officer	Technology Licensing	Ofc of Business and Finance
Erin Kathleen Bender	Senior Tech Licensing Officer	Technology Licensing	Ofc of Business and Finance

Jason G Harb	Post Doctoral Researcher	Comprehensive Cancer Center	Ofc of Health Sciences
Valerie Kay Bergdall	Dir-Laboratory Animal Resource	Univ Lab An Res	Office of Research
Esther Maria Chipps	Director-A4	HS Nursing Quality & Research	OSU Medical Center
E. Christopher Ellison	Associate Vice President	Ofc of Health Sciences	