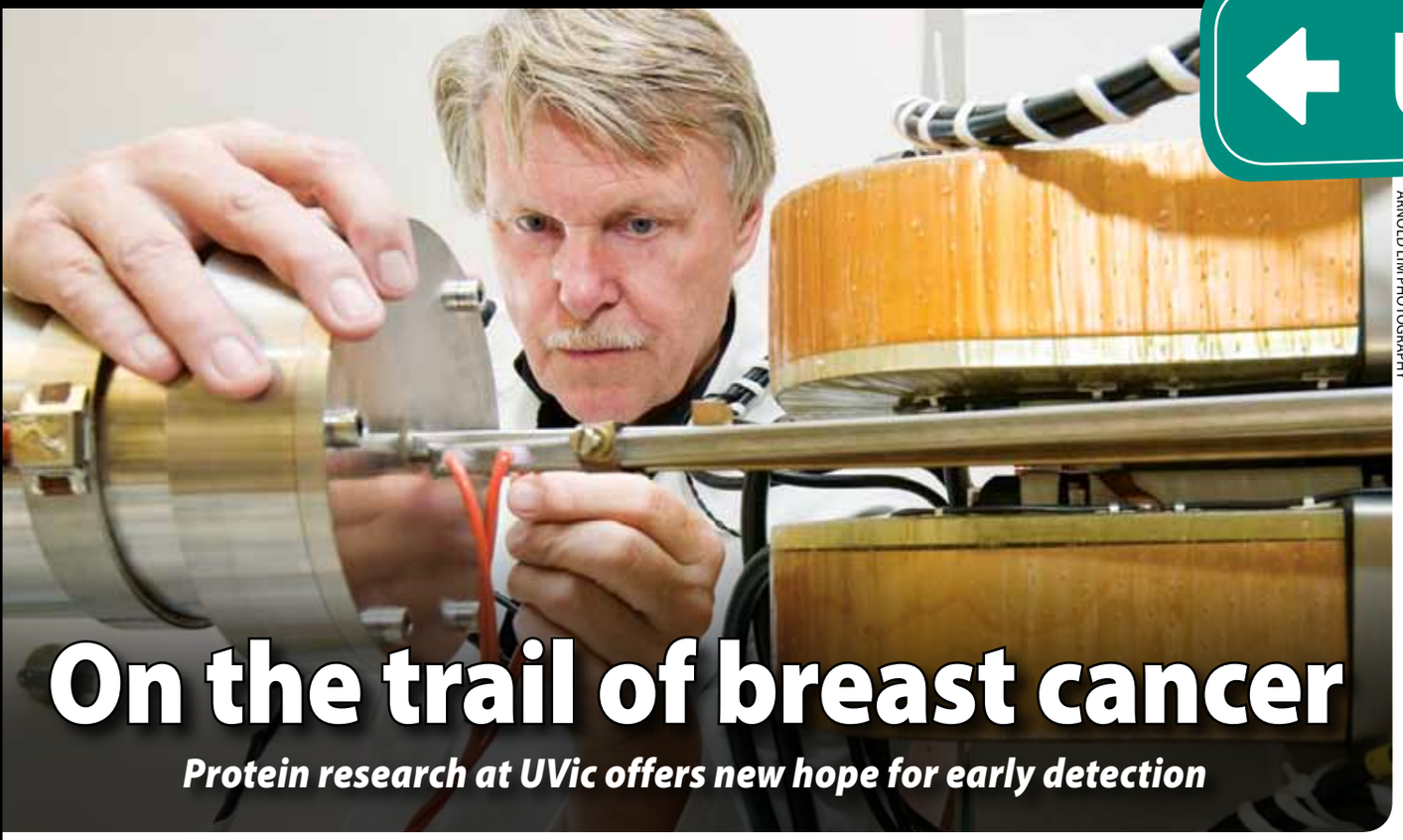
UVic knowledge



ARNOLD LIM PHOTOGRAPHY

On the trail of breast cancer

Protein research at UVic offers new hope for early detection

Pearson adjusts part of a mass spectrometer used to determine the identity of blood molecules.

by Peigi McGillivray

"It's like looking for a trail of breadcrumbs in the forest—from the space shuttle," says University of Victoria biochemist Dr. Terry Pearson of the search for molecules involved in the early stages of breast cancer.

Pearson and his research team, along with three labs in the US, are developing a new technique that promises a radical improvement in early detection.

"We're measuring the amounts of blood proteins with suspected links to breast cancer to confirm whether or not they are reliable 'biomarkers' of the disease," says Pearson.

Biomarkers are molecules in the blood that indicate the presence of a disease. They are increasingly used to predict and diagnose diseases, to follow the progression of a disease, and to tell whether a treatment has been effective.

"Our blood contains millions of protein molecules, but only an infinitesimal number of them may indicate that a cancerous tumour is forming," says Pearson. "Those early indicators are what we're looking for."

The challenge is that the molecules released by a tiny tumour are diluted in more than five litres of blood. "Our job is to find them, identify them and measure their concentration—a very difficult task," he says.

A new technique, invented by a researcher at the Plasma Proteome Institute in Washington DC and developed in collaboration with the UVic lab, offers new hope. The technique uses antibodies, which our immune system produces to fight disease.

"Essentially, we use the antibodies to 'fish' for cancer-associated proteins," says Pearson. "They attach themselves to the protein molecules, making it easier for us to find and concentrate them."

The team then identifies and counts the suspect cancer molecules using an ultrasensitive instrument called a mass spectrometer. "It's a tremendously laborious and expensive task, but it identifies each cancer protein accurately," he says.

To be a good biomarker a protein has to be found in all patients with the same type of cancer, and has to be identifiable early enough to improve diagnosis.

"It's unlikely that a single protein will diagnose a specific kind of cancer, so we need to screen for several biomarkers at once," says Pearson. "Using our new method we can do that."

Pearson is an internationally recognized expert in the use of antibodies for protein detection. He leads the UVic team, which includes graduate students and research assistants.

"Our students are getting hands-on experience in one of the youngest, most exciting fields of biochemical study," he says. "It's something available in only a few labs in the world."

Of several hundred proteins suspected by the global research community to be involved with breast cancer, the team has so far developed antibodies for nearly 100 and used mass spectrometry to begin measuring them in human blood. Next year, the study team will test the blood of breast cancer patients to determine whether the suspect proteins are good biomarkers.

Several international drug companies are already interested in the research, which has tremendous potential for the early diagnosis of breast cancer, other types of cancer, infectious diseases and even organ failure.

"It's too early to say when our work will translate into clinical tests," says Pearson, "but it's exciting to be involved in something that holds so much promise."

EDGEwise

Proteomics is the study of the structure and function of proteins—the enzymes, antibodies and other molecules that make up our cells and tissues. There are an estimated one million different proteins in the human body. The role of many of them is unknown.

In 2006, the UVic team received a $4-million five-year grant from the US National Cancer Institute for research into leading-edge proteomics technologies relevant to the early detection of breast cancer.

Other partners in the study are the Broad Institute of MIT and Harvard University in Massachusetts; the Fred Hutchinson Cancer Research Center in Seattle, and the Plasma Proteome Institute in Washington, DC.

Mass spectrometers are so sensitive they can identify hundreds of molecules from a single human fingerprint. Those used in this study are housed at the UVic-Genome BC Proteomics Centre, located at the UVic-owned Vancouver Island Technology Park in Saanich.

UVic researchers were awarded more than $104 million in outside research grants and contracts in 2008/09—more than double the research support of five years ago.

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