

Beating Breast Cancer at Baylor

Prepared for the Nancy Owens Breast Cancer Foundation in November 2023

Your Impact

The American Cancer Society has estimated that there will be nearly 300,000 new breast cancer cases in 2023. Many people and their families are impacted by this disease, and while there are treatments available, more effective therapies need to be developed to improve survival outcomes and quality of life. Baylor College of Medicine has a long history of pioneering new treatments and translating findings in the lab to the bedside. This work is largely made possible through the generosity of partners like the Nancy Owens Breast Cancer Foundation, which invest in our people and programs.

Having given nearly \$850,000 to Baylor over close to two decades, the Foundation has spurred discovery at Baylor and has brought hope to many of our breast cancer patients. Today, the Lester & Sue Smith Breast Center is a leader in developing personalized therapies that give patients a better chance at recovery and help them spend more time with loved ones. Additionally, the Smith Breast Center's faculty train young investigators and physicians to be knowledgeable and compassionate physicians who center their work on the patient experience. The Foundation's investment in the Smith Breast Center is an investment in tomorrow's doctors and researchers.

The Smith Breast Center is pleased to share this report on the Foundation's impact over the past year with its \$55,000 gift made in November 2022.



Growing Research Capacity

Research is essential to developing more effective breast cancer treatments. One way to accelerate new discoveries from the bench to the bedside is by enhancing the equipment and resources available for various studies. The Foundation's gift helped the Smith Breast Center purchase three new critical pieces of equipment. These include:

1. **HALO Modules** from Indica Labs: The modules help the Smith Breast Center's researchers quantify the number, intensity and co-expression of an unlimited number of fluorescently labeled RNA or DNA probes on a per cell basis. This heightened form of imaging accuracy allows the Smith Breast Center's scientists to advance tissue-based research, clinical trials and diagnostics.
2. **GloMax Explorer** from Promega Corporation: This instrument provides researchers superior luminescence sensitivity and dynamic range for both strong and weak bioluminescence experimental tissue samples. This enables the Smith Breast Center's investigators to better track cancer cells and study their distribution and activity *in vivo*.
3. **Microtome**: This is a specialized precision cutting instrument, which accurately and repeatedly slices sections from a block of embedded tissue. Different kinds of microtomes are used to section paraffin and plastic embedded tissues. This is essential for examining tumors and other diseases tissues while conducting promising and potentially life-saving studies.

With this new equipment, the Smith Breast Center has been able to increase its research efforts and deliver more precise results that enable more personalized therapeutics for patients. The Foundation has been an indispensable partner in making these activities possible.

The Smith Breast Center's faculty use a variety of research approaches to identify new breast cancer targets and develop therapies, such as:

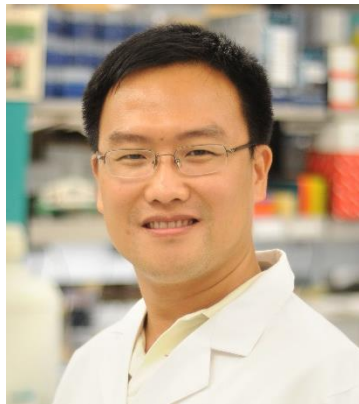
1. **Proteomics**, which most directly show protein function in breast cancer and are the active target of drugs. The Smith Breast Center is a pioneer of proteomic technology.
2. **Integrated omics** uses data generated in the field in the past decade, including proteogenomic and transcriptomic data, to try to determine the mechanisms of underlying treatment resistance.
3. **Proteins related to DNA repair and replication**, the basic machinery of normal cells. When those proteins are mutated, they confer properties to tumors that may make them more vulnerable to certain therapies.
4. **Immunotherapy**, which examines subpopulations of immune cells to understand their function in patients' tumors and what allows some tumors to progress and metastasize.



5. **New animal models** that can better mimic human disease. The Smith Breast Center's wide spectrum of patient-derived xenografts, tumors directly taken from patients, more faithfully maintain patient characteristics. The new animal models have more power replicating certain subtypes of breast cancer.

The new tools and equipment provided by the Foundation will assist several studies that employ these cancer research approaches. The Smith Breast Center is also testing drugs that are already in the clinic and studying how to better use them in combinations with other drugs to identify the right group of patients for these drugs. The new equipment is essential to carrying out this important work. Within a few years, the Smith Breast Center will develop better drugs with more precision from new combinations.

Dr. Xiang Zhang Named Director



"I am extremely honored and humbled by the opportunity to lead the Smith Breast Center, a powerhouse of breast cancer research worldwide, as well as a home that has nurtured my scientific career. I am standing on the shoulders of previous leaders, and I hope to continue our success in conducting cutting-edge research for better care of patients."

Xiang "Shawn" Zhang, Ph.D.

Professor, Molecular and Cellular Biology
Director, Lester & Sue Smith Breast Center
McNair Scholar

William T. Butler, M.D., Endowed Chair for Distinguished Faculty

Having served as the Lester & Sue Smith Breast Center's interim director since March 2022, Dr. Zhang was recently appointed as its director in October 2023. He joined the faculty at Baylor in 2011 after completing a postdoctoral fellowship in the Cancer Biology and Genetics Program at Memorial Sloan Kettering Cancer Center in New York. His dedication and leadership will accelerate much of the Smith Breast Center's exciting research in drug discovery and immunotherapy. Additionally, Dr. Zhang has his own lab, which investigates the biological mechanisms and therapeutic strategies of breast cancer metastasis. His lab is currently investigating early-stage bone colonization of disseminated breast cancer cells and breast cancer-induced immunosuppression.

Meet Dr. Qian Zhu

In September 2022, the Smith Breast Center hired a Cancer Prevention and Research Institute of Texas recruit from Harvard University, Qian Zhu, Ph.D. Dr. Zhu is an expert in computational genomics and bioinformatics. The genomics tools he has developed are being applied to data to better understand the sources of tumor cell populations within the same specimen and tumor formation and progression. These tools also reveal novel

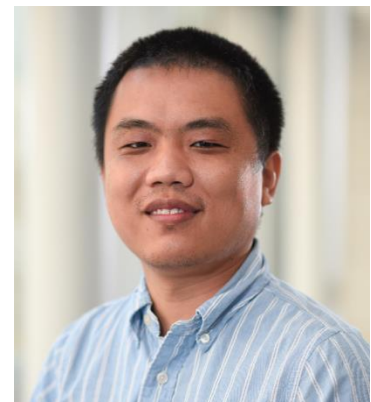


image-based and genomic biomarkers that predict clinical outcomes. Dr. Zhu works closely with experimental collaborators to understand the mechanisms underlying tumor progression and therapy resistance. Recently, he became interested in developing methods in spatial transcriptomics – a groundbreaking technique that allows scientists to measure all the gene activity in a tissue sample and map where it is occurring. He is also working to improve the integration of machine learning algorithms in imaging analyses for the diagnosis and study of diseases of the tissues. His bigger vision includes using large-scale data visualization approaches and developing databases and portals to improve patient and clinician access to genomics information.

New Research Initiatives

In summer 2024, the Smith Breast Center will submit a request for renewal of its Specialized Program of Research Excellence (SPORE). Baylor's SPORE seeks to overcome fundamental treatment barriers that have slowed the progress of curing metastatic breast cancer by articulating cross-cutting objectives and working collaboratively. This funding is essential for developing better therapies and potentially a cure for this disease. Recently, the Smith Breast Center completed a phase one clinical trial with its current SPORE grant.

The National Institutes of Health awarded Dr. Shawn Zhang a P01 grant to investigate bone metastasis and ER+ breast cancer. While many treatments for breast cancer are available, recurrence can be lethal because it often metastasizes and becomes more difficult to treat. Dr. Zhang's research aims to better understand the connection between cancer recurrence and bone metastasis to identify novel targets for more effective therapies.

Additionally, the Smith Breast Center has received several collaborative program grants involving multiple principal investigators. Multi-institution grants and collaborations are critical to facilitating new discoveries. Breast cancer is an extremely complex disease, so working together is critical for progress. Collaborations can also provide a larger and more diverse patient population, which is critical to developing personalized therapies that are tailored to each individual's health needs.

With Gratitude

The Nancy Owens Breast Cancer Foundation's impact continues to grow as the Lester & Sue Smith Breast Center builds out its research programs and recruits new faculty to conduct novel studies, deliver increasingly personalized patient care and train tomorrow's breast cancer experts. Thank you for the Foundation's ongoing support and confidence in the Smith Breast Center's faculty. If you have any questions about this report, please contact Alexandra Hood, associate director of Development, at 713-798-3565 or alex.hood@bcm.edu.