

Building immunity against cancer

By Koren Wetmore

If immunologist Olivera Finn's hunch is right, you may one day trade your colonoscopy for a shot that prevents colon cancer. Even more exciting, the vaccine her team is working on might be able to protect you from other cancers, including those of the pancreas, breast and lung.

The vaccine targets MUC1, a growth-related protein found in normal cells that behaves and looks differently in cancer cells. Like vaccines that teach our bodies to recognize and destroy viruses and bacteria, Finn's MUC1 formula trains the immune system to "see" and then kill tumor cells.

"We get cancer for the same reason we come down with other diseases, meaning there was a weakness in some part of the immune system," says Dr. Finn, distinguished professor of immunology at the University of Pittsburgh. "With vaccines that treat cancer, you try to supplement what the patient couldn't make enough of. With a prevention vaccine, we're trying to ensure that everyone has enough of the needed immune cells and antibodies to begin with."

Finn is one of a growing number of researchers shifting from using the immune system to fight cancer to priming the system to prevent cancer in the first place.

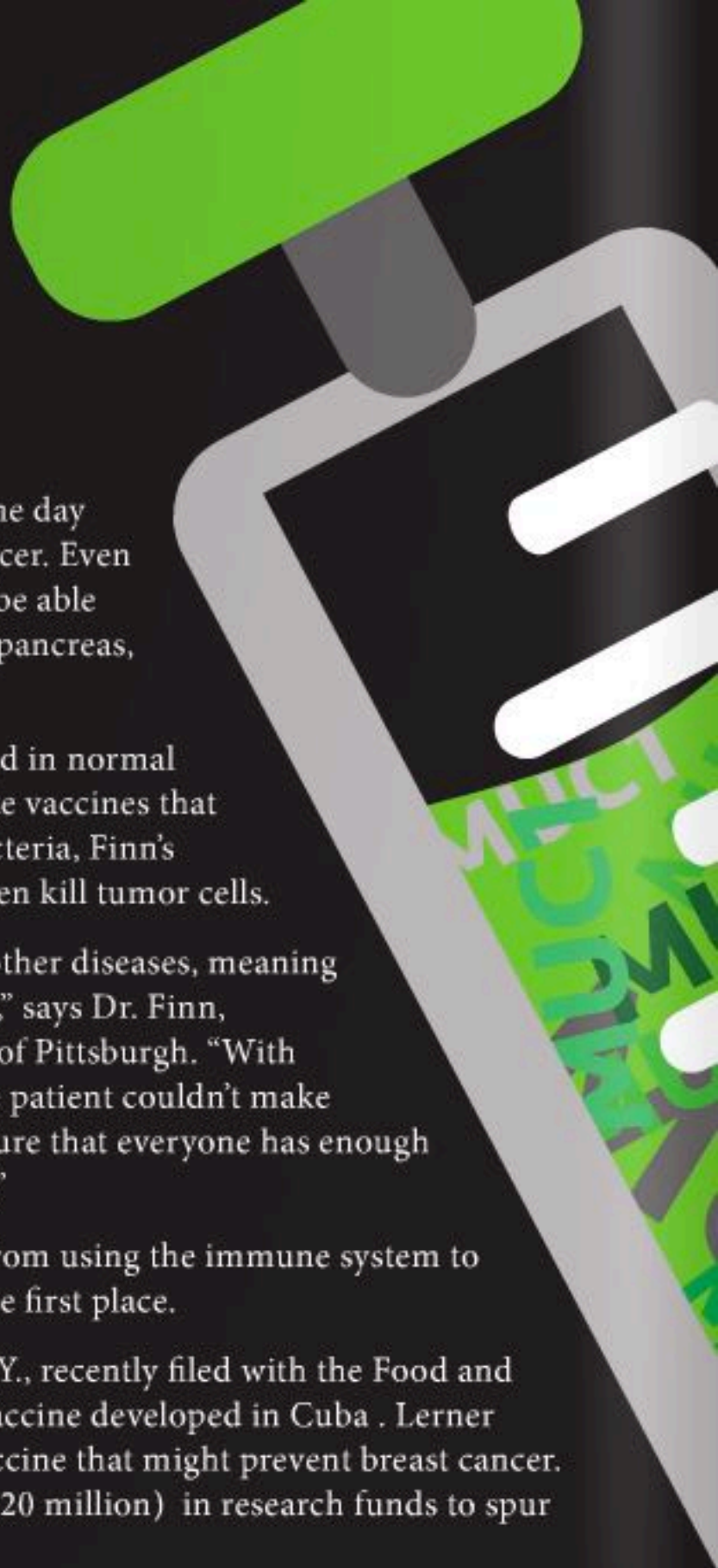
For example, Roswell Park Cancer Institute in Buffalo, N.Y., recently filed with the Food and Drug Administration to study a preventive lung cancer vaccine developed in Cuba. Lerner Research Institute in Cleveland, Ohio, is working on a vaccine that might prevent breast cancer. Cancer Research UK is offering up to \$30.1 million US (£20 million) in research funds to spur development of cancer prevention vaccines.

The trend follows on the success of the human papillomavirus (HPV) and hepatitis B (hep B) vaccines, which prevent viral infections that can cause cancers of the cervix, anus, throat (HPV) and liver (hep B).

About 20 percent of all human tumors arise from cancers caused by viral infections. If researchers like Finn are successful, their vaccines might target the remaining 80 percent.

In an early study using the MUC1 vaccine in 41 patients who had pre-cancerous colon polyps removed, nearly half responded to the vaccine. "We never get a 50 percent response in cancer patients, but in about half of these patients we induced a normal immune response using the vaccine," Dr. Finn says. "These polyps develop into colon cancer, so if we can prevent them, we prevent the cancer."

The vaccine is now part of a larger clinical trial to test how effective it is at helping the immune system



see and kill abnormal polyp cells before they become tumors. It is being used in 110 patients who, because of the type of polyps they had removed, are at high risk of developing more polyps within the next three to five years. The patients will be checked at the three-year mark to see if any new polyps have formed.

Cells to detect cancer

Methods similar to those used to create vaccines might help to screen for cancer in its earliest stages.

When scientists look at the antibodies found in different tumor types, they can tell which proteins or enzymes the cancer cells bind with and then create man-made antibodies—called monoclonal antibodies—that find and attach themselves to the cancer cells. But instead of rousing the immune system to fight the cancer, they work with special imaging tools to reveal where the cancer is hiding in a person's body.

“This is a very promising application of monoclonal antibodies, but it is still in the experimental stages,” says Sudhir Srivastava, Ph.D., MPH, chief of the Cancer Biomarkers Research Group for the National Cancer Institute's Division of Cancer Prevention. “It's possible that it might be able to detect pre-cancerous lesions, but the technology has not been fully validated.”

Tinkering with antibodies also carries risks, Srivastava warns. In fact, many of them can react with normal cells, which could trigger side effects or cause the immune system to attack the body.

Finn agrees, but says testing and the careful choice of vaccine targets can avoid such risks. “We have shown over and over—with animal studies and human safety trials—that with MUC1 these problems don't happen.”

While the field is still young, use of the immune system to prevent cancer offers much hope. Vaccines could protect high-risk individuals such as those with compromised immune systems or a genetic cancer risk.

Should science find a way to spur the production of antibodies and immune cells that target all known cancers, we might even see a “universal” vaccine in the future.

Such a breakthrough could help us achieve our vision to

Stop Cancer Before It Starts![™]