DISCOVERY OPERATION

UGA Scientists Team Up At The Forefront Of Cancer Research

Story: Kirk McAlpin
Photos provided courtesy UGA Public Affairs
Avinash Sujan lived with cancer just long enough to witness the birth of his first daughter. A researcher under Michael Pierce, director of the University of Georgia Cancer Center, Sujan was a doctoral student working in UGA’s Complex Carbohydrate Research Center (CCRC) when he was diagnosed with an advanced case of an aggressive brain cancer called a glioma. After surgery, Sujan lived another three years, working in a limited capacity at the bench until he became too weak. He was granted a Ph.D. by UGA posthumously.

“His story inspires people here,” said Pierce, who is also the Meder Professor in Cancer Research at UGA. “It affected everybody here because we knew him so well.” Doing research on glioma has been in the back of Pierce’s mind since then, and researchers at UGA are now beginning to work on detecting markers for glioma in serum that could be used clinically to detect glioma and distinguish between aggressive and non-aggressive tumors.

Founded in 2004, the UGA Cancer Center began with the goal of bringing together top researchers at the university to find diagnostic and therapeutic solutions to
the disease that is the second leading cause of death in the U.S.

The UGA Cancer Center is a collaboration of more than 40 researchers from scientific disciplines ranging from genetics, molecular biology and chemistry to health promotion, who all share the goal of improved cancer detection and treatment. The center conducts research in diagnostics, therapeutics, vaccines and prevention that hopefully will be applied to offer patients better clinical treatments. "We are a discovery operation," Pierce said. "That's what we do really well. We do the discoveries and take it a few steps to where we are confident that it is promising, and then we find partners who can take it the rest of the way to the patient."

HOPE FOR EARLY DETECTION

Pierce and the other researchers aim to discover early detection methods as a way to prevent cancer deaths. "Almost every cancer can be treated if it's detected early," he said.

Pierce and other researchers at the Cancer Center study complex carbohydrates, known as glycans, which are on the surface of cells. The A, B and O blood types that people are familiar with are all glycans with precise structures. "We are looking for glycans that are not part of the ABO system, but are expressed on the surface of cells. We know that those glycans change when cells become cancer cells," said Pierce. "That gives us another way to predict the presence of a cancer cell if the cancer cell releases glycans into the blood and we can find them and develop a test for them."

There are already screening methods for some cancers, such as colon cancer, but cancers like pancreatic cancer are harder to detect until they are already advanced and difficult to treat. In that case, said Pierce, "you really would like some sort of early blood test to say there is the possibility of something going on." The CCRC currently has a large grant from the National Cancer Institute to work on early detection of pancreatic cancer.

In their efforts to improve the early detection of pancreatic cancer, UGA researchers collaborate with the Translational Genomics Research Institute (TGen), a non-profit organization in Phoenix, Arizona that specializes in cancer research. The partnership began as a result of the researchers meeting a UGA alumnus and pancreatic-cancer survivor named Howard Young who wanted to make a donation to cancer research at UGA. Young introduced the UGA scientists to those at TGen, where he was treated after his initial surgery in Georgia. This collaboration helps UGA obtain tissue and blood samples to conduct their research.
Pierce said one of the ultimate goals of their work is that it may one day lead to the detection of cancers presymptomatically. "In the future you may be able to go in for a checkup, have a blood test, and find out that you are at risk for a cancer in its early stages when the chances of an effective treatment are far better."

Finding enough markers that will work on a diverse group of patients is a time consuming and difficult process. For this reason, Pierce explained, even though one marker has been proven to be an effective indicator of a cancer in some situations, it may not work in every case. "All cancers are not the same. All people are not the same," Pierce said. "You may miss one marker in one population, but that marker will be positive for someone in another population." The researchers have found potential markers in tissue and blood samples for breast cancer, pancreatic carcinoma and ovarian cancer. "It looks very promising," said Pierce. Now the researchers need to increase the number of samples that are analyzed to get to a level of statistical significance.

"In some ways it's very frustrating because the path is not straightforward. However, we and our collaborators have found potential markers for pancreatic cancer by looking at tissue and pancreatic ductal fluid, so we are pursuing those leads to now look in serum to see if we can detect these markers as part of a blood test," said Pierce. Again, early detection is key. "Who cares if you can detect a cancer the size of a golf ball? That's nice, but it is not really going to help anything."

Pancreatic cancer has a very low survival rate because it is so difficult to detect early.

TOMORROW'S TREATMENTS

Geert-Jan Boons, associate professor at the Franklin College of Arts and Sciences and UGA Cancer Center collaborator, has been working on a cancer vaccination for the last 10 years by studying the same complex carbohydrates that Pierce and his colleagues in diagnostics are. "A very small number of cancer patients have a natural immunity to these carbohydrates," Boons explained. "The outcome of these patients is very much improved." Boons and his colleagues seek to create a vaccine that creates this type of immunity in a larger number of patients. The researchers have successfully fought cancer in mice injected with breast cancer cells. The next step is to work with human blood cells to see if they can process the vaccine. Ninety-five percent of cancer cells associated with breast, prostate and pancre-
atic cancers have these particular carbohydrates on their surfaces. Boons hopes that the vaccine will be able to eradicate cancerous stem cells that often cause cancers to recur in patients who have already received treatment.

Cancer Center collaborator Natarajan Kannan, assistant professor of biochemistry and molecular biology in the UGA Franklin College of Arts and Sciences, recently received a $720,000 grant from the American Cancer Society to detect harmful cell mutations that can cause cancer. Identifying these mutations and pinpointing specific areas of the genome that contribute to cancer progression could help develop drug targets for new cancer therapies. “Currently, cancers are treated without taking into account the genomic makeup of a patient,” said Kannan. “But that’s not working because the genomic makeup of a cancer patient is not only different from a normal individual, but also changes as cancer progresses.” Kannan, who is a Georgia Cancer Coalition Distinguished Cancer Scholar, is analyzing the data generated from cancer genome sequencing studies to develop markers for cancer prevention. His studies will also inform current efforts to develop personalized cancer care.

NEW OPPORTUNITIES

Now, with the first year of medical students taking classes in Athens as part of Medical College of Georgia/University of Georgia Medical Partnership, Pierce sees the opportunity of future collaboration among medical faculty and students and the Cancer Center. “Instead of having to go to Augusta or Emory or Phoenix, we can have sources of tissues and fluids right here in Athens. That would help us accelerate our cancer cell targeted program,” Pierce said.

Another focus of the UGA Cancer Center is stem cell research, an area which UGA is very strong in. “There is very good evidence now that many if not most cancers arise from stem cell populations that become cancerous,” Pierce said. Learning to fight the cancer stem cells could lessen the probability that cancer will come back after treatment. Pierce makes an analogy to fire ants. “If you want to kill fire ants, you’ve got to kill the queen. If you don’t, you will go out your back door three or four days later and the mound will be just as big.” Like the queen generating the colony, the cancer stem cells generate the rest of the cancer. The researchers hope that by identifying markers specific for the cancer stem cells, they will be able to open up new areas of therapy and diagnostics.

Pierce became deeply motivated to research cancer as a young Ph.D. While starting his laboratory at the University of Miami, his father died of a rare cancer called mesothelioma, which is now associated with asbestos inhalation. Although he was already a Ph.D., he was not sure what his specialty area of research would be. The loss of his father helped him determine his profession. “I realized that we were so ignorant of cancer,” Pierce said. □