

The CIHR Institute

CIHR's Institute of Cancer Research, under the leadership of Scientific Director Dr. Philip Branton, supports health research to reduce the burden of cancer on individuals and families. Its goals are to help prevent and treat cancer while improving the health and quality of life of people with the disease. The Institute, in consultation with its partners, has identified seven health research priorities: palliative and end-of-life care, molecular profiling of tumours, early detection, functional and molecular imaging, risk behaviour and prevention, clinical trials and access to quality cancer care. Other priorities include capacity building and training in cancer research and the promotion of translational research on promising new therapies.

The Institute of Cancer Research was instrumental in the establishment of the Canadian Cancer Research Alliance (CCRA), which brings together all the major organizations and agencies funding cancer research in Canada to develop a united research response for cancer control. This national initiative, with its strong international linkages, will ensure that Canadians derive the health, social and economic benefits of cancer research.

About the Canadian Institutes of Health Research

The Canadian Institutes of Health Research is the Government of Canada's agency for health research. Its objective is to excel, according to internationally accepted standards of scientific excellence, in the creation of new knowledge and its translation into improved health for Canadians, more effective health services and products and a strengthened Canadian health care system. Composed of 13 Institutes, CIHR provides leadership and support to close to 10,000 researchers and trainees in every province of Canada. For more information visit www.cihr-irsc.gc.ca

The Canadian Institutes of Health Research (CIHR) is the Government of Canada's agency for health research. Through CIHR, the Government of Canada invested approximately \$105 million in 2004-05 in cancer research across Canada.

The facts

- Canada is facing a cancer epidemic over the next 20 years due to our aging population.
- If current trends continue, 5.7 million Canadians will develop cancer and 2.7 million will die of the disease over the next 30 years.
- An estimated 149,000 new cases of cancer and 69,500 deaths from cancer will occur in Canada in 2005.
- Lung cancer is the leading cause of cancer death for both men and women. Overall, colorectal cancer is the second leading cause of death from cancer.
- Canadians aged 70 and over represent 44% of new cancer cases and 60% of deaths due to cancer.
- 38% of Canadian women and 44% of men will develop cancer during their lifetimes based on current incidence rates.
- 24% of women and 29% of men, or about a quarter of all Canadians, will die from cancer, based on current mortality rates.
- Smoking is responsible for 27% of potential years of life lost due to cancer.
- Cancer costs Canadians more than \$14 billion every year. Of that total, \$2.5 billion is for direct costs such as hospitalization and medication, while \$11.8 billion is for indirect costs such as early death or disability.

Research finding solutions to cancer

Canadians are at the forefront of research that will lead to the development of new and improved ways to control cancer. Some examples are:

- Dr. Jerry Pelletier and his team at McGill University have discovered a new type of combination chemotherapy that could offer improved treatment for patients whose tumours have stopped responding to standard treatment. The CIHR-funded team found that tumours in mice given a combination of an antibiotic and a chemotherapy drug went into long-term remission.
- New vaccines could help to eradicate cervical cancer among women. CIHR-funded researcher Dr. Alex Ferenczy of McGill University has been part of a clinical trial for one of the vaccines, which is believed to be within a year or two of regulatory approval. The vaccines protect women against persistent infection with HPV 16 and 18, which are responsible for about 70% of cervical cancer cases.
- Dr. Shabbir Alibhai, a CIHR-supported researcher from the University Health Network and University of Toronto, has shown that many men over age 65 benefit from surgery and radiation treatment for prostate cancer. Previous studies have shown that older patients often do not receive this potentially life-prolonging treatment.

- Anti-angiogenesis drugs, which cut off the blood flow to a cancerous tumour, show great promise but, to date, there has been no way to measure their effect. CIHR-funded researcher Dr. Bob Kerbel from Toronto's Sunnybrook and Women's College Health Sciences Centre led an international team that has discovered a biological marker that could provide a good indicator of whether a specific drug is working. His work could help set appropriate doses for anti-angiogenesis drugs and provide evidence of their effectiveness.
- Dr. Peter Dirks and his team at Toronto's Hospital for Sick Children have isolated brain cancer stem cells in humans. With support from CIHR, they have also demonstrated in mice that as few as 100 of these stem cells can trigger tumour growth. Their discovery could lead to new treatments to prevent tumours from growing, as well as lead to a better understanding of the mechanisms of brain tumour growth.
- A new drug called temozolomide may prolong the lives of some people with the most common and deadliest type of brain tumour, glioblastomas. The drug, discovered by a team of Canadian and European researchers, prolonged the average survival rate of patients to 15 months, compared to 12 months in patients who only underwent radiation therapy. This is the first advance in managing this disease in 30 years. More than 1,100 Canadians are diagnosed with glioblastoma each year; most die within 9 to 12 months of diagnosis. The Canadian arm of the study was led by Dr. Greg Cairncross, a CIHR-supported researcher at the University of Calgary.

In the pipeline ... A new era in Canadian palliative and end-of-life care research

As our aging population continues to grow and modern medicine provides the means to prolong the life of many people, our society struggles with the ethical and legal issues around the 'appropriate' use of health care resources, and with quality of care toward and at the end of life. The CIHR Institute of Cancer Research has identified palliative and end-of-life care as a major health research priority, not only for cancer research but across a wide range of health research disciplines. The Institute is building partnerships to collaborate with these other disciplines. Among the health research projects being funded are:

- an examination of the transition from curative to palliative and end-of-life care to help patients, families and clinicians making that transition;
- a series of studies to optimize the family caregiving experience and reduce the negative consequences of such caregiving;
- a study of the nutritional and psychological issues leading to malnutrition in advanced cancer patients and the development of nutritional intervention therapies that will lead to an enhanced quality of life; and
- an investigation of the unique challenges and barriers faced by vulnerable populations, including the frail elderly and those with longstanding disability, to enable dignity-conserving care at the end of life.

The researchers ... Dr. Bill Muller: Turning off cancer

Imagine being able to turn off cancer at the flip of a switch.

In August 2004 Dr. Bill Muller made headlines with a discovery that could eventually do just that.

A full professor at McGill University and member of the Molecular Oncology Group at Montreal's Royal Victoria Hospital, Dr. Muller and his research group found a way to 'turn off' a gene called beta-1 integrin in mice. Beta-1 integrin is a potential proto-oncogene, a gene that activates another gene that causes cancer. In lab experiments, Dr. Muller determined that without interaction with Beta-1 integrin, the cancer-causing gene, called erbB2, could not function. When Beta-1 integrin was 'turned off,' breast cancer tumours regressed and were no longer detected on scans.

"This is a really promising target," says Dr. Muller, a Canada Research Chair holder in cancer research who now wants to understand the whole network of interactions between the beta-1 integrin gene and the erbB2 gene.

The next step is to see if this kind of gene interaction occurs in humans. If all goes well, Dr. Muller anticipates that, as a result of his discovery, a new breast cancer treatment could come about in approximately 5-10 years. Breast cancer is the second leading cause of cancer death for women in Canada.

In 1994, Dr. Muller found similar success with the discovery of the C-Src gene, which is critical for tumour progression and was one of the first genes ever described. His discovery has resulted in a better understanding of how breast cancer starts, and in better prognoses for patients with certain forms of the disease.

Dr. Muller's goal is to develop models that could explain how cancer-causing genes affect cells that cover the internal and external surfaces of the breast. Multidisciplinary research is the key to achieving his goal, by helping him construct effective animal models for diseases.

For instance, in the case of the model he developed for mice and breast cancer, structural biologists helped him to create 'crystal' representations of genes. These representations serve as models to help other scientists develop new treatments to battle tumour progression in breast cancer.

"I think it's a good point to embrace multidisciplinary science," Dr. Muller says. "Science by nature is a collaborative process."