



Science Making Miracles

2006/07 Annual Report

## New building

connects science  
and community—  
opening in 2008



Why are some children  
**more vulnerable**  
to sickness?



Taking care of  
**mother & baby**  
when complications arise  
during pregnancy



## Type 2 diabetes

is striking more Canadian  
children. It's a new epidemic  
that's happening alongside  
childhood obesity.



The Child & Family Research Institute (CFRI) is dedicated to world-class research spanning a wide range of children's and women's health concerns. CFRI works in close partnership with: the University of British Columbia; BC Children's Hospital and Sunny Hill Health Centre for Children, and BC Women's Hospital & Health Centre (agencies of the Provincial Health Services Authority); and BC Children's Hospital Foundation.

### **Our Mission**

The Child & Family Research Institute conducts discovery research to benefit the health of children and families.

### **Our Vision:** *Science Making Miracles*

We passionately pursue discovery, knowing our achievements have the capacity to transform lives.

### **Our Values**

We work in an environment that values:

- Integrity
- Excellence
- Transformation
- Interaction
- Openness

### **Our Programs**

The Child & Family Research Institute is the largest research institute of its kind in Western Canada. More than 175 investigators are affiliated with CFRI, and approximately 210 trainees, including graduate students and post-doctoral fellows, work at the institute.

Research is conducted in several program areas:

- Community Child Health Research
- Diabetes
- Clinical and Applied Health Research & Evaluation
- Genetics
- Immunology
- Informatics
- Infectious & Inflammatory Diseases
- Molecular Medicine & Therapeutics
- Neurobiology & Mental Health
- Nutrition & Metabolism
- Oncology
- Human Reproduction & Healthy Pregnancy

## Why are some children more vulnerable to sickness?

Some children get a runny nose and slight cough while others end up battling pneumonia or meningitis in the hospital intensive care unit – yet the same bacteria and viruses are to blame.

**B**oth groups of kids are otherwise healthy,” says Dr. Stuart Turvey, clinician scientist at the Child & Family Research Institute. “Why is it that after contacting the same microbes, some kids get a devastating illness while for others it’s only a trivial infection? We suspect that something’s gone wrong with the innate immune system, which is the body’s first line of defence against disease.”

Children rely heavily on their innate immune system during the early years of life while they develop cellular “memory” of how to fight specific infections based on exposure to protective vaccines and previous illnesses. This memory is part of the adaptive immune system.

When a microbe invades the body, a group of proteins called Toll Like Receptors (TLRs) quickly trigger the innate immune system and prompt special cells to immediately contain the infection. The TLRs also activate the adaptive immune system, which takes a few

days to identify the microbe’s molecular structure and manufacture T-cells and B-cells to destroy the infection. TLRs are inherited and evolved over generations to recognize specific parts of bacteria, viruses, and parasites. Adaptive immunity continues developing over a person’s lifetime in response to new infections and vaccines.

“If your innate immune system is faulty and your Toll Like Receptors don’t work, then you could be in big trouble, waiting for the adaptive system to get revved up,” says Dr. Turvey. “Our hypothesis is that subtle defects in the TLR pathway – where it works at only 50 per cent or 80 per cent of its capacity – may explain the dramatic differences we see in the outcomes of otherwise healthy children. We’re trying to understand and ultimately predict which kids are at risk of developing the severe illness so we can offer them different protective strategies.”



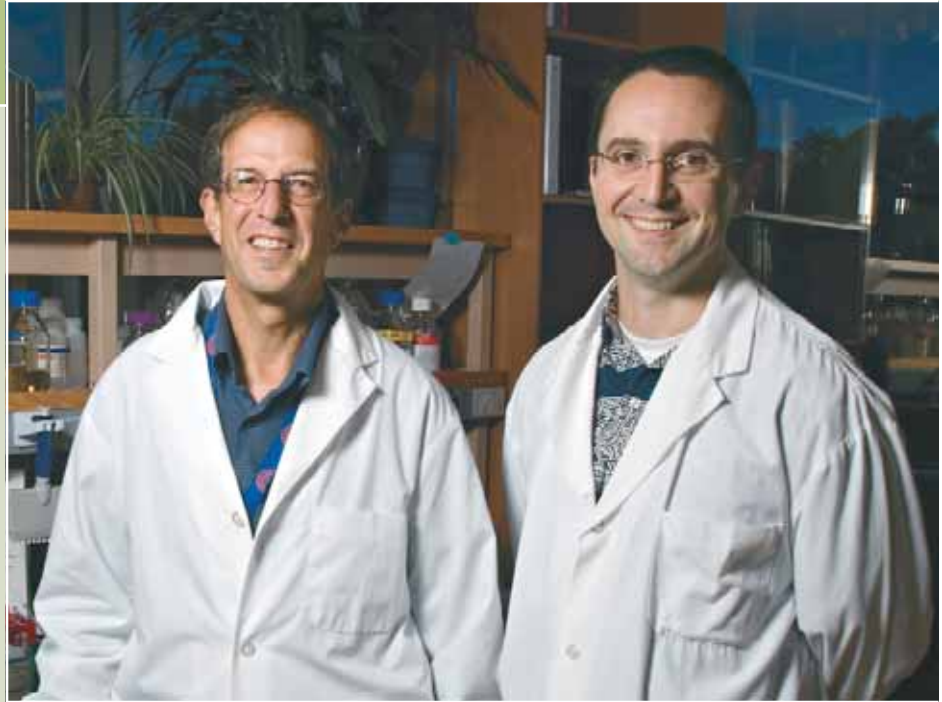
“Our patients have access to experts in infectious diseases in both the clinic and the lab,” says Dr. David Speert. “Our scientists study patient blood samples to determine what’s wrong at a cellular, molecular, and genetic level. Then we use the lessons learned from the lab to develop better treatments for patients.”

Dr. Turvey is a pediatric immunologist and rheumatologist at BC Children’s Hospital and assistant professor in the Division of Infectious and Immunological Diseases in the Department of Pediatrics at the University of British Columbia (UBC). He’s also a member of CFRI’s Infectious and Inflammatory Diseases Research Program, which brings together a team of basic biomedical, clinical, and population health scientists to study childhood infectious diseases. The program is the only one in Canada with a major focus on the innate immune system in children.

“CFRI’s partnership with BC Children’s Hospital is a major strength of this program,” says Dr. David Speert, who’s a pediatrician at BC Children’s and heads both the CFRI Infectious and Inflammatory Diseases Research Program and the UBC Division of Infectious and Immunological Diseases.

“It means that our patients, who come from all over British Columbia and the Yukon, have access to experts in infectious diseases in both the clinic and the lab,” says Dr. Speert. “Our scientists study patient blood samples to determine what’s wrong at a cellular, molecular, and genetic level. Then we use the lessons learned from the lab to develop better treatments for patients.”

The program is closely connected to Vancouver’s universities. At UBC’s Department of Microbiology and Immunology, Dr. Robert Hancock’s team analyzes patient blood samples to determine the global expression of genes and proteins and to identify any defects in expression. Together with Dr. Fiona Brinkman’s team of bioinformaticists at Simon Fraser University’s Department of Molecular Biology and Biochemistry, they have created innovative software that allows the scientists to quickly examine patient problems at a molecular level.



Dr. David Speert (left), is head of CFRI’s Infectious and Inflammatory Diseases Research Program. Both he and Dr. Stuart Turvey (right) research ways of preventing and treating infections in children.

This year, the CFRI Infectious and Inflammatory Diseases Research Program received \$3.2 million from the Canada Foundation for Innovation and \$3.2 million from the British Columbia Knowledge Development Fund to set up the Centre for Understanding and Preventing Infection in Children. Housed in CFRI’s new building, which opens in early 2008, the centre will feature a special containment lab for studying highly infectious diseases such as tuberculosis as well as sophisticated equipment for evaluating the function of immune cells.

Dr. Turvey says the new centre will be an invaluable resource for his latest research project, funded by the Canadian Cystic Fibrosis Foundation and the BC Lung Association. He’s looking at ways of correcting problems with the innate immune system in patients with cystic fibrosis, a genetic disease that’s presently incurable. Common bacteria that are harmless to most people cause deadly lung infections in children and adults with cystic fibrosis. Dr. Turvey suspects that new drugs targeting the Toll Like Receptors could strengthen the immune system in children and adults, helping them fight off illnesses and live longer.

# The growing epidemic of Type 2 diabetes in children

Type 2 diabetes is striking more Canadian children. It's a new epidemic that's happening alongside the epidemic of childhood obesity, says Dr. Dina Panagiotopoulos, a clinician scientist at the Child & Family Research Institute.

**T**en years ago, the diabetes clinic at BC Children's Hospital had fewer than five patients with Type 2 diabetes. Today, there are about 100 patients with Type 2 diabetes or impaired glucose tolerance, which is a precursor to the disease.

"That's a massive increase over a very short period of time," says Dr. Panagiotopoulos, who's a pediatric endocrinologist at BC Children's Hospital and clinical assistant professor of pediatrics at the University of British Columbia. She's a 2007 recipient of a CFRI Clinician Scientist Award.

"It's worrisome to see it in kids," says Bruce Verchere, PhD, head of the CFRI Diabetes Research Program and professor in the Department of Pathology and Laboratory Medicine at the University of British Columbia. "As they grow up, they're at risk

of complications such as nerve damage, blindness, kidney failure, cardiovascular disease, and stroke. The disease is tragically linked to a shorter lifespan."

The scope of the problem isn't defined in Canada. To determine just how many children are affected with Type 2 diabetes, Dr. Panagiotopoulos and a national network of researchers are partnering with the Canadian Pediatric Society to survey health care professionals across the country. The numbers will guide clinicians, scientists, and policy makers in forecasting the next generation's health care needs.

What is known, however, is that being overweight or obese is one of the major risk factors for developing the disease. Over the past 25 years, the number of overweight and obese children between 12–17 years of age

has more than doubled, according to Statistics Canada. As recently as 2004, 26 per cent of Canadian children and adolescents aged two to 17 were overweight.

"You inherit a genetic susceptibility to Type 2 diabetes," says Dr. Verchere. "The disease develops when your genes collide with environmental factors such as diet, lifestyle, and weight. Kids today spend a lot of time sitting in front of the TV and computer. They're not exercising very much, they're eating a lot of junk food, and on average, they weigh more than previous generations. When you combine that with a family history of Type 2 diabetes, you have the tragedy of this increasing rate of disease among children."

People with Type 2 diabetes are unable to use effectively what little insulin the beta cells in their pancreas produce. Insulin is a hormone that regulates blood sugar levels and allows the body to take energy from food. If it doesn't work properly or there isn't enough of it, then cells throughout the body are unable to absorb glucose, a form of sugar that fuels metabolism. High levels of glucose will accumulate in the blood and cause irreversible damage over time. Since there is no cure for

Joanne Edwards (left), diabetes nurse educator, and Dr. Dina Panagiotopoulos, clinician scientist and pediatric endocrinologist, see patients in the Type 2 Diabetes Clinic at BC Children's Hospital. The machines they're holding analyze blood samples and report the patient's average blood sugar level over the previous three months.



"If you get diabetes as a child, then you get the complications much sooner and more severely than as an adult," says Dr. Dina Panagiotopoulos. "If we can detect problems and intervene earlier, then hopefully we can delay development of the disease and prevent complications."

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Bruce Verchere, PhD, won the 2006 Canadian Diabetes Association’s Young Scientist Award. He’s head of CFRI’s Diabetes Research Program, which is moving into CFRI’s new translational research building in 2008.



diabetes, the only treatment is medication – which often includes insulin injections – healthy diet, and exercise.

“If you get diabetes as a child, then you get the complications much sooner and more severely than as an adult,” says Dr. Panagiotopoulos. “If we can detect problems and intervene earlier, then hopefully we can delay development of the disease and prevent complications.”

In the lab, Dr. Verchere and his colleague Dr. Michael Hayden, head of CFRI’s Molecular Medicine and Therapeutics Program, are studying the genetic and cellular mechanisms underlying the disease. Earlier this year, they discovered that cholesterol in the beta cells contributes to the development of Type 2 diabetes and that a gene called ABCA1 plays a key role in transporting cholesterol out of the

cells. The finding was published in the journal *Nature Medicine*. The relationship between cholesterol and heart disease is well known, but this is the first time it’s been shown to be involved in insulin secretion. “We saw that cholesterol damages the ability of beta cells to secrete insulin,” says Dr. Verchere.

The research helped explain how a commonly prescribed drug called rosiglitazone works. It acts directly on the beta cells and stimulates the ABCA1 gene to regulate cholesterol. “The exciting thing about this work is that it points to ABCA1 in the beta cell as a new drug target for treating diabetes,” says Dr. Hayden, who is also a professor in the Department of Medical Genetics at UBC. Dr. Hayden’s lab cloned the ABCA1 gene in 1999 and determined its importance in regulating the amount of good cholesterol in the blood. Then last year, Liam Brunham, PhD, a UBC medical student working with Dr. Hayden, was examining the role of the ABCA1 gene in lipid metabolism for his doctoral thesis when he saw the gene was also highly expressed in the pancreatic beta cells. “We wondered what the gene was doing there,” says

Dr. Hayden. “We suspected it was critical in transferring cholesterol out of the beta cells.”

Dr. Hayden and Dr. Brunham, who is first author on the *Nature Medicine* paper, approached Dr. Verchere, an expert in beta cells. The team hypothesized that cholesterol in the beta cell contributed to Type 2 diabetes. “It’s a great example of what’s possible when you get complementary expertise coming together – one in cholesterol metabolism and one in diabetes,” says Dr. Verchere. The Canadian Institutes of Health Research recently awarded Dr. Hayden and Dr. Verchere a five-year operating grant to continue researching the role of ABCA1 in regulating cholesterol and its impact on beta cell function.

In early 2008, the Diabetes Research Program will move into the new CFRI building where it will have new facilities for processing tissue samples, and for analyzing and imaging cells. “The new space is designed to encourage interactions such as the one that led to the cholesterol and ABCA1 discovery,” says Dr. Verchere. “The next idea will come from discussions with clinicians and trainees. The clinicians see the health issues the children are facing, and we work together to understand and solve these problems.”



Dr. Michael Hayden (left) is head of CFRI’s Molecular Medicine and Therapeutics Program. Liam Brunham, PhD, is a UBC medical student who looked at the genes involved in cholesterol metabolism, heart disease, and diabetes for his doctoral thesis.

# Healthy Buddies program teaches children about healthy living

A new elementary school program is helping children get a head start on healthy habits. Teachers and doctors in British Columbia designed the program to prevent obesity and eating disorders, which are on the rise among children.



Award-winning artist Kim LaFave created the program illustrations.

**C**alled Healthy Buddies, the program pairs students in grades four to seven with their younger peers in kindergarten to grade three. The older children teach the younger ones about healthy food choices, active living, and skills for building self-esteem. In addition to the planned lessons, the buddies play games and do fitness activities together.

“We start early because the kids can still change and develop good habits,” says Dr. Jean-Pierre Chanoine, who’s leading an evaluation of the pilot program. Dr. Chanoine is a clinician scientist at the Child & Family Research Institute and heads the Endocrinology and Diabetes Unit at BC Children’s Hospital.

Results from the pilot program show that it works. After participating in Healthy Buddies, children knew more about healthy foods and behaviour than those who hadn’t been involved in the program. They also had lower blood pressure and gained weight and body fat at a healthier rate. “The kids became a lot more aware of their health,” says Valerie Ryden, a teacher at West Sechelt Elementary School on BC’s Sunshine Coast who led the pilot program. “They’d be enthusiastic about reporting to me that they went running and didn’t watch TV.”

Ryden co-authored the program with Dr. Sue Stock, a pediatric endocrinologist at BC Children’s and clinical instructor at the University of British Columbia. Dr. Stock developed the idea of peer-teaching as the basis of the program. “Kids are the teachers and they love that,” says Ryden. “It’s a novel aspect of the program. The younger buddies are keen to hear the information from their older buddies, who need to learn it



well enough to teach it. That’s when we know that the knowledge is well ingrained.”

The program includes lessons on communication skills, positive body language, and “tease proofing.” Teachers were delighted to discover the program increased the children’s sense of responsibility for each other. “In the playground, you see the kindergarten children running up to the older kids who are their buddies,” says Ryden. “The older students act in helpful ways towards the other children. They learned how to be positive participants in their school culture.”

A grant from the Sick Kids Foundation funded the pilot study. Based on its success, the Provincial Health Services Authority awarded the project a three-year Prevention, Promotion, and Protection Grant. This funding enabled 40 schools across BC to implement the program and receive all course materials, including lesson plans, posters, games, and activity supplies. Dr. Chanoine says the team hopes to expand the program to more schools across the country and internationally.



The Healthy Buddies program pairs students in grades four to seven with their younger peers. Together, they learn about nutrition, exercise, and skills for building self-esteem. Funding from the Provincial Health Services Authority enabled BC schools to receive program materials free of charge.

## How mom's age affects pregnancy and child development

Nearly half of Canadian women today are over 30 years old when they have their first child – unlike the 1980s when only 10 per cent were over 30. Women today often wait to start a family while they spend their 20s and 30s obtaining an education, launching their careers, or searching for a partner.

**A** lot of women don't realize that as they get older, they face a dramatically higher chance of infertility, miscarriage, and genetic conditions in the baby. They're also more likely to suffer complications during pregnancy.

"Many women mistakenly assume they don't need to worry about their infertility until they approach menopause in their 40s or 50s," says Wendy Robinson, PhD, head of the Human Reproduction & Healthy Pregnancy Program at the Child & Family Research Institute and professor of genetics at the University of British Columbia. "But that's not so. Female fertility starts to decline about 10–15 years earlier as the reproductive system naturally ages."

Unlike men who produce sperm throughout their lives, women are born with a limited supply of ovarian cells that are designed to become eggs. Many of these cells are lost before girls reach puberty and the number continues to dwindle over the years. With each menstrual cycle, many cells begin to mature but only one will be

If one of these damaged eggs combines with a sperm, the resulting cells could have 47 chromosomes – a genetic condition called trisomy. The cells end up in the developing baby or in the placenta.

ovulated while the others are lost. The ovulated egg lives for a couple of days while it travels down the fallopian tubes towards the uterus, ready to be fertilized by a sperm. The remaining cells sit inside the ovaries and as they age, their quality diminishes.

During fertilization, the egg and sperm bring together genes from each parent into the new cell. Genes are made up of DNA and are located on structures inside the cell called chromosomes. Normally, human cells have two copies of each chromosome, half inherited from the mother's egg and half from the father's sperm, for a total of 46 chromosomes. Each month during the woman's menstrual cycle, one of her eggs will undergo a special round of cell division to reduce its chromosomes from 46 to 23 as it prepares for possible fertilization. With aging, this process becomes less reliable and by the time a woman is 40 years old, many of her eggs will have the wrong number of chromosomes.

If one of these damaged eggs combines with a sperm, the resulting cells could have 47 chromosomes – a genetic condition called trisomy. These cells end up in the developing baby or in the placenta, which is an organ formed in pregnancy that provides vital nutrients to the baby. Most trisomic pregnancies result in miscarriage, and babies born with an additional chromosome usually have a host of developmental and medical conditions.

Dr. Robinson's team recently reported that pregnant women who have three copies of chromosome 16 in their placenta are more susceptible to developing pre-eclampsia, a type of life-threatening hypertension that can be dangerous for both mother and baby. It often causes the baby to be born underweight.



*Left:* Wendy Robinson, PhD, heads the CFRI Human Reproduction & Healthy Pregnancy Program. She won the 2006–2007 University of British Columbia Killam Teaching Prize. She's leading one of the few studies to understand how genetic abnormalities in the placenta affect the baby's long-term health and development.



Left: Karla Bretherick is a doctoral candidate in the Department of Medical Genetics at the University of British Columbia.

Doctoral candidate Karla Bretherick and master's student Courtney Hanna are investigating how genetic factors involved in aging are linked to trisomy.

"It's always age related," says Dr. Robinson. "The older the woman is, the more at risk she is of developing trisomy of chromosome 16."

Dr. Robinson is leading one of the few studies to understand how trisomy in the placenta affects the baby's long-term health and development.

"We're screening hundreds of placentas associated with growth-restricted infants or women who've had pre-eclampsia," says Dr. Robinson. "We're asking, how often is trisomy causing these findings? We're looking at the long-term outcomes because nobody's followed up these pregnancies to see if these infants develop normally or not. And that's what parents really want to know."

The discovery that trisomy can happen in the placenta took place in 1983 at BC Children's Hospital and BC Women's Hospital & Health Centre (formerly known as Grace Hospital). The hospital's head of cytogenetics, Dr. Dagmar Kalousek, and Dr. Fred Dill, then a professor of medical genetics at UBC, published the first paper on this phenomenon in the journal *Science*. Their findings explained why some babies are born underweight. When Dr. Robinson joined the research program in 1994, she began collaborating with clinical geneticist Dr. Sylvie Langlois on molecular studies to understand how abnormal cells affect pregnancy and development.

Today, UBC doctoral candidate Karla Bretherick and master's student Courtney Hanna are building on the program's history of achievement as they work with Dr. Robinson to investigate how genetic factors involved in aging are linked to trisomy. They're looking at the connection between a woman's risk of a trisomic pregnancy and her eventual age at menopause, which usually occurs between 40–60 years as part of the natural aging process.

"We suspect that it's the time remaining until menopause that's important, rather than a woman's biological age," says Bretherick. "For example, women who will have menopause in their early 40s may be more susceptible to a trisomic pregnancy while they're in their late 20s. But women who have menopause after age 50 might not encounter that risk until late in their 30s."

Dr. Robinson hopes her team's research will enable clinicians to ultimately predict which women are at higher or lower risk of a trisomic pregnancy and to provide information on the possible effects of trisomy.

"It's a huge, underappreciated issue," says Dr. Robinson. "Young people learn about birth control in school but not about their future fertility and on planning their families. It's not talked about. Just because you haven't reached menopause doesn't mean it's going to be easy to have a baby. Reproductive aging creeps up on women quickly with potentially serious consequences to both their own health and the baby's health."



Right: Courtney Hanna is a UBC master's student who recently joined Dr. Wendy Robinson's lab at the Child & Family Research Institute.

## When complications arise during pregnancy

A new set of hospital tests is dramatically reducing the number of women who suffer severe complications of pre-eclampsia, a type of pregnancy-induced hypertension that's a common cause of death for women around the world. It's estimated to affect between 5–8 per cent of pregnancies.

Untreated, pre-eclampsia disturbs the lining of the mother's blood vessels, alters her blood clotting, causes her red blood cells to burst, and results in multiple organ failure that's very similar to sepsis. Since the onset of pre-eclampsia is triggered by the placenta, the organ that develops in pregnancy to nourish the baby, the only cure is a caesarean section or to induce labour. Although early delivery protects the mother's life, it can be risky for the baby

"We introduced a batch of timed tests and assessments, called standing orders, that aid physicians in catching the evolution of pre-eclampsia early and determining more precisely when early delivery of the baby is needed," says Dr. Peter von Dadelszen, clinician scientist at the Child & Family Research Institute, consultant in maternal-fetal medicine at BC Women's Hospital & Health Centre and associate professor of obstetrics and gynecology at the University of British Columbia.

"This helps us to safely prolong the pregnancy, which is better for the baby when pre-eclampsia arises very early," he says.

Dr. von Dadelszen and his colleagues set up the standing orders at BC Women's on September 1, 2003 as part of a study. These were used in the care of 405 women, of whom only 0.7 per cent developed severe complications due to pre-eclampsia. The researchers compared these outcomes with the charts of 295 women admitted to BC Women's between January 2000 and December 2001 – before the standing orders – and found that 5.1 per cent had the same severe complications.

These findings were published in the journal *Obstetrics & Gynecology* in 2007. Facilities across BC are now implementing the standing orders. In addition, these results are informing the new national guidelines of the Society of Obstetricians and Gynecologists of Canada.



Husband and wife team Dr. Peter von Dadelszen and Dr. Laura Magee have dedicated their careers to improving the care of pregnant women with hypertensive disorders. They're both clinician scientists at the Child & Family Research Institute and physicians at BC Women's Hospital & Health Centre.

The Canadian Institutes of Health Research recently awarded Dr. von Dadelszen, Dr. Laura Magee, and colleagues a three-year operating grant of \$258,165 per year to continue the PIERS (Pre-eclampsia Integrated Assessment of RiSk) project, which aims to develop an evidence-based way of categorizing women's risk of complications once they have developed pre-eclampsia. This research is also funded by the Michael Smith Foundation for Health Research, CFRI, and BC Women's Hospital & Health Centre, an agency of the Provincial Health Services Authority.

Standing physician orders reduced the number of women who suffered severe complications due to pre-eclampsia to 0.7 per cent from 5.1 per cent of patients admitted to BC Women's Hospital & Health Centre.

# Building a translational research complex

When it opens in early 2008, CFRI's new translational research building will bring together teams of experts to collaborate on a common concern: how to solve the health issues of children and families.

**T**he new space will house scientists in traditional wet labs where they will examine genes, molecules, and cells to discover the mechanisms of disease. In the neighbouring dry labs down the hall, researchers armed with computers and data sets will analyze patterns of health and disease in different communities with a view to identifying population needs, trends, and risk factors. Inside the building's clinical trials unit, clinical investigators will lead studies to find better treatments for patients.

"It's a holistic approach to science," says Dr. Stuart MacLeod, PhD, executive director, CFRI. "The building is designed to encourage communication between different groups so that clinicians, social scientists, and population health researchers are close to those who are working in the wet laboratory. It's about understanding the pattern of disease and the burden of illness among populations, and applying a variety of multidisciplinary approaches towards solving health problems."

"The concept involves mixing wet and dry lab activities and transferring scientific knowledge back into the community to benefit the lives of children and families," says Geoff Hammond, PhD, scientific director, CFRI. "The physical space is planned so that people will naturally interact and share ideas. People working on related issues will be housed in the same space, which lends itself to collaboration and teamwork."

In addition to the research teams, BC Children's Hospital Foundation is moving into the building's first floor together with CFRI administration.

The new building is CFRI's first step towards creating a translational research complex to support the flow of questions and answers between researchers and their community partners to inform health decision makers.

## About the new building:

- Five floors totalling 121,000 square feet
- Total cost of the building is \$44.1 million
- Funded by generous donations to the BC Children's Hospital Foundation (\$22.5 million)
- Major grants from the Canada Foundation for Innovation (CFI) and the BC Knowledge Development Fund (BCKDF) have purchased equipment and infrastructure for some labs and enabled the space to be fitted out
- **Level 5** – investigators studying childhood infection and immunology
- **Level 4** – researchers dedicated to childhood diabetes
- **Level 3** – researchers studying mental health issues across the age spectrum
- **Level 2** – a clinical trials unit for patients; CFRI administration; and BC Children's Hospital Foundation
- **Level 1** – mechanical and building facilities and other support services



# Message from the Board Chair



Maurice Mourton, Chair, CFRI Board of Directors

**T**he Child & Family Research Institute has made enormous progress since it formed more than 12 years ago.

Today, CFRI is the largest institute of its kind in Western Canada – in terms of people, productivity, funding, and size. It coordinates the activities of 175 investigators, many of whom are leaders in research collaborations and networks across the province and country as well as internationally.

CFRI has established a strong record of provincial partnerships. These include the Provincial Health Services Authority and BC's five regional health authorities; our major supporter the University of British Columbia and other universities throughout the province; and funding support from the Michael Smith Foundation for Health Research and BC Children's Hospital Foundation. We are also proud to support the government of British Columbia in the areas of health, child and family development, and advanced education.

Our investigators have an extraordinary track record of achievement in some of the toughest funding competitions. CFRI's overall success rate with Canadian granting agencies is close to 50 per cent – twice the national average. Many granting committees – composed of top scientific experts – consistently rank CFRI submissions within the top three applications. This reflects the talent of our investigators, the high quality of their research, and the value of CFRI's Research and Technology Development Office, which offers our researchers in-house assistance in developing competitive grant applications.

This success means that CFRI is able to leverage every dollar of philanthropic contributions from the BC Children's Hospital Foundation into four dollars of external grant money. All of this support pays for core infrastructure, operations, research teams and projects, career scientists, students, and trainees.

The combined support of the Foundation, granting agencies, and government has enabled CFRI to double its size in the past six years. Opening in early 2008, CFRI's new building is dedicated to translational research, which is about studying diseases at a cellular and molecular level and translating this knowledge into better treatments for patients. The stories in this report illustrate the discoveries that result from dialogue between the lab, the clinic, and the community.

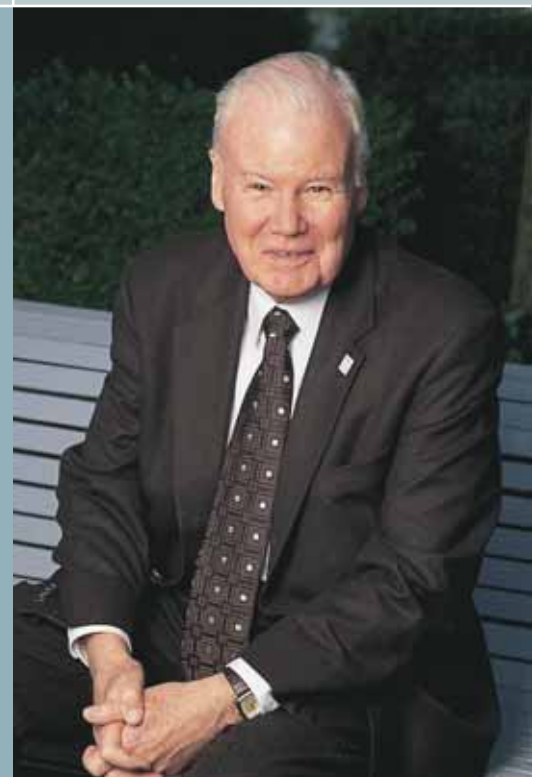
The Board is pleased to support the wonderful progress of CFRI. As Chair, I wish to express my appreciation to the individuals who have volunteered as Board members, as well as to the membership, staff, and trainees of CFRI for their contributions to this success.

## CFRI Board Member Named to Order of Canada

**C**CFRI Board Member Dr. Donald Rix was appointed as a Member of the Order of Canada on June 29, 2007. Esteemed businessman, generous philanthropist, and dedicated volunteer, Dr. Rix has had a longstanding involvement in science and technology. Chairman and co-founder of MDS Metro Laboratory Services, he is a member of the Premier's Technology Council and sits on several technology and health research boards.

Over the years, Dr. Rix has served in various capacities at many of the province's post-secondary institutions, including the British Columbia Institute of Technology, Simon Fraser University, the University of Northern BC, and the University of British Columbia.

Dr. Rix's exceptional contributions to Canada's health and research environments have been widely recognized. He has received the Order of British Columbia, the BC Medical Association Silver Medal of Service Award, and the Queen's Golden Jubilee Award, as well as honorary degrees from the University of British Columbia, Simon Fraser University, the University of Western Ontario, and the British Columbia Institute of Technology.



# Translational Research and Transformational Change



Within the past few years, we've seen a remarkable increase in the number of university trainees who are furthering their education at CFRI.



Dr. Stuart MacLeod, Executive Director, CFRI

Dr. Geoff Hammond, Scientific Director, CFRI

**R**esearch into innovative health care improvements has never been more exciting than it is today. Given the increasing sophistication of biological research methods and the availability of new scientific tools, the potential for new cures and preventive treatments is greater than it has ever been. Child & Family Research Institute investigators are at the forefront of this work and some of their advances are illustrated in the stories of this annual report.

Over the past decade, CFRI has grown dramatically and has become an integral part of the child and youth services offered to the citizens of British Columbia by the BC Children's Hospital, an agency of the Provincial Health Services Authority (PHSA). Within the last 18 months, we have watched a new research facility rising on the site as an embodiment of CFRI's commitment to providing a strong research foundation for exemplary clinical care.

Our increased research capacity has placed a great emphasis on knowledge translation activities directed at ensuring that our discoveries are eventually applied to improve health outcomes. This represents an important part of the mandate of the Canadian Institutes of Health Research (CIHR), which is now a

major source of research funding for CFRI investigators. Through the support and encouragement of CIHR and other major funding agencies, there is an increasing emphasis on accelerating technology and knowledge transfer in partnership with the University of British Columbia and other universities.

There is also an increasing appreciation that improved outcomes will not occur unless basic and clinical investigations are integrated with population health studies to define, in practical terms, the real value of new health care interventions. In essence, scientific teamwork is essential to this process. Our new research building, which will open in 2008, represents the first phase of a Translational Research Complex in which basic scientific discoveries can occur in close proximity to clinical and epidemiologic studies that examine new diagnostic and treatment strategies. As such, it stands as a cornerstone in our strategy to transform health care through innovative research.

Within the past few years, we've seen a remarkable increase in the number of university trainees who are furthering their education at CFRI. This past year alone, our investigators have supported and mentored 210 trainees, including 65 post-doctoral fellows. These

trainees represent our future: they are the front line researchers who accelerate and contribute in major ways to the discovery process. They will lead the next generation of scientific and clinical discovery, and we are proud of the fact that many of them have won fellowship awards this year from CIHR, the Michael Smith Foundation for Health Research, and internal funding from CFRI.

All Canadians have a stake in supporting innovations to improve health, and it is important that children and adolescents not be excluded from the enormous advances in health care that are being driven by improved understanding of basic biology. Isolated scientific discoveries require an integrating force or framework designed to foster a linkage of research capacity to impact on the overall determinants of health with the objective of yielding better health outcomes.

At CFRI, we are committed to such a paradigm. We are excited by the opportunities afforded by the commissioning of our new research facility, which we are confident will ensure that scientific, technological and clinical innovations will position the Provincial Health Services Authority to deliver cost effective and sustainable health services across BC in the years ahead.

# Research Funding

The Child & Family Research Institute's 2006/2007 revenue was approximately \$45.1 million, of which \$35.5 million was external funding, including grants, contracts and agreements. More than 140 agencies contributed to external funding in 2006/2007, and these agencies are recognized below.

## FOUNDATIONS AND GRANTING AGENCIES/ORGANIZATIONS

AllerGen NCE Inc. – Allergy, Genes and Environment Network  
American Health Assistance Foundation  
Arthritis Society  
Association for Frontotemporal Dementias  
BC Academic Health Council  
BC Children's Hospital Foundation  
BC Medical Services Foundation  
British Columbia Ataxia Society  
British Columbia Lung Association  
Burroughs Wellcome Fund  
Canada Foundation for Innovation  
Canadian Council on Learning  
Canadian Cystic Fibrosis Foundation  
Canadian Diabetes Association  
Canadian Foundation for Women's Health  
Canadian Gene Cure Foundation  
Canadian Institute for Advanced Research  
Canadian Institutes of Health Research  
Canadian Language and Literacy Research Network  
Canadian Paediatric Society  
Canadian Pain Society  
Canadian Patient Safety Institute  
Canadian Society for Mucopolysaccharide and Related Diseases Inc.  
Cancer Research Society  
Charles A. Dana Foundation  
Children's Arthritis Foundation  
Crohn's and Colitis Foundation of Canada  
Genome British Columbia  
Heart and Stroke Foundation of BC & Yukon  
Heart and Stroke Foundation of Canada  
High Q Foundation  
Huntington Society of Canada  
Huntington's Disease Society of America  
International Pediatric Association  
Juvenile Diabetes Research Foundation International  
Kidney Foundation of Canada  
Lawson Foundation  
Lloyd Jones Collins Foundation  
Lotte & John Hecht Memorial Foundation  
March of Dimes Birth Defects Foundation (US)  
Meningitis Research Foundation of Canada  
Michael Smith Foundation for Health Research  
Multiple Sclerosis Scientific Research Foundation  
National Alliance for Autism Research  
National Cancer Institute of Canada  
National Institutes of Health  
National Multiple Sclerosis Society (US)  
National Ovarian Cancer Association

Natural Sciences and Engineering Research Council of Canada  
North American Pediatric Renal Transplant Co-operative Study  
Ontario Cancer Research Network  
Prostate Cancer Research Foundation of Canada  
Rethink Breast Cancer  
SickKids Foundation  
Social Sciences and Humanities Research Council of Canada  
Spastic Paraplegia Foundation, Inc.  
Sunny Hill Foundation for Children  
TB Vets Charitable Foundation  
The Blue Sky Foundation  
The Children's Hospital Foundation of Manitoba Inc.  
Thrasher Research Fund  
United Way of the Lower Mainland  
Washington State Developmental Disabilities Endowment Trust Fund  
Wegener's Granulomatosis Association

## GOVERNMENT

BC Ministry of Children and Family Development  
BC Ministry of Economic Development  
BC Ministry of Health  
BC Academic Health Council  
BC Mental Health & Addiction Services  
British Columbia Knowledge Development Fund  
Calgary Regional Health Authority  
Delegation of the Commission for European Economic Communities  
Government of Canada  
Health Canada  
Healthy Child Manitoba  
Human Resources and Social Development Canada  
Insurance Corporation of British Columbia  
Interior Health Authority  
North Shore – Long Island Jewish Health System  
Public Health Agency of Canada  
Southwest Pediatric Nephrology Study Group  
US Department of Energy  
United States Army  
US Food and Drug Administration  
Vancouver Coastal Health Authority  
Vancouver Island Health Authority

## HOSPITALS/UNIVERSITIES

BC Cancer Agency  
BC Children's Hospital and Sunny Hill Health Centre  
BC Women's Hospital & Health Centre  
Children's Hospital of Eastern Ontario  
Stanford University  
Sunnybrook Health Science Centre

The Hospital for Sick Children  
The Hospital for Sick Children Research Institute  
The University of British Columbia  
UBC Department of Paediatrics  
UBC Faculty of Medicine  
UBC Institute of Mental Health  
UBC Peter Wall Institute for Advanced Studies  
UBC School of Nursing  
UBC VPR Research Development Fund  
University of Waterloo

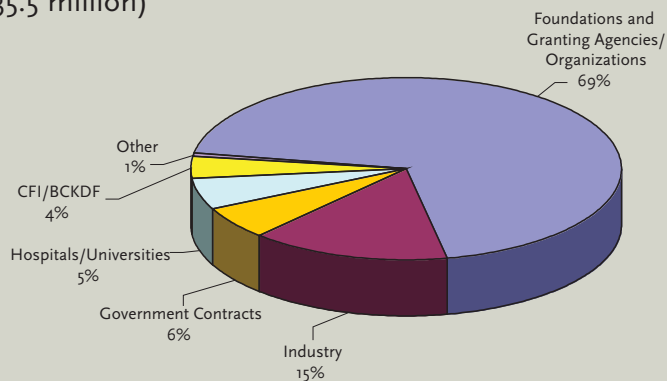
## INDUSTRY

Abbott Laboratories  
Allergan Inc.  
AMGEN Canada, Inc.  
Aspreva Pharmaceuticals SA  
AstraZeneca Canada Inc.  
Bayer Schering Pharma AG  
Berlex Biosciences  
Bristol-Myers Squibb  
Bristol-Myers Squibb Medical Imaging  
Centocor Inc.  
Chiron Corporation  
Circa Dia BV  
Codman & Shurtleff, Inc.  
Concord Pacific Group Inc.  
Edwards Lifesciences LLC  
Eli Lilly Canada Inc.  
Genzyme Corporation  
GlaxoSmithKline Inc. (Canada)  
GlaxoSmithKline UK Ltd.  
Guidant Corporation  
Hoffman-La Roche Limited  
Hollis and Wright P.G.  
IBM Canada Ltd.  
Immunex Corporation  
Inhibitex, Inc.  
Mead Johnson Nutritional Group  
MedImmune, Inc.  
Merck Frosst Canada Inc.  
Merck Frosst Canada Ltd.  
Migenix Inc.  
Novartis Pharmaceuticals Canada Inc.  
Novartis Vaccines & Diagnostics, Inc.  
Ohmeda Pharmaceutical Products Division, Inc.  
Pfizer Canada Inc.  
Pharmaxis Ltd.  
Sanofi Pasteur Limited  
Sero Canada, Inc.  
Walter Lorenz Surgical, Inc.  
Wyeth Pharmaceuticals  
Wyeth-Ayerst Canada Inc.  
Wyeth-Ayerst Research  
Xenon Pharmaceuticals Inc.

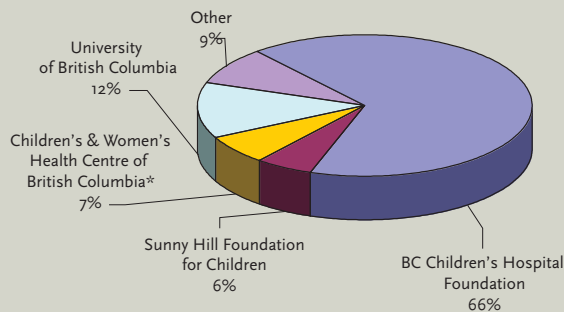
# Financials

For 2006/2007 external funding, there was an increase from foundations and granting agencies/organizations of approximately \$1.3 million (11 per cent) over the previous year. Certain one-time infrastructure funding from Canada Foundation for Innovation and BC Knowledge Development Fund and other government funding decreased in 2006/2007 as compared to the last year. Approximately \$9.6 million in internal funding was received from BC Children's Hospital Foundation, University of British Columbia, Sunny Hill Foundation for Children, and the Children's & Women's Health Centre of British Columbia, an agency of the Provincial Health Services Authority.

## 2006–07 External Revenue (\$35.5 million)



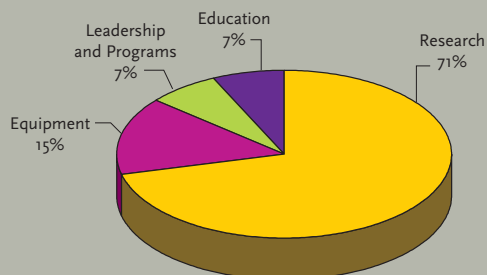
## 2006–07 Internal Revenue (\$9.6 million)



\* Children's & Women's is comprised of BC Children's Hospital, Sunny Hill Health Centre for Children, and BC Women's Hospital & Health Centre.

## 2007 Miracle Weekend

Every year, BC Children's Hospital Foundation raises millions of dollars for research. In 2006/2007 alone, the Foundation committed approximately 71 per cent of the funds raised through its annual Miracle Weekend to research.



## Child & Family Research Institute 2006/2007 Board & Board Committees

### Board Members:

Mr. Maurice Mourton	(Chair)
Ms. Helen Low	(Vice Chair)
Ms. Patricia Hanbury	(Secretary-Treasurer)
Dr. Don Brooks	
Ms. Sue Carruthers	(by invitation)
Dr. Diane Finegood	
Dr. David Hardwick	
Ms. Lynne Kent	
Mr. Michael Marchbank	
Dr. Donald Rix	Representative, BC Children's Hospital Foundation (Alternate: Dr. Alison Buchan)
Dr. Gavin Stuart	
Ms. Sharon Toohey	
Dr. Ron Woznow	
Dr. Stuart MacLeod	(ex officio)

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Mr. Michael Marchbank	
Dr. Stuart MacLeod	(ex officio)
Dr. Geoff Hammond	(by invitation)

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Dr. Stuart MacLeod	(ex officio)
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Dr. Stuart MacLeod	(ex officio)
Ms. Sharon Toohey	

# Our People

The outstanding success of the Child & Family Research Institute is possible because of its community of committed investigators, trainees, support staff, and administration. Every effort has been made to be accurate; please accept our apologies for any errors or omissions.

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# Our Partners

CFRI works in close partnership with the University of British Columbia; BC Children's Hospital and Sunny Hill Health Centre for Children, BC Women's Hospital & Health Centre (agencies of the Provincial Health Services Authority); and BC Children's Hospital Foundation. CFRI has additional highly valued partnerships with BC's five regional health authorities and with BC academic institutions Simon Fraser University, the University of Victoria, the University of Northern British Columbia, and the British Columbia Institute of Technology.



## BC Children's Hospital Foundation

Since 1982, BC Children's Hospital Foundation has raised money to support the work of BC Children's Hospital, the province's only pediatric acute care hospital. The Foundation is united with its donors by a single, simple passion – to improve the health and the lives of the young people who enter BC Children's Hospital every day. The Foundation exists to provide financial support to BC Children's Hospital, Sunny Hill Health Centre for Children and the Child & Family Research Institute through accountability of contributions, stewardship of donors and advocacy to better accommodate sick and injured children and their families who live in all parts of the province.



## University of British Columbia

The University of British Columbia is one of Canada's largest and most prestigious public research and teaching institutions and consistently ranks among the top 40 institutes in the world. It offers a range of innovative undergraduate, graduate and professional programs in the arts, sciences, medicine, law, commerce and other faculties. UBC ranks in the top 10 of North American universities in creation of spin-off companies, has particular strengths in biotechnology, and its research generates more U.S. patent applications than any other Canadian institution.



## BC Children's Hospital and Sunny Hill Health Centre for Children

Children's is home to many specialized pediatric services available nowhere else in the province, including BC's trauma centre for children, neonatal intensive care, kidney and bone marrow transplants, open heart surgery, neurosurgery and cancer treatment. Sunny Hill is a provincial facility that offers specialized services to children and youth with developmental disabilities.



## BC Women's Hospital & Health Centre

BC Women's is the province's only facility devoted exclusively to the health of women, newborns and families. It is one of the country's busiest and largest obstetrical centres. BC Women's supports women through all the phases of their lives – more than 20,000 women are seen annually through its specialized women's health programs, which include world-class services in breast health, substance dependency, osteoporosis, HIV/AIDS and reproductive health.



## Provincial Health Services Authority

The first authority of its kind in Canada, the Provincial Health Services Authority (PHSA) plans, manages and evaluates selected specialty and province-wide health care services across BC, working with the five geographic health authorities to deliver province-wide solutions that improve the health of British Columbians. With more than 10,000 employees and an annual budget of over \$1.2 billion, the PHSA operates provincial agencies like BC Children's Hospital, plans and in some instances funds specialized health care services like trauma, critical care and thoracic surgery, and delivers a variety of specialized programs and services throughout the province.





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