CHANGING WHAT'S POSSIBLE

MUSC RESEARCH

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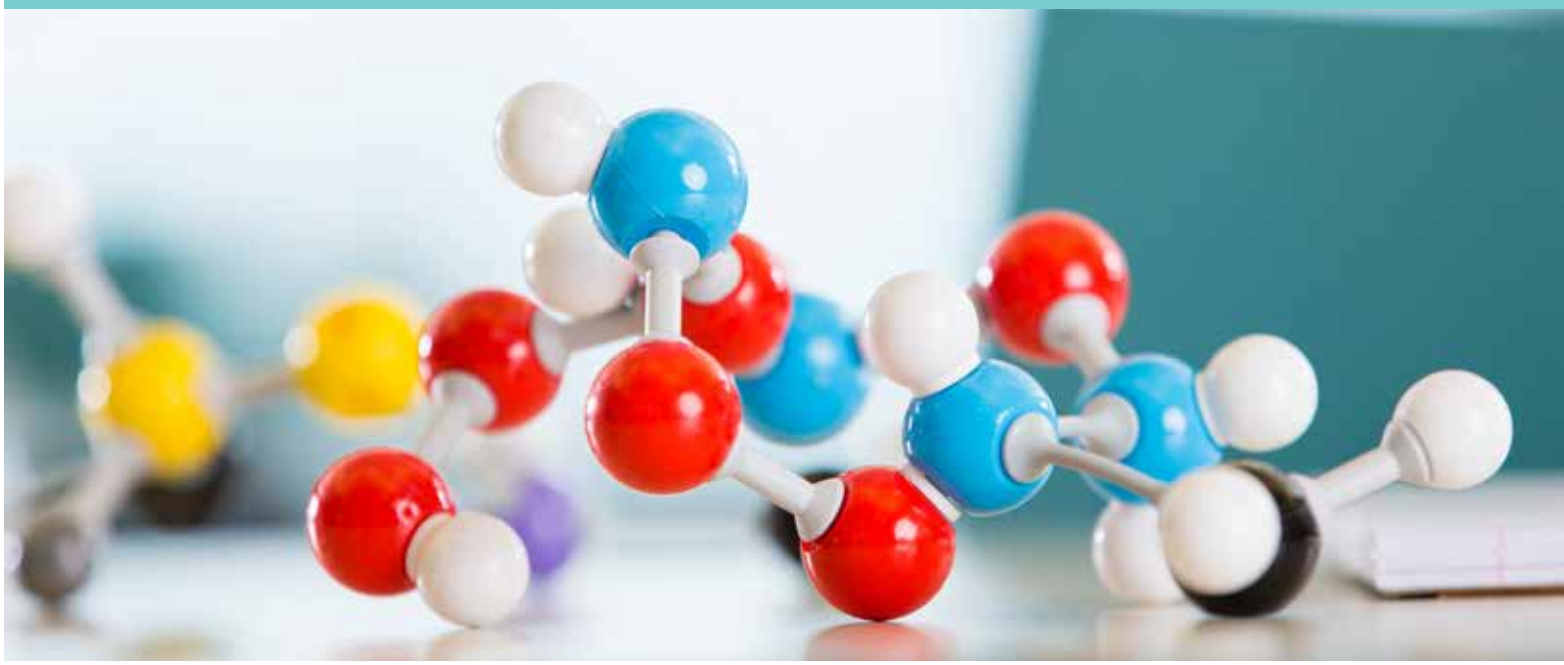
of South Carolina



MUSC **RESEARCH**

Message from **Kathleen Brady, M.D., Ph.D.**

Vice President for Research | Distinguished University Professor

The Medical University of South Carolina (MUSC) is the premier biomedical research institution in South Carolina, with a record of more than $276 million in research funding in Fiscal Year 2018. This funding reflects a research enterprise of clinical and basic scientists internationally recognized for biomedical work in diseases such as cancer, stroke, health disparities, addiction sciences, inflammation and fibrosis, and digestive disease – just to name a few! All a direct result of recruiting top scientists with a strategic focus to serve the needs of the people of South Carolina.

The catalyst for changing the culture of biomedical research is MUSC's South Carolina Clinical and Translational Research Institute (SCTR), the only such institute in the state. Through this institute we are able to facilitate sharing of resources and expertise and optimize processes and communications to bring about large-scale change in the clinical and translational research efforts that transforms healthcare. Not only does the MUSC research enterprise support the health and welfare of our communities, it also provides strong and positive economic impact for the region and state, through our innovation and discovery, research funding and job creation.

In fiscal year 2018, MUSC's research economic impact for the state of South Carolina totaled more than $556,000,000! MUSC's Foundation for Research Development has supported over 70 startups, issued more than 400 patents, brought 30 products to market, and assisted with 3 startups being acquired by multi-million dollar corporations. We are committed to leading health innovation for the lives we touch. We invite you to explore these stories, engage with us, and get to know the scientists who are the heart of our research community dedicated to changing what's possible in healthcare through state of the art research and discovery.

HOPE IN A HANDFUL OF MAGIC CELLS

There are times when life is overshadowed by elements outside our control. For Lashanda Wiggins, that included a devastating diagnosis of lupus. But thanks to a clinical trial led by MUSC's Gary Gilkeson, M.D., and Diane Kamen, M.D., there is hope on the horizon — not just for Wiggins but perhaps lupus patients everywhere.

Systemic lupus is an autoimmune disease that causes the body's immune cells — the defense system that usually protects against disease — to attack healthy organs and tissue. Lupus is not only more prevalent but also more severe in African-American and Hispanic women. Wiggins' family searched desperately for any possible solution.

In early 2017, she and her family learned of a study led by Chinese scientist Lingyun Sun, M.D., Ph.D., who used stem cell infusions to treat lupus flare-ups. Even more remarkably, a similar study was taking place at MUSC. Gilkeson and Kamen were using mesenchymal stem cells harvested from umbilical cords to treat the disease.

Gilkeson and Kamen recently were awarded a $3.8 million grant from the Lupus Foundation of America and $4 million grant from the National Institutes of Health to perform a five-year phase 2 multicenter placebo-controlled trial, which will allow them and their team to determine the efficacy of MSCs in patients with lupus resistant to treatment.

Wiggins said phase 1 yielded miraculous results for her. **"It took about four weeks, and I noticed I had a lot more energy. I wasn't as fatigued. Before I would take naps all throughout the day."** There was no doubt in her mind that the lupus she had long suffered with had been dealt a severe blow.

What is even more incredible, she said, is to be given back the gift of motherhood. "I can go outside and play with my kids with just sunscreen, and I'm fine. I can't express what it's like to have my life back." With her lupus under control, she expresses her gratitude to everyone involved in the study and MUSC. "MUSC is amazing. Any time my kids or I get sick, we always come here first. I feel that's because MUSC is always studying and researching. Dr. Gilkeson gave me the floor to ask any questions I had and made me feel included. "

Meeting the community **where the needs are**

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 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.

- 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.

- 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.

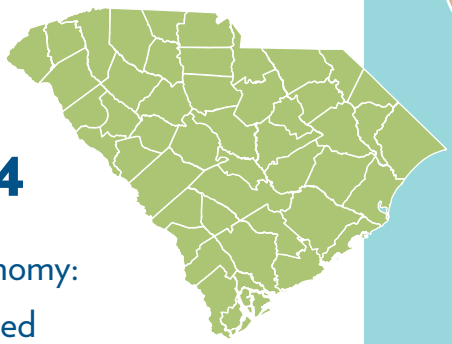
More than 89,000 South Carolinians currently live with Alzheimer's. This number is expected to increase by 34.8 percent by 2025, a projected spike due in part to an influx of retirees.

However, it is also fueled by health care disparities facing its large African American population, 24.3 percent of whom live below the poverty line, many in rural areas.

MUSC researcher Marvella Ford, Ph.D., is co-leading a research education component to increase diversity of researchers focused on population health and reduce disparities in Alzheimer's disease.

SC: Research Labor Income

$196,061,474



Charleston Metro Economy:

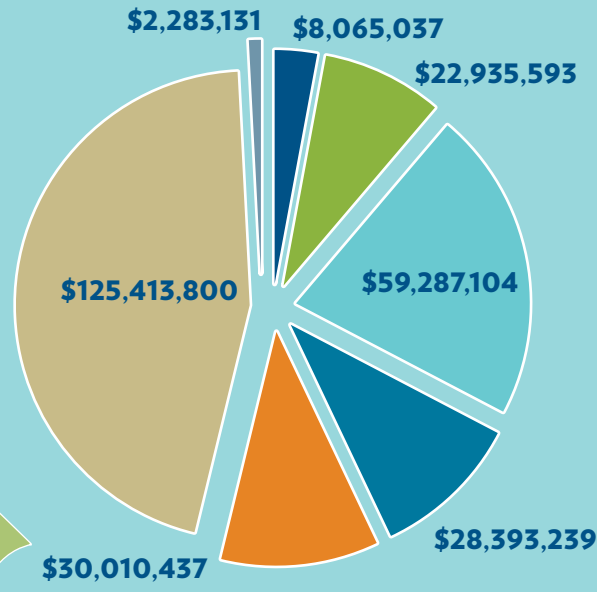
- **3,117** Jobs Supported
- **$191 Million** in Labor Income
- **$16,281,145** State & Local Tax Impact

People trying to overcome alcohol-use problems are more successful when a spouse or family member joins them in therapy – but their alcohol use might also have frayed bonds to the point that family members don't want to join them in therapy.

MUSC researcher Julianne Flanagan, Ph.D., decided to investigate whether incorporating oxytocin – known colloquially as the "cuddle hormone" – into a specific couples therapy regimen could help people stick with treatment. Dr. Flanagan received a five-year, $2.75 million award from the National Institute on Alcohol Abuse and Alcoholism to test this idea and will begin recruiting participants. The hormone also has anti-anxiety and anti-stress effects and has even been shown to reduce alcohol tolerance and withdrawal symptoms, she said.

RESEARCH FUNDING CATEGORIES

- State
- Other Federal
- Foundation
- NIH
- Corporate
- Other
- Federal Flow-down



Research Funding

$276,388,341

SC: Total Economic Impact

$556,256,613

DIRECT IMPACT

- **$276.388,341**
  Labor, services & goods supporting research

INDIRECT IMPACT

- **$155,693,486**
  Purchase of good or services by firms in SC producing materials used in research

INDUCED IMPACT

- **$124,174,786**
  Purchases made as the result of wages paid

A new link between **cancer and aging**

Cancer becomes more common as people get older, but scientists are still searching for answers about why this happens. At Hollings Cancer Center, research into the connections between aging and cancer is led by Besim Ogretmen, Ph.D., SmartState Endowed Chair in Lipidomics and Drug Discovery. Ogretmen's team found that cancer cells have specific ways to resist dying the way normal cells do. They do so by protecting the tips of their chromosomes, which hold our DNA, from age-related damage.

Ogretmen studies how cancer cells are different than normal cells to understand how cancer grows and spreads in the body. His work is part of an $8.9 million program project grant that is helping fund a clinical trial of an anticancer medicine to inhibit cellular signaling that helps cancer survive. The drug was found to be useful against cancer in the research reported in the group's new paper.

"We hope that maybe we can do both: delay aging and prevent the growth of cancer," said Ogretmen. **"That's the ultimate outcome of this."**

As normal cells get older, the tips of their chromosomes, called telomeres, can start to break down, which is a signal for the cell to die. This seems to be part of the aging process in normal cells. However, cancer cells have developed a way to prevent their telomeres from falling apart, which helps them to live much longer than normal cells. The long life of cancer cells is part of what allows them to grow and spread throughout the body.

In their new paper, Ogretmen's research group discovered a specific way that cancer cells escape death in response to telomere damage. Scientists have known that various types of cancer cells have low levels of a protein called p16. Ogretmen's group found that, when telomeres become damaged by age or in response to chemotherapy, p16 is a type of cellular decision-maker, where it helps cells decide to grow older or to simply die.

A delicate **balance**

America is fighting the deadliest drug crisis ever. And with Americans consuming considerably more opioids than any other country, nearly 60 percent more than Canada, the No. 2 consumer according to the United Nations International Narcotics Control Board, the problem doesn't necessarily lie with illegal drugs. Prescribed opioid painkillers are actually at the heart of the issue. Two-hundred-fifty nine million prescriptions were written for opioids in 2012, reports the American Society of Addiction Medicine. That's more than enough for every adult in the United States to have their own bottle of prescription opioids.

Kelly S. Barth, D.O., a psychiatrist and internal medicine physician at MUSC Health who concentrates her efforts on the management of patients taking opioid medications for chronic pain, says patients with this type of persistent pain can have a worse quality of life than patients with cancer, adding that chronic pain can negatively affect their daily lives in countless ways.

Properly treating pain while not creating addiction is a delicate balance — one that has not been struck particularly well. The increase in the number of opioid prescriptions written coincides with a high number of drug overdose deaths, says Barth. In an effort to address both problems, MUSC has launched South Carolina's first comprehensive chronic pain rehabilitation program. With half of opioid prescriptions in the U.S. written for chronic pain, opioid misuse and chronic pain often go hand in hand.

Specific goals for recovery include the reduction or discontinuation of pain medication use; education is also a major component of the program, as patients learn stress management, relaxation techniques and coping skills and improve the ability to self-manage chronic pain.

"Ultimately, patients will be able to reduce their reliance on both opioids and health care professionals, moving more towards a model of "wellness rather than illness." Barth says.

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:

- Aging
- Alzheimer's Disease
- Autism
- Cancer
- Fatty Liver Disease
- Heart Failure
- Lupus
- Neurofibromatosis
- Resilience
- Stroke

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

THE MEDICAL UNIVERSITY OF SOUTH CAROLINA

Founded in 1824 in Charleston, MUSC is the oldest medical school in the South, as well as the state's only integrated, academic health sciences center with a unique charge to serve the state through education, research and patient care. Each year, MUSC educates and trains more than 3,000 students and 700 residents in six colleges: Dental Medicine, Graduate Studies, Health Professions, Medicine, Nursing and Pharmacy. The state's leader in obtaining biomedical research funds, in fiscal year 2018, MUSC set a new high, bringing in more than $276.5 million.

As the clinical health system of the Medical University of South Carolina, MUSC Health is dedicated to delivering the highest quality patient care available, while training generations of competent, compassionate health care providers to serve the people of South Carolina and beyond. Comprising some 1,600 beds, more than 100 outreach sites, the MUSC College of Medicine, the physicians' practice plan, and nearly 275 telehealth locations, MUSC Health owns and operates eight hospitals situated in Charleston, Chester, Florence, Lancaster and Marion counties. In 2018, for the fourth consecutive year, U.S. News & World Report named MUSC Health the number one hospital in South Carolina.

To learn more about clinical patient services, visit http://muschealth.org.

MUSC and its affiliates have collective annual budgets of $3 billion.
The more than 17,000 MUSC team members include world-class faculty, physicians, specialty providers and scientists who deliver groundbreaking education, research, technology and patient care. For information on academic programs, visit musc.edu.

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