TAKING AIM AT CANCER

UVic knowlEDGE

Improving the accuracy of radiation therapy is the goal of a UVic physicist

by Shannon McCallum

Anyone who has had radiation therapy for cancer, or has seen relatives or friends go through it, knows how unpleasant the side effects can be.

The University of Victoria's Dr. Andrew Jirasek wants to change that. As a medical physicist he studies how radiation interacts with biological materials, and his goal is to make radiation therapy a more accurate, effective and less debilitating tool for treating cancer patients.

Radiation therapy is used in about half of all cancer cases. It works by destroying the genetic material of tumour cells, preventing them from replicating and causing the tumour to shrink or disappear. Side effects—such as fatigue, nausea, hair loss and skin irritation—occur when the radiation damages surrounding healthy cells and tissue.

The goal of improved radiation therapies is to maximize damage to cancer cells while minimizing damage to the surrounding healthy cells and, consequently, limiting the side effects.

"This is easier said than done," says Jirasek. "We know that different organs and tissues tolerate different amounts of radiation. Add to this that tumours tend to be oddly shaped, and the task of targeting cancerous tissue with the proper dose while avoiding healthy tissue can be a challenge."

Modern radiation techniques are now sophisticated enough to deliver radiation that conforms to the complex, three-dimensional shape of tumours. "What we can't do as well," says Jirasek, "is confirm, by measurement, how well the radiation doses have hit their intended mark. This creates some uncertainty about exactly where the radiation has been deposited."

To reduce this uncertainty, Jirasek is collaborating with researchers at the BC Cancer Agency's Vancouver Island Centre. Their project uses jelly-like substances that absorb radiation in the same way as human tissue.

These "gel dosimeters" include special materials that form distinctive molecules when hit by radiation. By counting the number of molecules formed after a dose of radiation, Jirasek and his colleagues can measure the exact amount of radiation absorbed.

"The therapeutic benefit is that treatment plans and doses can be verified more quantitatively," says Jirasek. "It will allow us to say with more confidence that the dose we think we're giving is actually what the patient is receiving".

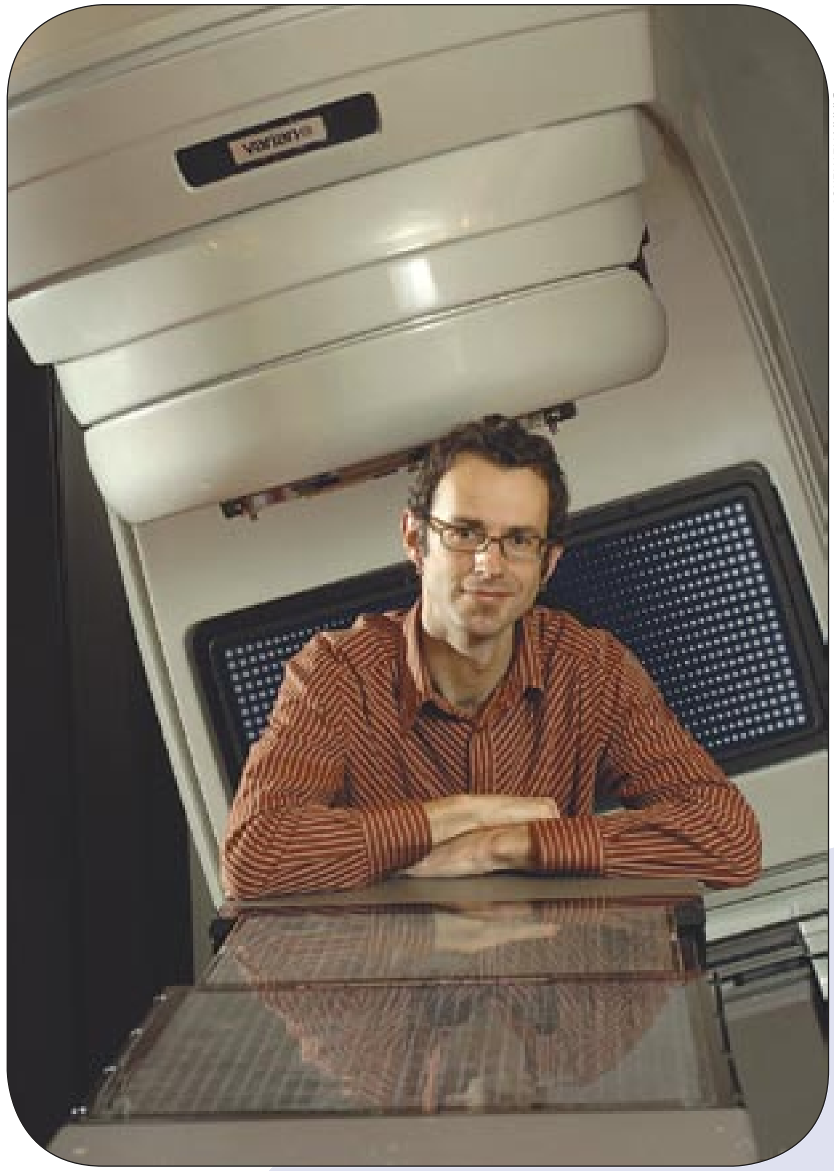
Jirasek's lab is also working on research to personalize radiation doses. "Two people of the same age and gender with the same type of cancer and similar-sized tumours can respond very differently to the same dose of radiation," he explains.

Since DNA is what makes individuals unique, it could help explain these variations. To find out, Jirasek has developed a method that monitors changes in the molecular structure of DNA as it's bombarded with varying doses of radiation.

"We've taken radiation therapy to a point where it is very effective, but the doses we use are conservative ones based on population statistics," says Jirasek. "Now we want to personalize treatments for individual patients, organs and tissues. That's where the next wave of radiation therapy research is headed."

This article was written by Shannon McCallum, a student in the faculty of graduate studies, as a participant in the UVic SPARK program (Students Promoting Awareness of Research Knowledge).

SPARK



DIANA NETHERCOTT

▲ Jirasek, with a linear accelerator used for radiation therapy.

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For many cancer patients, radiation is the only kind of treatment needed. Thousands of people are free of cancer after having radiation treatments alone or in combination with surgery or chemotherapy.

High doses of radiation can kill cells or keep them from growing and dividing. Radiation therapy is a useful tool for treating cancer because cancer cells grow and divide more rapidly than many of the normal cells around them.

Andrew Jirasek joined UVic's physics and astronomy department last year as the first faculty member solely dedicated to the field of medical physics. To learn more about his research, visit www.phys.uvic.ca/jirasek.

Building on UVic's existing ties with the BC Cancer Agency (BCCA), Jirasek heads up two labs—one at UVic and one at the BCCA—in which researchers from both institutions collaborate on various projects.

Jirasek's labs were established with funding from the Canada Foundation for Innovation, the B.C. Knowledge Development Fund, the BC Cancer Foundation (Vancouver Island), and the University of Victoria.

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University of Victoria researchers were awarded $59.1 million in outside research grants and contracts in 2003-04, up more than 90 per cent over the past five years.