



Changing What's Possible

MUSC RESEARCH



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MESSAGE FROM MUSC VICE PRESIDENT FOR RESEARCH

The Medical University of South Carolina has achieved record high numbers in its research funding, but that only tells a small part of the story. In today's research world, it's all about serving the community and accelerating the process of getting scientific discoveries translated to the patient's bedside.

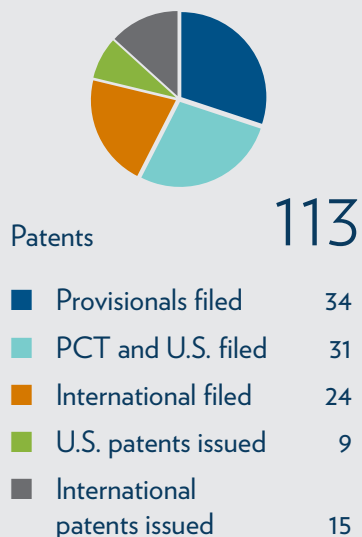
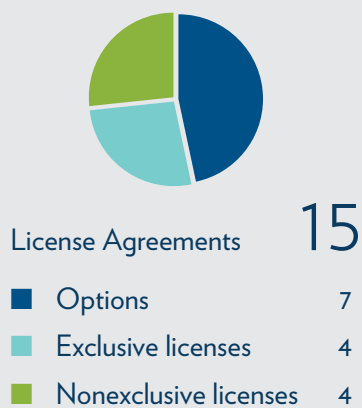
This funding reflects the quality of the research and discovery at MUSC, a direct result of recruiting top scientists with a strategic focus to serve the needs of the people of South Carolina.

For example, our researchers are working to overcome the barriers faced by people from rural areas so they can better participate in research, and they are doing that via conducting research using telehealth. Scientists are learning there is power in numbers as they join forces from multiple disciplines to push discoveries further. Many exciting research projects, such as ECHO or Environmental Influences of Child Outcomes program (page 5), involve researchers from different specialties to explore the environmental factors influencing our children's health.

We support researchers who understand that health and illness is an interaction between an individual's genetic makeup, their lifestyle choices and habits, and the environment in which they live. MUSC is committed to leading health innovation for the lives we touch.

Kathleen Brady, M.D., Ph.D.





NEW FRONTIERS IN MEDICAL RESEARCH

- > New immunotherapy cancer treatments that harness the body's immune system to fight cancer cells.
- > The use of powerful new gene-editing tools to correct mutations at precise locations in the human genome to treat genetic causes of diseases.
- > The increasing use of population health by researchers aiming to create healthier lifestyles and communities, including in many cases the use of mobile applications and technology for easier public access.
- > An exploration of the role of the body's microbiome to see how we may be able to change it to promote health and prevent disease.
- > Advances in regenerative medicine, a game-changing area of medicine with the potential to heal damaged tissues and organs
- > An increased focus on aging research, as MUSC prepares for the estimated more than 1 million South Carolinians who will be older than 65 by 2029.
- > The continued expansion of addiction research, an area of specialty for MUSC and one of urgent need given the state's epidemic of opioid deaths that quadrupled between 1999 and 2013.

 **105** Invention Disclosures

 **50** Faculty Start-Ups

 **70** Products on the market

 **\$700M** exits and capital raised

Translating discoveries from bench to marketplace

- > Our scientists thrive on finding solutions at the frontiers of biomedical research. And their discoveries benefit not only patient care but economic opportunity as well.

The Foundation for Research Development works in close collaboration with the South Carolina Clinical & Translational Research Institute and the Center for Innovation to identify and protect intellectual property and encourage consideration of commercial opportunities.

MUSC startups have attracted substantial investment and this research has attracted investor interest, leading to subsequent acquisition by publicly traded corporations and major pharmaceutical companies.

HEALTH CARE DISPARITIES



465

Studies on Health Disparities

Precision medicine holds significant promise to make substantial strides in reducing racial disparities through the delivery of individualized health care based on biological, behavioral, and social factors that contribute to disease risks and enhance health outcomes.



PRECISION MEDICINE RESEARCH THAT HELPS THE UNDERSERVED

MUSC is involved in more than 465 research projects that address healthcare disparities.

Disparities can stem from a number of factors, including whether people live in a rural versus urban area, their access to health care, financial resources and their race and genetics.

One example of how researchers are prioritizing helping the underserved is MUSC's Transdisciplinary Collaborative Center (TCC) in Precision Medicine and Minority Men's Health. MUSC's Hollings Cancer Center and Department of Psychiatry and Behavioral Sciences received an \$8 million grant from the National Institute of Minority Health and Health Disparities and the National Cancer Institute to establish the center.

The center will integrate existing strategies and determine new approaches for improving health outcomes among minority men through precision medicine. Genomic, social, clinical, and psychological data will be integrated using medical informatics to learn how these factors can be adapted into more precise medical strategies to prevent, diagnose, and treat chronic health conditions and diseases that disproportionately affect minority men.

Chanita Hughes-Halbert, Ph.D., principal investigator for the project says this dedication to health disparities will be the focus of future projects of the center. "We will continue to address other chronic diseases that are common among minority men, and develop best practices for implementing precision medicine into medical care."



ENVIRONMENTAL FACTORS

“There’s an obesity epidemic, there’s an epidemic of asthma, there’s an epidemic of disorders like autism and attention deficit disorder. These aren’t just inherited. Something’s happening to our children in our environment.”

*- Roger Newman, M.D.
MUSC Health researcher and obstetrician*

RESEARCHERS EXPLORE ENVIRONMENTAL FACTORS AFFECTING OUR KIDS’ HEALTH

Our environment may be causing serious problems with lifelong implications for children, but a new national project that includes the Medical University of South Carolina may help change that.

Co-principal investigator and Founding chairman of the MUSC Department of Public Health Sciences John Vena, Ph.D., said the study, part of an effort by the National Institutes of Health to document those factors, will track kids’ health over a seven-year period. It’s called the Environmental Influences on Child Health Outcomes Program, or ECHO. MUSC will serve as a coordinating center for part of the project known as the Exposure Contributors to Child Health Originating from National Fetal Growth Study.

The Exposure Contributors to Child Health Originating from National Fetal Growth Study team includes scientists from public health, obstetrics and pediatrics who will follow the children enrolled in the National Fetal Growth Study at 10 clinical centers throughout the U.S., including MUSC and Columbia University.

Over the course of the seven-year project, researchers with the MUSC and Columbia University-led part of ECHO will re-contact the 2,400 families involved in the National Fetal Growth Study and try to enroll the children in ECHO.

MEETING THE COMMUNITY WHERE THE NEEDS ARE

BRAIN

- > MUSC brain researchers are using transcranial magnetic stimulation (TMS) to treat specific brain circuits involved in **alcohol addiction** as part of a \$7M NIH grant.
- > Neuroscientists are also studying the brain's wiring to understand how to develop better treatments for **substance abuse disorders**.
- > MUSC is part of \$11.1M NIH aphasia study designed to help determine the best treatment options to help **stroke patients** recover from communication problems.

HEART

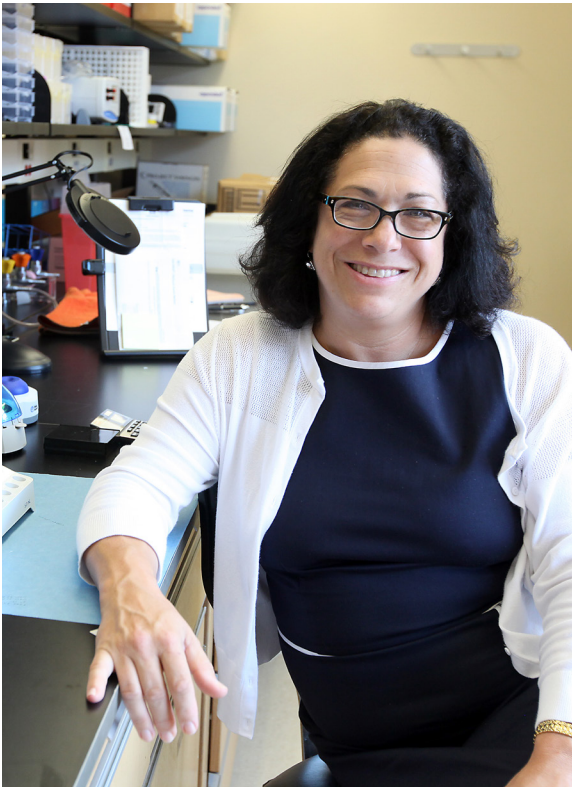
- > MUSC cardiologists are the first to address a therapeutic target for **heart failure patients** with a preserved ejection fraction (HFpEF). Research to test the safety and effectiveness of the treatment is being funded by the Department of Defense.
- > Researchers are exploring why African-Americans are more likely to suffer and die from **congestive heart failure** than their white counterparts.

CANCER

- > The Hollings Cancer Center received an \$8.9 million grant from the National Cancer Institute to foster collaboration across clinical and laboratory research to study **solid tumors cancers**.
- > The National Cancer Institute awarded MUSC \$15 million to lead an international consortium of research designed to evaluate the impact of government policies on **tobacco use behaviors** and the evolving nicotine delivery market.
- > MUSC researchers and clinicians using nanomedicine as a potential new treatment option for **patients with an aggressive cancer**, glioblastoma multiforme (GBM), to deliver a chemotherapeutic drug more effectively.

MUSC is dedicated to engaging community members in all aspects of the research process to promote health, reduce the risk of illness and disease, and build community resilience to help transform health care.

- > MUSC researchers use a **\$1.68 million NIH grant** to explore a better treatment for **chronic pancreatitis**, with the hopes that it also may shed light on a future cure for patients with Type 1 diabetes.
- > An orthopaedic surgeon is studying the safety and effectiveness of three blood-thinning drugs used to prevent potentially deadly blood clots in **patients undergoing hip and knee replacement** with a \$13.5 million award from the Patient-Centered Outcomes Research Institute (PCORI).
- > MUSC researchers provide **patients with pulmonary fibrosis** opportunities to participate in novel clinical trials, while our basic research scientists focus on disease mechanisms, diagnostics and the development of new therapies.
- > Department of Justice award will fund treatment for Emanuel AME church congregation to help establish a resiliency center that will serve that will serve as a hub to connect **those affected by the violence** to recover.
- > Study suggests home-based telemental health delivers **better quality of life for veterans** as it helps them deal with depression and delivers as good a quality of life as in-person visits.
- > MUSC is dedicated to engaging community members in all aspects of the research process to promote health, **reduce the risk of illness and disease**, and build community resilience to help transform health care.

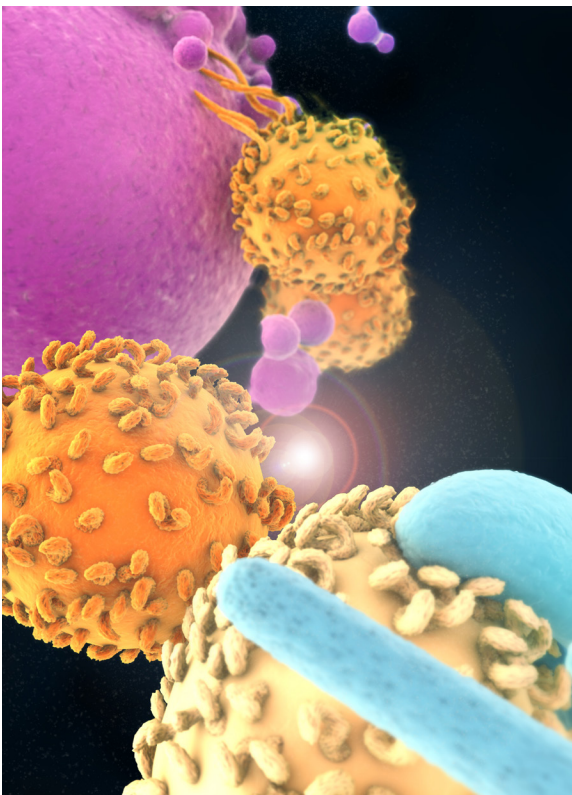


INNOVATIONS IN BREAST CANCER CARE

The best ideas can come at the oddest of times. Just ask oncology surgeon Nancy DeMore, who while performing a lumpectomy, asked herself why there wasn't an easier way to do the procedure that wouldn't involve two invasive surgeries.

She reached out to her colleague Dr. Delphine Dean, who holds a degree from MIT in electrical engineering and computer science and directs the Multiscale Bioelectromechanics Lab at Clemson University. Ideas and plans flew back and forth between MUSC and Clemson, with a group of Clemson students taking on the task and spending long hours in the lab.

Over time, all the brainstorming and work paid off. In August 2016, a patent was filed on the resulting hand-held detector. The prototype is set to go through pre-clinical trials and probably will be on the market for use in two years.



EQUIPPING OUR IMMUNE SYSTEM TO FIGHT BACK

Cancer immunotherapy is perhaps the most significant recent advancement in the battle against cancer. Multiple teams are exploring novel ways to harness the body's own immune system to fight cancer and advance targeted cancer therapies that prevent the growth and spread of cancer by interfering with specific molecules.

Zihai Li, M.D., Ph.D., chair of the Department of Microbiology and Immunology, received a grant of more than \$6.8 million from the National Institutes of Health to study this.

Dr. Li's research focuses on how cancer escapes recognition by the immune system. This research may accelerate breakthroughs in cancer research and drug discovery.



BRINGING SCIENCE TO THE COMMUNITY

Discover the fascinating science happening all around us at the MUSC Science Café Series. Science Cafés bring the community together with MUSC scientists in a casual setting.

You'll learn about the latest research being conducted, get to know the faces behind the science, and have opportunities to ask questions and deepen your understanding.

Come join the conversation about issues such as:

- > Alzheimers Disease
- > Genetics
- > Drug Discovery
- > Human Microbiome
- > Melanoma
- > Opioid Addiction
- > Fibrosis
- > Nanotechnology
- > Sickle Cell Disease
- > Antioxidants

To view upcoming Science Café events, please visit: muscd.edu/research/science-cafe

THE MEDICAL UNIVERSITY OF SOUTH CAROLINA

The Medical University of South Carolina (MUSC) is South Carolina's only comprehensive academic health science center. Our purpose is to preserve and optimize human life in South Carolina through our vision to lead health innovation for the lives we touch. MUSC provides an interprofessional environment for learning, discovery and healing through our tripartite mission of education, research and patient care.

The MUSC values of compassion, collaboration, respect, integrity and innovation are nurtured every day by people who believe in each other and in Charleston, South Carolina and our global community.

Founded in 1824 as the first medical institution in the southern United States, MUSC's main campus is located on more than 50 acres in the city of Charleston. Since its founding, the university has awarded more than 36,000 degrees and grown from a small medical school to an academic health science center comprised of a 700-bed referral and teaching hospital and six colleges with more than 1,700 faculty educating approximately 3,000 students annually. As the largest non-federal employer in Charleston, the university and its affiliates have collective annual budgets in excess of \$2.3 billion, with an annual economic impact of more than \$3.8 billion and annual research funding in excess of \$250 million.



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