Dr. Helen Nichol of the University of Saskatchewan at the Canadian Light Source facility in Saskatoon.

SPECIAL REGIONAL EDITION-FALL 2009

Your Health Research Dollars at Work

CIHR IRSC

The past year saw another crop of outstanding contributions from researchers supported by the Canadian Institutes of Health Research (CIHR).

In this special regional edition of the *Your Health Research Dollars at Work* newsletter, we have compiled a selection of noteworthy stories of research in action as well as research in progress.

We are excited to profile work by **Dr. Garnette Sutherland** at the **University of Calgary** who has partnered with the firm that built the famed Canadarm to produce the world's first surgical robot capable of working in tandem with intra-operative magnetic resonance imaging. The result: a product called neuroArm and the ability for neurosurgeons to perform precise, image-guided operations.

Elsewhere, **Dr. Antonio Nanci** at the **University of Montreal** and his team of collaborators, drawing on the science of nanotechnology, have developed a simple, efficient chemical treatment for new metal implants that could significantly improve the success rate of orthopedic, dental and cardiovascular prostheses. Given that the number of oral implant procedures is expected to exceed 200,000 by 2012 – up from 90,000 in 2005 – this is an important discovery.

Research results such as these and others described in the newsletter will form the basis of new products, innovations in health-care delivery and, ultimately, improved health for Canadians. We hope that you will find this special edition of *Your Health Research Dollars at Work* very informative.

Welcome to this special regional edition of CIHR's newsletter, *Your Health Research Dollars at Work*.

As the pages of this publication illustrate, CIHR-funded researchers are working hard to improve health, strengthen the health-care system, and develop better health products and services.

CIHR invests in high-quality research all across Canada. Initiatives like our Regional Partnerships Program assist researchers from smaller universities in securing funding for important work. And CIHR's emphasis on multi-institution, multi-disciplinary research is encouraging scientists from across the country to pool their efforts to solve health puzzles together.

These investments are helping build important and internationally recognized research capacity throughout the country. From innovative clinical genetics studies at the Centre for Molecular Medicine and Therapeutics at the University of British Columbia, to obesity research at Laval University in Quebec City, to life-saving vaccine research at the Centre for Vaccinology at Dalhousie University in Halifax, CIHR is helping enable science with impact.

These investments are not only helping make Canadians healthier, they are also promoting prosperity. With the publication of its Science and Technology Strategy in 2007, the Government of Canada recognized that funding excellent research is vital in building a competitive knowledge-based economy. By funding world-class researchers in each province, the Government is helping put Canada at the forefront of health research. These kinds of investments are critical for developing specialized hubs of research expertise that, in turn, represent the potential for exciting new commercial opportunities and serve as a magnet for new talent.

As an example, the new Vanier Canada Graduate Scholarship Program is currently enabling 166 of the brightest domestic and foreign doctoral students – many of them working in health research – to pursue their studies and potentially begin careers at Canadian universities. These new scholars are conducting valuable research at institutions in all regions of Canada.

Strong health research capacity in each region also provides provincial governments with vital research evidence to help facilitate the delivery of quality health-care services for their residents.

I hope you enjoy reading about the accomplishments of CIHR-supported researchers across Canada.

Alain Beaudet, MD, PhD
President

CIHR IRSC

About the Canadian Institutes of Health Research

The Canadian Institutes of Health Research (CIHR) is the Government of Canada's agency for health research. CIHR's mission is to create new scientific knowledge and to catalyze its translation into improved health, more effective health services and products, and a strengthened Canadian health-care system. Composed of 13 Institutes, CIHR provides leadership and support to more than 13,000 health researchers and trainees across Canada.

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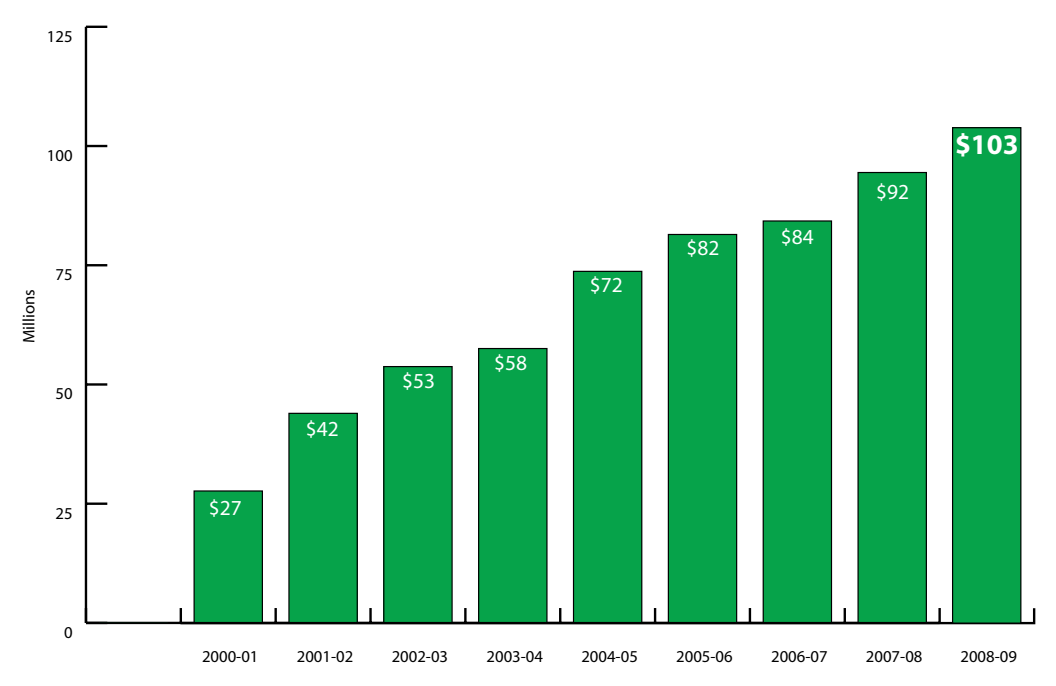
CIHR Investment in BRITISH COLUMBIA

CIHR IRSC



Direct payments are excluded in the figures above.

In 2008-2009, CIHR contributed approximately **$103** million in funding for health research in British Columbia. The funding helped support researchers working at **43** different research institutions in the province.

New Knowledge

Keeping memories alive

Active older adults who exercise, socialize and keep busy around the house are less likely to show memory decline and have a lower risk of developing dementia. Some seniors, however, become less active and rely on what they did in the past to keep them healthy in the future. **Dr. Allison Bielak** of the **University of Victoria** is leading a project investigating the impact of recent activities on cognition compared to those performed five years ago.

Depression goes right to the heart, researcher finds

The **University of British Columbia's Dr. Gregory Miller** is leading a CIHR-funded study to examine how depression affects biology and sets people up for heart disease. While earlier studies have shown profound differences in biological markers for heart disease between patients who were actively depressed and those who weren't, research so far has only provided moment-in-time snapshots. Dr. Miller wants to chart the transformation. "We want to see what happens to the immune system and to hormones as this transformation happens and see if risk of heart disease evolves as depression evolves." That knowledge could help doctors target people at risk for heart disease earlier, so that they can avoid the disease or lessen its impact.

New network studies HIV treatments

A **Simon Fraser University** researcher will lead a new national network aimed at improving treatment for the 58,000 people living with HIV in Canada. **Dr. Robert Hogg** heads a group of 31 HIV/AIDS clinicians and researchers in British Columbia and Ontario who form the Canadian Observational Cohort. They will follow 5,000 people who started on antiretroviral medication in 2000 over five years to study the effectiveness of the therapy. The researchers will investigate how the drugs affect different populations, including the gay community, injection drug users and Aboriginal People, to determine the best therapy regimen.

Did You Know…

…that Canadians going for their annual flu shots may one day also get a dab of "immune stimulating" ointment at the site where the needle pierces the skin, increasing the effectiveness of the vaccine?

Dr. Jan Dutz of the **University of British Columbia** predicts this may soon be the case. He used the approach in a recent pilot project with 3M. The vaccine was injected into the muscle and a cream containing the chemical Rasiquimod was applied to the site of the injection. "Adding the Rasiquimod cream proved safe and improved the vaccine responses" Dr. Dutz says.

Canada's Best

Curiosity and commitment make for medical breakthroughs

For **Dr. Michael Hayden**, a deep and lifelong sense of curiosity has continually proved its ability to produce medical research successes.

Director and senior scientist at the **University of British Columbia's Centre for Molecular Medicine and Therapeutics** and a Canada Research Chair in Human Genetics and Molecular Medicine, Dr. Hayden has identified a number of genes that contribute to many serious diseases, including premature coronary artery disease and Huntington's disease (HD). His work has led to the development of a predictive genetic test for HD and recently provided the first evidence of a potential cure for this devastating illness.

"Fundamentally I'm optimistic that through intelligence, creativity, determination and a bit of luck, we can solve some major medical problems," says Dr. Hayden, the 2008 winner of the Canadian Institutes of Health Research Award for Canada's Health Researcher of the Year – Biomedical and Clinical Research.

Despite his research accomplishments, Dr. Hayden remains as driven – and curious – as ever. "What keeps me going is I recognize the impact research can have on peoples' lives. For people suffering from potentially fatal illnesses, there's an urgency to translate these discoveries as quickly as possible into treatments, services and products that benefit patients everywhere. Research builds hope and promise for the future."

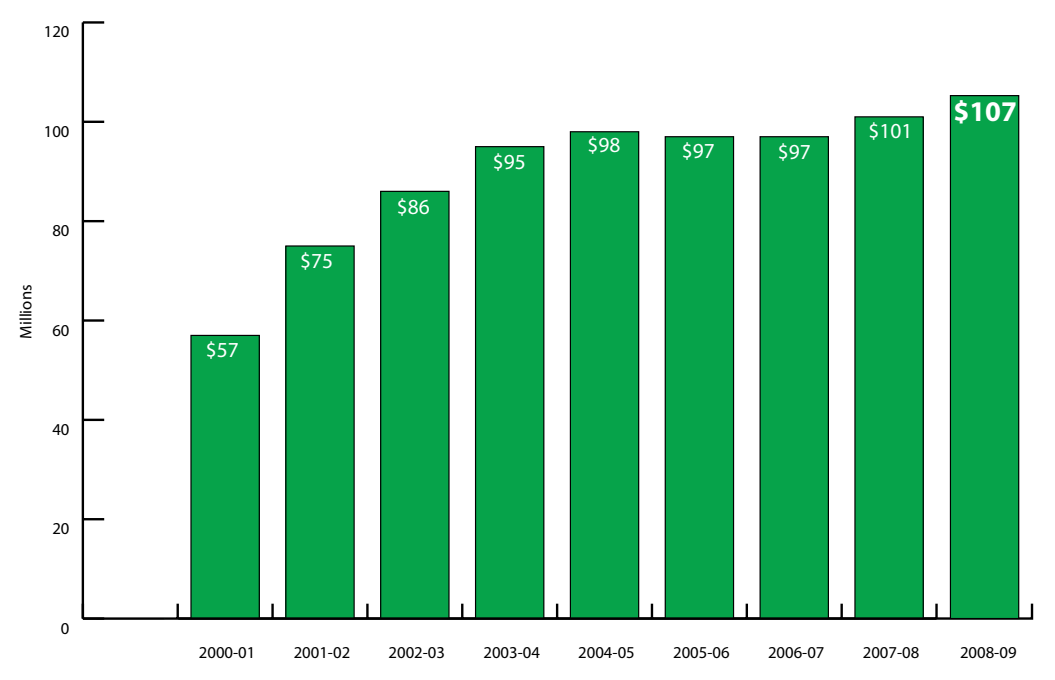
Commercial Opportunities

Inexpensive test could spare transplant recipients from pain and save costs

The average cost of a biopsy in Canada is somewhere between $5,000 and $10,000. The average heart transplant recipient, meanwhile, will need between 14 and 16 painful post-surgery biopsies to detect signs of organ rejection. According to **Dr. Bruce McManus**, head of the **Prevention of Epidemic Organ Failure (PROOF) Centre,** a new testing option could save several million dollars a year in biopsy costs for heart transplant patients alone. The Biomarkers in Transplantation project, in which the CIHR-funded PROOF is partnered with Genome British Columbia, has used advanced genomic, proteomic and computational tools to develop a blood test that can diagnose organ rejection much earlier, allowing doctors to intervene quickly and personalize the patient's immunosuppressant therapy. "We have validated our test in one group of patients and we are now taking our test across Canada in preparation for the Health Canada and FDA approval process," says Dr. McManus.

CIHR Investment in the PRAIRIES

CIHR IRSC



Direct payments are excluded in the figures above.

In 2008-2009, CIHR contributed approximately **$107** million in funding for health research in the Prairie provinces. The funding helped support researchers working at **32** different research institutions across the region.

New Knowledge

Cell-death discovery has heart/cancer care implications

A Manitoba researcher's discovery of the master switch for a gene that triggers cell death during heart attacks also has important implications for cancer treatment. **Dr. Lorrie Kirshenbaum** of the **St. Boniface General Hospital Research Centre** led a team investigating a gene called Bnip3 that is switched on when oxygen levels in the heart drop below a certain level, signaling cells to die. Dr. Kirshenbaum and his group also found that turning Bnip3 on can prevent certain cancer tumour cells from growing. The research marks a major leap forward in understanding how cells grow and die.

Training for the big event

For many people with osteoarthritis (OA), their best chance at recovery is surgery to repair their ailing joints. Unfortunately, the surgery does not produce equal benefits for all patients. According to **Dr. Allyson Jones** at the **University of Alberta**, a simple set of exercises could help OA patients get more out of knee surgery. In a new CIHR-funded project, Dr. Jones and her team will investigate whether using exercises to improve patients' mobility before surgery would improve the outcome of the operation. "We'll be looking at factors such as how much pain the patients experience, the change in their range of motion, muscle strength and their overall health," says Dr. Jones. "In addition to looking at whether the exercises are beneficial, we'll also be assessing how cost effective the program is."

Learning lessons from nasty nanoparticles

The **University of Calgary's Dr. Matthias Amrein** is demonstrating that air pollution nanoparticles – which can penetrate deep into lung tissue and enter the blood stream – can also be used for good. Dr. Amrein is using an atomic force microscope to study how different nanoparticles make contact with the lung's wall and interact with the cells. "By identifying potentially harmful air pollutants, we can then develop health and safety standards to reduce their risk," explains Dr. Amrein. "We can also learn to develop nanoparticle-based aerosols that deliver drugs against lung diseases more effectively to the place where they are needed."

Did You Know…

…that a CIHR-supported researcher has developed a computerized surgical system called neuroArm that combines magnetic resonance imaging (MRI) and space-age robotics?

NeuroArm is controlled by a neurosurgeon and uses detailed MR images generated during the surgery to guide the robot. The robot, the first of its kind, was designed by **Dr. Garnette Sutherland** of the **University of Calgary** and manufactured by MacDonald, Dettwiler and Associates. With neuroArm, neurosurgeons can perform extremely precise image-guided operations.

Canada's Best

Researcher's 'Memory Clinic' aids seniors and their families

Dr. Debra Morgan's research is driven by the needs of Saskatchewan's aging population – most of whom lives in rural areas.

Dr. Morgan, a researcher with the **Canadian Centre for Health and Safety in Agriculture** at the **University of Saskatchewan**, led a multidisciplinary CIHR-funded research team that designed and evaluated a special new Rural and Remote Memory Clinic to improve diagnostic and treatment services for seniors living in rural areas.

The clinic, in operation since 2004, is "one-stop shopping" for dementia assessment and diagnosis. Patients get referred to the clinic by their family physician, and family members are invited to participate. At the end of the full-day assessment, patients and family members meet with a neurologist and neuropsychologist to discuss the diagnosis and consider recommendations for management and care.

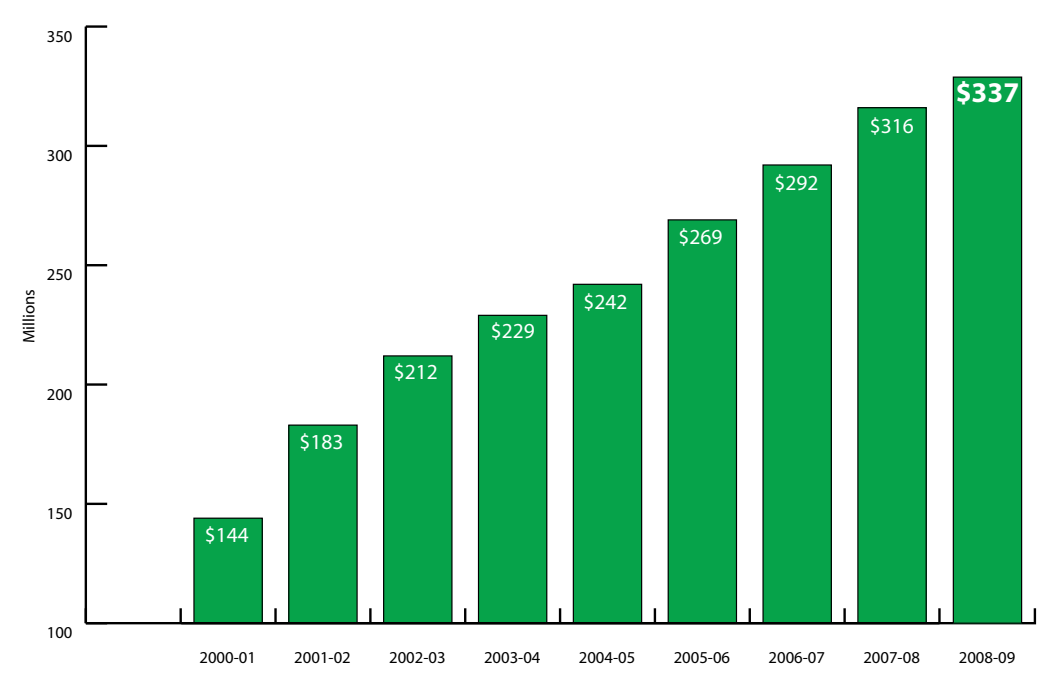
Widely regarded as a success, the flagship project might never have happened without funding that Dr. Morgan first received through CIHR's Regional Partnerships Program (RPP). From 1999 to 2004, she was a CIHR New Investigator through RPP, which is designed to help build health research capacity in less populous regions of Canada.

Commercial Opportunities

Dr. Grant Pierce and researchers at the **St. Boniface General Hospital Research Centre** and the **University of Manitoba** are leading a first-of-its-kind study to find out whether flaxseed – a key component of a healthy diet – helps prevent heart disease. With funding from CIHR and others, some 250 people will participate in the study, which will examine whether the omega-3s, antioxidants and fibre found in flaxseed can help in the fight against heart disease. If flaxseed is eventually shown to be good for the heart, it could be a big boost for Canadian farmers, who currently produce 40% of the world's flax.

CIHR Investment in ONTARIO

CIHR IRSC



In 2008-2009, CIHR contributed approximately **$337** million in funding for health research in Ontario. The funding helped support researchers working at **102** different research institutions in the province.

Direct payments are excluded in the figures above.

New Knowledge

Advancing toward stem cell treatment for many diseases

A 2007 discovery that skin-derived adult stem cells can be reprogrammed into induced pluripotent stem (iPS) cells shook the world of regenerative medicine. It presented the possibility that a person's skin could yield iPS cells to stimulate repair of diseased tissue or a scar-weakened heart. However, the procedure required the use of viruses to accomplish the task; the risk with this approach is that the virus can disrupt the cell's DNA, destroying essential genes and possibly triggering tumour growth. In a breakthrough almost as important as the initial discovery, **Dr. Andras Nagy** of the **Samuel Lunenfeld Research Institute** in Toronto found a way to create iPS cells without viruses. He and his colleagues developed a technique involving a gene called piggyBac which represents a major advance towards a future clinical use. His lab's discovery was published in *Nature* in April.

Mood disorders, addiction share dopamine connection

Dr. Usoa Busto of the **Centre for Addiction and Mental Health** in Toronto is investigating why so many people with mood disorders are also addicted to alcohol, nicotine or gambling. Dr. Busto's team has found that people with mental illnesses and a nicotine addiction may have lower than normal levels of dopamine, an important neurotransmitter in the brain. This finding could have implications for the treatment of both disorders.

London researcher's HIV/AIDS vaccine in clinical trials

Dr. Chil-Yong Kang, a virologist at the **University of Western Ontario** in London, has succeeded in shepherding his experimental HIV/AIDS vaccine through to early phase clinical trials. In the spring, Dr. Kang's vaccine passed animal toxicology testing, clearing the way for Phase I human toxicology testing and then clinical trials. Unlike other vaccines, which have used only a small amount of HIV's genetic material, Dr. Kang's vaccine uses a whole dead HIV-1 virus, the same technique that Dr. Jonas Salk used in the polio vaccine. The plan is to test the vaccine on individuals who are HIV-positive, but don't yet have AIDS symptoms.

Did You Know…

… that a CIHR-funded study is investigating the relationship between junk food ads and the dietary intake and obesity rates of Quebec and Ontario children?

University of Ottawa researchers are surveying the dietary habits of children in Quebec, where advertising to kids is prohibited, with those of kids in Ontario, where it is not.

Canada's Best

Research helps patients better manage their health care

It's not easy being a patient. Not only do you feel sick, weak and sore, it can also be a chore navigating the health-care system and getting what you need.

Dr. Peter Tugwell, a professor of medicine at the **University of Ottawa** and winner of the Canadian Institutes of Health Research Award for Canada's Health Researcher of the Year – Health Services and Systems and Population Health Research, wants to help patients set their sights beyond simply living with their disease. "I feel very strongly that we should help ensure patients have the skills of effective health-care consumers," he says.

To do that, patients need to be able to know how to unearth and understand useful and up-to-date information about their disease, discuss different options with health professionals and negotiate their way through the health system. So, in partnership with an organization called the Cochrane Collaboration, Tugwell is documenting the kinds of skills health-care consumers need to effectively manage their conditions. "It's been shown that if you make sure patients understand the issues, understand their values, and you can help them make their own decisions, they're much happier."

Commercial Opportunities

New solution for unblocking clogged arteries

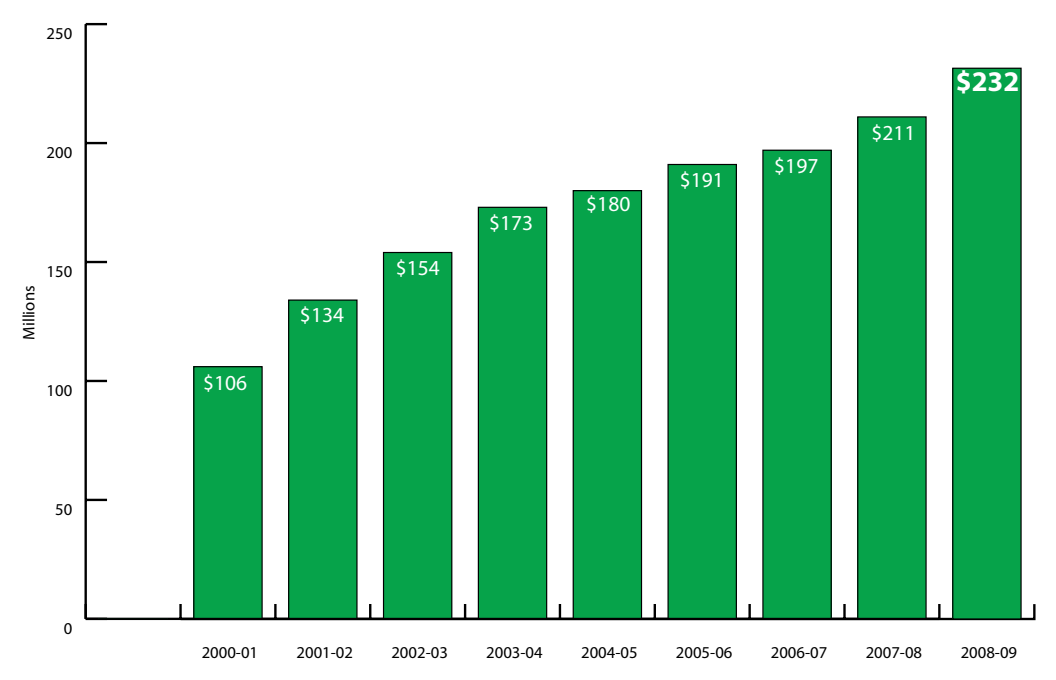
Dr. Bradley Strauss describes the material that blocks coronary arteries as being "like cement." Until recently, many of these blocked arteries were considered nearly impenetrable by angioplasty, and bypass surgery was one of the few options for treatment. In a landmark, CIHR-funded study at **Sunnybrook Health Sciences Centre**, Dr. Strauss has found a biological solution, called collagenase, that softens the dense fist of collagen blocking the artery, allowing a physician to successfully cross the blockage with a guide wire, followed by a stent.

New lenses reduce health risks from nocturnal light

Dr. Robert Casper, a CIHR-supported researcher at the **Samuel Lunenfeld Research Institute** in Toronto, has developed an optical lens that could be worn by shift workers or installed on light covers to reduce the health risks associated with nocturnal light, including increased risk of cancer, heart disease, depression and obesity. In clinical trials with the lenses, which filter low wavelength light, researchers have shown it's possible to prevent disruptions in circadian rhythm – the body's natural cycles that control sleep and other biological functions. "Not only could these lenses help improve the overall health of shift workers, they could also prevent circadian rhythm disruption for people with jet-lag or other sleep disorders," says Dr. Casper.

CIHR Investment in QUEBEC

CIHR IRSC



In 2008-2009, CIHR contributed approximately **$232** million in funding for health research in Quebec. The funding helped support researchers working at **86** different research institutions in the province.

Direct payments are excluded in the figures above.

New Knowledge

In-home COPD rehab just as effective as hospital program

Quebec researchers have designed a home-based rehabilitation program that they say is just as effective as hospital programs for treating chronic obstructive pulmonary disease (COPD). Based on aerobic exercises, it can easily be performed at home after an appropriate evaluation by a physician and instruction by a kinesiologist. About 750,000 Canadians have COPD, the fourth leading cause of death in the country. The CIHR-supported study was led by **Dr. François Maltais** of the **Institut universitaire de cardiologie et de pneumologie de Québec (Laval Hospital)** and **Dr. Jean Bourbeau** of the **McGill University Health Centre**.

Study pinpoints failure to provide anti-blood clot therapy

Most patients in Quebec are not receiving the drugs they need to reduce the risk of potentially life-threatening blood clots, according to a CIHR-funded study. **McGill University's Dr. Elham Rahme** and her team analyzed the medical records of 7,058 Quebec hip and knee replacement patients and discovered that only 19% received post-discharge antithrombotic treatment, even though treatment guidelines recommend up to 35 days of anti-clotting drugs after surgery.

Understanding the spinal cord

One of Canada's leading young neuroscientists**, Dr. Frédéric Charron** of the **Institut de recherches cliniques de Montréal (IRCM),** has made a discovery that could lead to new treatments for spinal cord injuries and neurodegenerative diseases. The new finding throws light on the function of a molecule called Sonic Hedgehog (Shh) in neural circuitry as it acts as an axonal attractant for brain and spinal cord neurons. "How exactly Shh elicited this effect has remained unknown so far," says Dr. Charron. "The molecular pathway my team discovered provides part of an answer." The work has been heralded as a significant step forward in understanding how the spinal cord is made and how spinal cord injuries can be treated.

Did You Know…

… that the amount of time children spend sleeping has been decreasing while obesity levels have been rising?

A CIHR-funded project led by **Dr. Jennifer McGrath** of **Concordia University** is examining factors that may link sleep to obesity and see how they are related.

Canada's Best

Making time to get teenagers excited about science

Dr. Michel G. Bergeron, Director of the **Infectious Diseases Research Centre** at **Laval University**, has published more than 400 articles and some 50 book chapters on infection and immunity.

But despite a full schedule, Dr. Bergeron has always made time to get young people excited about science. Since 1998, he and the Centre's researchers have conducted weekly Researcher for a Day sessions that have given more than 1,800 high school students a peek into laboratory life.

The Centre, which Dr. Bergeron founded in 1974, was named the 2009 winner of CIHR's Synapse Mentorship Award for exceptional contributions by a group or institution to promote health research among secondary school students.

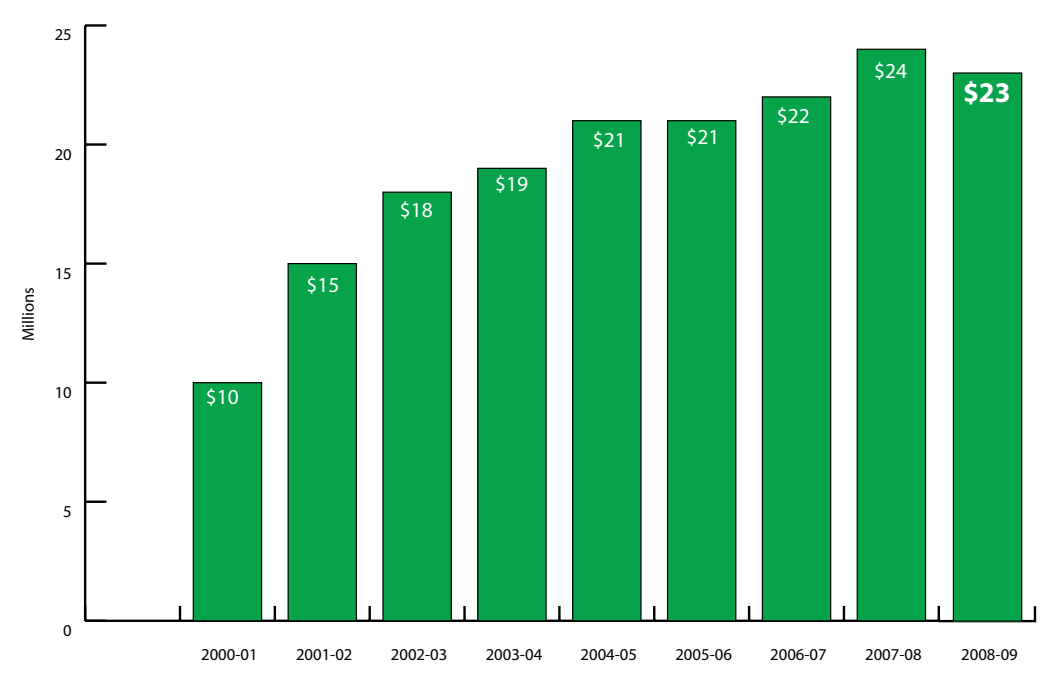
"I wanted to make sure that our Centre could make a small contribution to the future of science by getting young people interested," says Dr. Bergeron. "The objective is sensitizing students to science."

Commercial Opportunities

Using nanotechnology for better medical implants

Dr. Antonio Nanci at the **University of Montreal** and his team of collaborators, drawing on the science of nanotechnology, have developed a simple yet extremely efficient chemical treatment for new and improved metal implants. The breakthrough could significantly improve success rates of orthopedic, dental and cardiovascular prostheses. Given that the number of oral implant procedures is expected to exceed 200,000 by 2012 – up from 90,000 in 2005 – this is an important discovery.

CIHR Investment in ATLANTIC CANADA



Direct payments are excluded in the figures above.

In 2008-2009, CIHR contributed approximately **$23** million in funding for health research in Atlantic Canada. The funding helped support researchers working at **17** different research institutions in the region.

New Knowledge

45 new genes linked to weight gain

Dr. Guang Sun of **Memorial University of Newfoundland** has discovered 45 genes involved in weight gain. In his CIHR-funded project, volunteers overate for seven days, mimicking the overeating in the development of obesity. Dr. Sun and his colleagues found that this behaviour altered the activity of 45 genes in the volunteers' fat stores. "These genes may represent a protective mechanism at the molecular level in people who are lean," says Dr. Sun. "This will provide valuable insights into the genetic targets responsible for individual differences in weight gain."

Dads confused about how to help with postpartum depression

While approximately half of women with postpartum depression (PPD) decline offers of help from support services, they may also have trouble getting it at home: their partners have a limited understanding of the illness and may develop symptoms themselves, says **Dr. Nicole Letourneau** of the **University of New Brunswick**. She leads a CIHR-funded study that is developing and testing a support program for partners of women with PPD. "The men were very clear that they were very involved with partnering, but felt left out of the partnership when it came to PPD. They really wanted to fix it, but had little clarity about what role they should play or how to discuss PPD with their partner," says Dr. Letourneau.

Their generation: Study looks at baby boomers' oral health

Dalhousie University's Faculty of Dentistry has launched a CIHR-supported study to gauge aging baby boomers' expectations for oral health. "Older adults may not have access to needed dental care due to an inability to afford care or other barriers linked to mobility and transportation," says lead investigator **Dr. Deborah Matthews**. "The study will clarify the current state of oral health care and needs among this population." Data collected from some 1,200 participants throughout Nova Scotia will be used to direct planning and influence public policy.

Did You Know…

… that zebrafish might hold the clues to new treatments for leukemia?

These small, striped fish are remarkably similar to humans in their genetics and physiology. **Dr. Jason Berman** at Halifax's **IWK Health Centre** is using them to study leukemia. "By studying blood-cell development in zebrafish – which happens in much the same way as in humans – we hope to pinpoint the genetic changes that lead to leukemia."

Canada's Best

Addressing the problem of pregnant teens who smoke

Dr. Colleen MacQuarrie, an Assistant Professor in the Department of Psychology at the **University of Prince Edward Island**, wants to know what it would take to convince new teenage mothers to stop smoking.

"No one has looked at the experience of adolescent girls as they transition from pregnancy to motherhood and how tobacco fits in," says Dr. MacQuarrie. "We're doing that. A teen perspective will be directly applied to the data, too, which is also unique."

Dr. MacQuarrie is the Principal Investigator for a CIHR-funded project examining smoking behaviour and cessation in pregnant girls who are adjusting to the role of being a mother.

Previously, Dr. MacQuarrie was a co-investigator on two other CIHR projects funded through CIHR's Regional Partnerships Program (RPP), which helps build research capacity in targeted areas across the country. She credits her RPP experience with helping her to succeed in the CIHR competition that led to her current research.

Commercial Opportunities

Could antibiotics tackle cancer?

Dr. David Jakeman leads a research team at **Dalhousie University** that is working to generate antibiotics with greater selectivity and power for treating cancer and infectious diseases. Funded in part by CIHR, the investigation has already isolated more than 20 new antibiotics. They are being tested against bacteria that cause diseases and various cancer cell lines to determine their therapeutic potential.