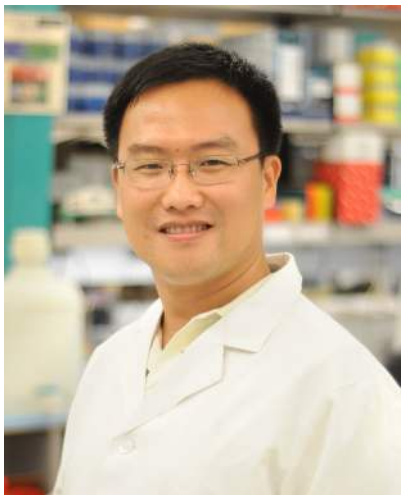
Behind the Science
Dr. Xiang Zhang, PhD

Komen Grantee Dr. Xiang Zhang, PhD is an Assistant Professor at the Lester and Sue Smith Breast Center at Baylor College of Medicine. This is his story.

When a close family member or friend is diagnosed with breast cancer, you offer your support, encouragement, and love. You drive them to doctors' appointments, provide a comforting presence during treatment sessions, prepare meals, and help with everyday chores. You may even spend countless hours learning about the diagnosis, trying to find the right doctor and the most effective treatment options - worrying about the possibility of metastasis. You do all that is necessary to let your loved one know they are not alone in this battle – that you are fighting with them.

Metastasis occurs when the cancer spreads to other parts of the body.

But what if you could do more? What if you had the scientific knowledge and skills to find a better way to treat the disease? Dr. Xiang Zhang, an early-career Komen-funded scientist, spends his days doing just that – trying to improve the treatment of breast cancer, a diagnosis his own mother faced in 2012 and continues to live with.



Dr. Zhang began his career studying breast cancer prior to his mother's diagnosis. After receiving his Ph.D. from Columbia University in 2006, he decided to study cancer metastasis at Memorial Sloan Kettering Cancer Center. In 2011, he was recruited to the Lester and Sue Smith Breast Center at Baylor College of Medicine where he is currently the lead investigator of his own laboratory, studying how the immune system can be used to fight breast cancer.

In 2012, not long after establishing his lab at Baylor, Dr. Zhang's mother was diagnosed with ER+ breast cancer. Five years later, she is still on adjuvant therapy. "Everything looks fine now. But, I know that she is still at risk for recurrence, just as many other breast cancer survivors are. Therefore, curing breast cancer, especially metastatic breast cancer, has become the major focus of my research", Zhang noted. As a co-survivor, Dr. Zhang is committed to providing better outcomes for breast cancer patients like his mother.

Zhang's research is focused on a single question: How can we harness the immune system to fight breast cancer? The immune system has the ability to kill tumor cells. However, tumors have learned to "hide" or "turn off" the immune system in order to survive. One way tumors do this is by releasing proteins that recruit normal cells to block the immune system from attacking tumors.

In a recent publication in Nature Cell Biology, Dr. Zhang and his colleagues reported they had discovered a new way to prevent tumors from disabling the immune system. The process works like a domino effect. Tumor cells release a protein that acts as a signal to recruit a specific type of immune cell, called myeloid-derived suppressor cells or MDSCs, into the tumor. In a healthy body, MDSCs are cells that help control other immune cells by "turning off" the immune response when it is no longer needed and ensure that healthy cells are not attacked. But tumor cells can take advantage of MDSCs and use them to protect themselves from being attacked by the immune system. Dr. Zhang showed that if they can stop MDSCs from moving into the tumor and disabling the immune system, they can help immune cells recognize and kill tumor cells.

The immune system is the body's natural defense against disease. It works to defend the body by recognizing and eliminating anything that could be harmful.

Immunotherapies are therapies that use the body's own immune system to fight cancer. While immunotherapies have shown incredible promise in recent years for treating a number of cancers, including skin and lung cancers, they have not been very effective in the treatment of breast cancer – something that has stumped scientists. Immunotherapies are designed to boost the immune system. But, if the immune response is disabled by MDSCs, the immunotherapy will not be very effective.

Dr. Zhang's work addresses this problem by combining immunotherapies with drugs that block the activity of MDSCs. He believes this approach can improve the ability of the immune response to defend itself against the tumor. "We have seen dramatic effects of the immune system on tumor progression," says Zhang. "In some of our experiments, an immune system capable of attacking the tumor can sometimes completely eliminate an aggressive breast tumor. If this effect can also be realized in patients, it would speed up our progress of curing breast cancer," he adds. An immune system capable of attacking tumor cells could also be effective at killing any tumor cells that have returned (recurrence) or that have spread (metastasized).

Dr. Zhang plans to use the momentum of his recent publication to drive this work forward, always keeping the patient in mind. Prior to his mother's diagnosis, Dr. Zhang's sole focus was studying the disease itself. However, following her diagnosis, he began to consider patient quality of life – "I vividly remember the side effects from her treatment," says Zhang. Conversations with patient advocates, including his mom, have opened his eyes to the "real needs and hopes for patients, which should always be our top priority in pre-clinical research," says Zhang. "[These interactions] help me gauge the importance of our findings and help us decide on the right direction." Dr. Zhang's future studies will investigate ways to target and block MDSCs so they can improve immune response attack against breast tumors. They plan to begin these studies by testing drugs that have already been FDA approved - drugs that have already been tested in patients but used to treat other diseases. If they can re-purpose an existing FDA-approved drug to treat breast cancer, that drug could move to the clinic more quickly to benefit patients.

Dr. Zhang meets with patient advocates Susan Rafte and Josh Newby at the Annual SABCS meeting.

While his mother's diagnosis has motivated Dr. Zhang's passion for his work, it has also compelled him to do more outside of the laboratory to bring the patient voice to research. Along with Komen Scholar Dr. Matthew Ellis, Dr. Zhang has served as Activity Director for the 3rd Annual Metastatic Breast Cancer Conference held at Baylor College of Medicine which provides a platform for patient advocates, clinicians and scientists to exchange ideas and discuss the most demanding needs and concerns for metastatic breast cancer patients. This conference "increases communication amongst all parties so that we can accelerate the cure for metastatic breast cancer," says Zhang.

"My mother's battle with breast cancer left a deep impression on me. We need to find a cure and we need to improve patient quality of life by any means."

Dr. Zhang is just one of the more than 900 early career investigators to receive Komen funding, which is intended to recruit the brightest scientific minds to breast cancer research and to support them as they become the next generation of leaders in the field. Dr. Zhang credits Komen research dollars as being instrumental in establishing his work on immunotherapy, noting that "Komen not only funded our research, but also allowed me to assemble a team of senior scientists with the necessary expertise to advise us on the development of our research. This has been tremendously important for a new lab to debut in an unfamiliar field." As a Komen Career Catalyst Research grantee and an early career investigator, Dr. Zhang has a promising career ahead. He is already making major discoveries and using his personal story to facilitate collaborations between patient advocates and the scientific community. More importantly, Dr. Zhang is finding a way to fight alongside his mother, providing hope for her and for all breast cancer patients.

Read more about Dr. Zhang's work.