

The CIHR Institute

The CIHR Institute of Infection and Immunity spearheaded the Canadian research community's rapid response to the SARS outbreak, issuing and rapidly evaluating a call for proposals, fast-tracking the peer review process and bringing together partners to fund immediate research into understanding, diagnosing and treating the virus. It later helped to create the Canadian SARS Research Consortium. The Institute supports research to reduce the burden of infectious diseases, focusing on a wide range of issues, including safe food and water, HIV/AIDS, novel vaccine development and emerging infectious diseases.

The Institute of Infection and Immunity is working with its partners to build on the teamwork characterized by Canada's response to SARS to better respond to other emerging infectious diseases, both in Canada and as an integral part of the international effort to prepare for future research challenges. The Canadian Rapid Research Response Team brings together scientific leaders from a wide range of disciplines with expertise in infectious diseases and related areas, as well as the federal government, provincial governments, the private sector and representatives from the World Health Organization and the Centers for Disease Control and Prevention in the United States.

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 \$6.2 million in 2004-05 in research on new and emerging diseases across Canada.

The facts

- There were 97 confirmed cases of avian influenza in humans between January 28, 2004 and May 19, 2005, all of them in Vietnam, Thailand and Cambodia. Of the 97, 53 resulted in deaths. Most cases are the result of bird-to-human infection; however, human-to-human transmission has been suggested in one case. The virus's ability to turn into a pandemic is being closely monitored.
- A flu pandemic could infect 15-35% of the Canadian population, causing up to 50,000 deaths, according to estimates by the Public Health Agency of Canada. A vaccine or antiviral drugs would reduce both illness and deaths.
- Between November 1, 2002, and July 31, 2003, 251 Canadians were diagnosed with SARS, of whom 43 died.
- *C. difficile*, a bacterium that is one of the most common causes of infections in hospitals and long-term care facilities, was responsible for 108 deaths over a six-month period in Quebec. *C. difficile* thrives in people taking antibiotics because of the absence of positive bacteria.
- The first recorded outbreak of West Nile virus in North America happened in New York City in 1999. The first reports of the virus in Canada came in August 2001 and the first confirmed human cases in 2002. West Nile virus has been found across Canada. It usually causes no symptoms or mild flu-like symptoms. It can, however, cause serious illness requiring hospitalization and, in some cases, death.
- Bovine Spongiform Encephalopathy (BSE) in cattle has been linked to variant Creutzfeldt-Jakob Disease (vCJD) in humans. Despite three cases of BSE in Canada, there have been no cases of vCJD here to date. The disease is one of a small group of fatal diseases called prion diseases, in which infectious agents called prions (or misfolded proteins) attack the brain, killing cells and creating gaps in tissue.
- Between 1995 and 2003, rates of multi-drug resistant *Staphylococcus aureus* (MRSA) in Canadian hospitals increased from about 0.5 cases per 1,000 admissions to 5 per 1,000 admissions. MRSA is making many antibiotics obsolete and is a threat to our ability to control bacterial infection.

Research finding solutions to emerging diseases

- CIHR-supported researchers responded to Severe Acute Respiratory Syndrome (SARS) with a rapidity and range of research that produced results applicable both to future SARS outbreaks and to outbreaks of other infectious diseases:
 - A team of 58 Canadian researchers was the first to publish the genome sequence of the human coronavirus that was confirmed to cause SARS. They accomplished this in an unprecedented 11 weeks.
 - Dr. Eleanor Fish of Toronto's University Health Network discovered that treating SARS with a combination of interferon alfacon-1 and corticosteroids was more effective than treating with the corticosteroids alone.

- Dr. Michel Bergeron of Université Laval and his team developed a rapid and simple method to extract the SARS virus from respiratory specimens as well as a test to detect SARS and other coronaviruses.
- Drs. Mark Loeb and Allison McGeer, from McMaster University and the University of Toronto respectively, found that increased time in a patient's room, closeness to the patient's airway and lack of masks increased the risk of transmission of SARS among health care workers.
- Dr. Marie Louie of Sunnybrook and Women's College Health Sciences Centre found that most patients recover well from SARS, with lung function returned to normal three months after infection and the majority of patients back at work after six months.
- The hepatitis C virus escapes detection by the immune system because its external coating mimics antibodies, one of the immune system's main weapons against infiltrators, according to a discovery by CIHR-supported researcher Dr. Earl Brown of the University of Ottawa and his team. Their finding could help understand why the virus causes chronic disease in about three-quarters of the people who become infected with it. Some 240,000 Canadians are infected with hepatitis C.
- The strain of *C. difficile* that has plagued some Quebec hospitals is 20 times more toxic than many other strains of the infection, according to research by CIHR-supported researcher Dr. Jacques Pépin of the Centre Hospitalier Universitaire de Sherbrooke, who worked with researchers at the U.S. Centers for Disease Control and Prevention.

In the pipeline ... Novel alternatives to antibiotics

For more than 50 years, antibiotics have come to the rescue, producing rapid and long-lasting 'miracle cures'. Their widespread use in humans and animals has led to a backlash – bacteria that are resistant to most conventional antibiotics. New antibiotics that fight these bacteria are not being actively developed. The CIHR Institute of Infection and Immunity is working with partners including the Alberta Heritage Foundation for Medical Research, the Canadian Committee on Antibiotic Resistance, the Canadian Foundation for Infectious Diseases, the Canadian Patient Safety Institute and the Public Health Agency of Canada to explore novel alternatives to antibiotics. Some of these alternatives include:

- increasing the body's innate ability to resist infection by boosting the immune system;
- exploring new therapies such as phage and probiotics; and
- modifying physical environments, such as hyperbaric conditions and temperature control, and applying technologies such as lasers and UV light to reduce the risk of infection.

The next step is to increase research in these areas, taking the focus away from antibiotics and toward new solutions.

The researchers ... Dr. Lorne Babiuk vs. the viruses

"I've always been interested in aspects of medicine that will help society," Dr. Lorne Babiuk says. Not an uncommon interest among researchers – but in Dr. Babiuk's case, he's approached this on a smaller scale than most.

As Director of the University of Saskatchewan's Vaccine and Infectious Disease Organization (VIDO), Dr. Babiuk has focused on viruses and how they invade cells to cause disease.

In the early-1970s, Dr. Babiuk developed a model of the rotavirus – a virus that causes severe diarrhea among children. This model, which demonstrated how the virus infected healthy 'host' cells, has since led to the development of vaccines that are now in the licensing stage of approval for use in humans. A vaccine for cattle has been on the market for more than 20 years.

In 2004, Dr. Babiuk's team worked on two different vaccines for Severe Acute Respiratory Syndrome (SARS). These vaccine prototypes, partly funded by CIHR, were developed in collaboration with McMaster University, the British Columbia Centre for Disease Control and the University of British Columbia, and have been tested on animals. In 2005, Dr. Babiuk was one of three Canadian researchers to receive awards through the Grand Challenges in Global Health initiative, spearheaded by the Bill and Melinda Gates Foundation. Dr. Babiuk is working to develop a single-shot vaccine that will reduce the need for multiple immunizations.

As Chair of the Institute of Infection and Immunity Institute Advisory Board and member of CIHR's Canadian Research Coalition on Food and Water Safety, Dr. Babiuk takes a broad approach to protecting the health of Canadians that encompasses many different aspects of public health. He says that, while we cannot predict Canada's next health crisis, the creation of both CIHR and the Public Health Agency of Canada are important steps towards creating the infrastructure that will help prevent and address a crisis – and that research is a critical element in that infrastructure.

In his research interests, Dr. Babiuk has focused on the miniscule, on viruses. In conducting his research, however, he recognizes the importance of larger elements – like people. He collaborates with researchers from many other disciplines, including sociologists, psychologists and engineers. And he regards the 48 graduate students and 42 postdoctoral researchers he has supervised as his greatest research achievement, for they will be the ones who will build upon his earlier work.