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Advancing the Tools to Attack Cancer

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Rowan Thomson, PhD
Carleton University's Canada Research Chair in Radiotherapy Physics

Rowan Thomson's Research is Helping Medicine Build a Better Cancer Bomb

Radiation therapy is one of the great weapons in the arsenal to defeat cancer. Ensuring that modern medicine has the vital tools to calculate the delivery of cancer-killing radiation quickly, safely but completely with absolute accuracy using the precise dosage is the work of medical physics.

One of Rowan Thomson's specialties is 'internal' radiation – radioactive seeds planted internally to attack a tumour with fewer side effects. The treatment is called brachytherapy.

Thomson's research team has yielded a code system for radiation dose (dosimetry) calculations with the goal of providing the precision necessary to damage a tumour without harming surrounding healthy cells. Clinical testing for eye, prostate, breast and lung cancers now are under way at four cancer centres including Toronto's Sunnybrook Hospital and the Mayo Clinic Medical College in Rochester, M.N., for a novel BrachyDose calculation package devised by Thomson's team.

Modern medicine now is moving towards cancer treatment by attacking cancerous cells, and cancer within cell components and deeper still in the DNA. Thomson plans to investigate cell dosimetry, a highly complex research area that would mean someday devising calculations in the nanometre range at about one-billionth the size of current radiation measurements.

One collaboration with Ryerson University and other partners involves nano-bio, an entirely new field combining physics, biology, chemistry and biotechnology to solve scientific problems that one research area alone cannot possibly exploit. One project is examining gold nanoparticles as a stable platform to enhance cancer therapy, which could be delivered using lower radiation levels.

"Our research is yielding greater insights into existing cancer treatment and will lead to development of new techniques in the battle against cancer."

Thomson plays a significant leadership role among her peers in the international community. She sits on joint working groups of the American, European and Australasian medical physics organizations as they prepare world-wide uniform guidelines of more accurate, advanced models for radiation dose calculations in brachytherapy.

Thomson also co-chairs the Task Group of American Association of Physicists in Medicine to set clinical standards for ocular brachytherapy – treatment for eye cancers.

THE RESEARCH

What I do

Designing and applying computer-based mathematical models to develop accurate calculations for effective radiation therapy for cancer treatment.

Why it matters

No known uniformly accurate, fast, comprehensive calculation packages are currently available to help plan radiation treatment that targets a tumour but leaves normal tissue unharmed.

What it will change

Improve cancer treatment with precise dose calculations with a goal to maximizing the cancer cell kill rate.

THE RESEARCHER

2011 Polanyi Prize in recognition of research excellence in physics related to devising calculations for radiation dosimetry.

2011-2015 Natural Sciences and Engineering Research Council (NSERC) Discovery Grant on computational techniques for studying cancer radiation therapy.

Co-Chair American Association of Physicists in Medicine (AAPM) Task Group on ocular brachytherapy; member, joint task group, European Society for Radiotherapy & Oncology (ESTRO), American Brachytherapy Society (ABS), and Australasian Brachytherapy Group (ABG) to study and advance accurate, standard radiation dose calculations.

PARTNERS

Partnerships in clinical studies and investigations include The Ottawa Regional Cancer Centre; Sunnybrook Health Sciences Centre, Toronto; Mayo Clinic College of Medicine, Rochester, MN; Centre Hospitalier Universitaire de Québec, Québec, and Ryerson University, Toronto.

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"The goal of brachytherapy is to damage the tumour without harming the healthy cells that surround it."

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