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CANADA'S VACCINE INDUSTRY COMMITTEE

LEADERSHIP IN GLOBAL HEALTH



THE VACCINE INDUSTRY COMMITTEE (VIC), CANADA'S VOICE FOR VACCINES

The VIC is comprised of Canada's major vaccine developers and suppliers. Members actively engage with federal, provincial and territorial governments to foster full access and availability of all existing and new vaccines for Canadians. The committee also promotes high-quality Canadian vaccine research and Canadian excellence in the development, manufacturing and distribution of vaccines. It helps to further awareness of the value of vaccines to the Canadian healthcare system, and to showcase how Canada's vaccine industry works to improve the health of Canadians and those in developing countries.

VACCINES SAVE LIVES

- Globally, vaccines have proven to be a highly effective tool for controlling and eradicating devastating infectious diseases such as polio.
- By 1979, immunization against smallpox eliminated the natural occurrence of this disease that previously threatened 60% of the world's population and killed one in four infected.
- In Canada, the introduction of childhood vaccines has been successful in decreasing infection rates and saving lives. By 2005, immunization with the pneumococcal meningitis vaccine had decreased rates of infection in infants aged 0–23 months by 84% in Vancouver, BC (Bjornson et al., 2007).
- Immunization with other important childhood vaccines helped reduce the number of cases of various diseases by over 99% (see chart below).

VACCINES IMPROVE THE HEALTH OF CANADIANS

PREVENTABLE DISEASE	CASES IN CANADA IN PEAK YEAR, BEFORE ROUTINE IMMUNIZATION	CASES IN 2004
Diphtheria	9,000	1
Hib Disease	2,000	68
Hepatitis B	3,000	829
Measles	300,000	7
Mumps	52,000	32
Whooping Cough	25,000	2,712
Polio	20,000	0
Rubella	69,000	9
Total	480,000	3,658

VACCINES ARE HIGHLY REGULATED

- As a cornerstone of the Canadian healthcare system, vaccines are a highly regulated disease prevention tool.
- Vaccines in Canada go through multiple controls to ensure product safety. Health Canada is responsible for maximizing the safety, efficacy and quality of drugs, including vaccines, for human use. In addition to manufacturers' quality assurance programs, Health Canada's continuous quality surveillance throughout the vaccine's journey to the patient guarantees safety is maintained.
- Each vaccine must be approved by Health Canada, which involves reviews of product scientific data, production site evaluations, independent vaccine sample testing, and once the vaccine is approved, testing of vaccine batches prior to their release for use.

WHO NEEDS VACCINES?

- CHILDREN
- ADOLESCENTS
- ADULTS
- TRAVELERS

VACCINATION AND IMMUNIZATION T

1882 SMALLPOX VACCINE IS MADE AVAILABLE IN CANADA.

1930 ROUTINE IMMUNIZATION WITH DIPHTHERIA TOXOID BEGINS IN CANADA.

1943 ROUTINE IMMUNIZATION FOR WHOOPING COUGH IS IMPLEMENTED IN CANADA.

1910 RABIES VACCINE TREATMENT IS INTRODUCED IN CANADA.

1941 CONNAUGHT LABORATORIES (NOW SANOFI PASTEUR LIMITED) PIONEERS THE DEVELOPMENT OF COMBINED VACCINES TO IMMUNIZE AGAINST DIPHTHERIA, WHOOPING COUGH AND TETANUS IN ONE SHOT.

1955 JONAS SALK'S POLIOMYELITIS VACCINE IS LICENSED IN NORTH AMERICA.

GLOBAL VACCINE INNOVATION FOR CANADIANS



MERCK FROSST

Discovering today
for a better tomorrow.

Merck Frosst is one of the few Canadian companies to offer vaccines that protect Canadians from debilitating, disabling and sometimes fatal infectious diseases such as measles, mumps, rubella, varicella, meningococcal diseases and hepatitis. Its most recent research efforts have focused on the prevention of cervical cancer and genital warts, as well as on the prevention of rotavirus gastroenteritis. The search continues with the development of vaccines to prevent shingles, HIV/AIDS and other diseases, which will contribute to maintaining the well-being of Canadians of all ages. www.merckfrosst.ca



Working for a healthier world™

Pfizer discovers, develops, manufactures and markets prescription medicines for humans and animals. Pfizer is working towards a best-in-class vaccine capability and actively driving business development agreements to access the best external science. Pfizer Canada Inc. is the Canadian operation of Pfizer Inc., the world's leading pharmaceutical company. Pfizer's Canadian headquarters are in Kirkland, QC, and our vaccines research facility is in Ottawa, ON. Pfizer Canada is a leader in Canadian healthcare research, investing more than \$137 million in research and development activities and partnerships in 2007. In Canada alone, the company has invested more than \$1 billion in R&D since 2000. www.pfizer.ca

sanofi pasteur

The vaccines business of sanofi-aventis Group

For almost a century, **Sanofi Pasteur**, Canada's largest vaccine company, has protected Canadians and the world against preventable diseases such as polio, tetanus, diphtheria, pertussis, meningitis and influenza. As an innovative leader in vaccine development, Sanofi Pasteur annually invests \$100 million in Canadian R&D to help develop new preventative and therapeutic vaccines. Sanofi Pasteur's Cancer Vaccine Program is a global initiative, anchored in Canada, aimed at developing therapeutic cancer vaccines, thus making Sanofi Pasteur a leader in protecting Canadians from vaccine-preventable diseases. www.sanofipasteur.ca



Solvay Pharma Inc. is active in the therapeutic areas of cardiology, gastroenterology, mental health, men's health and influenza vaccination, as well as a select group of specialized markets. Solvay Pharma has been one of the leading influenza vaccine companies in the world for more than 50 years. They are the proud owners of Inluvac®, the only thimerosal-free sub-unit vaccine available in Canada, easily administered by a single-dose, pre-filled, patented syringe. Over the last five years, more than 100 million doses of Inluvac® were distributed worldwide, and it is currently available in 65 countries. www.solvay.com

Wyeth

Since 1885, **Wyeth** has been a leader in the discovery, development, manufacturing and marketing of vaccines. In partnership with the World Health Organization in 1967, Wyeth supplied 200 million doses of polio vaccine per year and developed the bifurcated needle to help eradicate smallpox. Today, Wyeth manufactures the only conjugate vaccine proven to save lives by preventing pneumococcal disease in young children. Wyeth's global vaccine pipeline includes new bacterial and viral vaccines to help prevent or treat infectious diseases such as meningococcal, streptococcal, pneumococcal and HIV, as well as non-infectious diseases such as Alzheimer's. www.wyeth.com

IMELINE

1962 CANADA INTRODUCES THE SABIN ORAL POLIO VACCINE (OPV), PREVENTING OVER 20,000 CASES OF POLIO PER YEAR, AND IS ONE OF THE FIRST COUNTRIES IN THE WORLD TO ERADICATE POLIO.

1969 RUBELLA VACCINE IS INTRODUCED IN CANADA, DECREASING INCIDENCE BY 60,000 CASES PER YEAR.

1982 CANADA INTRODUCES THE IMMUNIZATION OF SCHOOL PUPILS ACT. FIRST RECOMBINANT DNA VACCINE FOR LIVESTOCK IS DEVELOPED.

1967 WYETH PARTNERS WITH THE WORLD HEALTH ORGANIZATION TO ERADICATE SMALLPOX, PROVIDING 200 MILLION VACCINE DOSES ANNUALLY.

1979 THE WORLD HEALTH ORGANIZATION ANNOUNCES THE WORLDWIDE ERADICATION OF SMALLPOX.



Crucell N.V. is a global company focused on research, development, production and marketing of vaccines, proteins and antibodies that prevent and treat primarily infectious diseases. Crucell's core portfolio includes a vaccine against hepatitis B, a fully-liquid vaccine against five important childhood diseases and a virosome-adjuvanted vaccine against influenza. Crucell also markets travel vaccines, such as the only oral anti-typhoid vaccine, an oral cholera vaccine and the only aluminum-free hepatitis A vaccine on the market. The company has a broad development pipeline, with several product candidates based on its unique PER.C6® production technology. www.crucell.com.



ImmunoVaccine Technologies

ImmunoVaccine Technologies Inc. (IVT) is the owner of the patented VacciMax®, a vaccine delivery platform that delivers long-duration enhanced immunity to a variety of antigens in a single dose, without boosting or significant side effects. VacciMax® achieved 100% tumor elimination in three independent pre-clinical cancer models and significant increase in antibody response in pre-clinical infectious disease models. VacciMax® will enter Phase 1 clinical trials for a therapeutic cancer indication in the fall of 2008, and a prophylactic infectious disease indication thereafter. www.immunovaccine.com



ICID
International Centre
for Infectious Diseases

The **International Centre for Infectious Diseases Inc. (ICID)** is Canada's unique organization delivering innovative solutions to the global fight against infectious diseases. ICID was created in 2004 in the wake of the SARS crisis to build national public health capacity in Canada. We do this by mobilizing public health expertise, building professional and technical capacity, and managing crucial projects and initiatives. We are available to work with organizations throughout the world who share our dedication to fighting diseases and fostering innovation in public health. www.icid.com



Medicago is pioneering the development of recombinant human vaccines using plant-based technologies. To face vaccine supply challenges, Medicago has developed proprietary transient expression systems that produce recombinant vaccine antigens in non-transgenic plants. Medicago offers numerous advantages over competitive technologies, including speed in large-volume vaccine delivery and reduced cost per dose. Medicago is targeting its research efforts on the H5N1 pandemic strain of influenza and plans to start human clinical trials of a vaccine in 2008. www.medicago.com



The **Vaccine and Infectious Disease Organization (VIDO)** is a world leader in the R&D of vaccine technologies for humans and animals. With a vision to protect the world from infectious disease, 150 interdisciplinary staff seek solutions to threats such as avian influenza, BSE and food-borne illness. Owned by the University of Saskatchewan, VIDO is building the country's largest Containment Level 3 vaccine research centre, which at 145,000 square feet will enhance a unique regional cluster of world-class life sciences research facilities. www.vido.org



Variation Biotechnologies Inc. (VBI) pioneers research in the bioinformatic design of vaccines. Variosite™ technology addresses the issue of "antigenic variation," which allows viral pathogens to escape detection by the human immune system. This technology can be applied to viruses such as HIV, Hepatitis C, SARS, Dengue and influenza, VBI's current vaccine focus. VBI is striving to create a next generation of vaccines with significant safety, breadth of reactivity, stability and production efficiencies over traditional vaccine approaches. www.variationbiotech.com

1997 SINCE 1986, CANADA HAS CONTRIBUTED \$96 MILLION IN DONATIONS TOWARDS UNIVERSAL IMMUNIZATION IN DEVELOPING COUNTRIES.

2000 SUCCESSFUL IMMUNIZATION OF MICE AGAINST ALZHEIMER'S IS ACHIEVED BY DR. PETER ST. GEORGE-HYSLOP AT THE UNIVERSITY OF TORONTO.

1988 GENETICALLY ENGINEERED HEPATITIS B VACCINE IS LICENSED FOR USE IN CANADA.

VACCINES FOR THE PREVENTION OF BACTERIAL MENINGITIS CAUSED BY *HAEMOPHILUS INFLUENZA* TYPE B ARE INTRODUCED IN CANADA, DECREASING THE NUMBER OF CASES IN CHILDREN BY NEARLY 97%.

1998 THE FIRST PUBLIC IMMUNIZATION PROGRAMS FOR CHICKENPOX ARE INTRODUCED IN CANADA.

2001 PREVNAR, THE VACCINE FOR PNEUMOCOCCAL MENINGITIS, IS INTRODUCED IN CANADA.

IT'S NOT JUST YOUR HEALTH: THE IMPORTANCE OF PREVENTING THE FLU

Each year, millions fall ill with influenza, a respiratory disease characterized by high fever and severe aches. The flu spreads easily and serious complications can result, even in healthy individuals. The flu shot can help reduce the risk of contracting influenza and can help reduce the seriousness of the disease should infection occur. Immunization is the best way to prevent the spread of flu to those who may be at a higher risk of developing serious complications. Vaccination can also save the time, money and productivity lost through illness. While it is an individual's choice to get a flu shot, the benefits of protection are worth the small amount of time it takes to get immunized.

VACCINES BENEFIT THE CANADIAN HEALTHCARE SYSTEM... "AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE"

- Today, more than 25 infectious diseases are vaccine-preventable.
- Vaccines are inexpensive compared to the long-term care required for disease treatment, and remain the most cost-effective health intervention available.
- Canadian spending on vaccines accounts for less than 0.17% of the annual healthcare budget (PHAC, 2007 & CIHI, 2006).
- Public funding is the most important factor in achieving high immunization rates. Every dollar spent on vaccination against measles, mumps and rubella saves nearly three times as much in healthcare dollars. In Canada, vaccination against these diseases saves \$88 million in treatment costs per year and over 420,000 lives annually.
- The benefits of vaccination often also extend from the individual to the overall population. For example, complete courses of vaccination for infants against invasive pneumococcal infection have helped decrease the incidence in adults 65 years or older by 75.1% (Kellner et al., 2006).

"The allure of the silver bullet — of wiping out an entire class of related diseases with a single injection — remains a powerful symbol of technological advance. Fifty years ago, vaccine creators captivated the world's imagination. With the return of vaccine-making to the center of the pharmaceutical business, new sources of profits are emerging, and new heroes of innovation." (PASCAL, 2000)

FUTURE OF VACCINES IN CANADA

Canadian innovation is driving the discovery of new vaccines that will transform the future of public health in Canada. Across the industry, the research pipeline is bulging. Vaccines that target cervical cancer caused by HPV and gastroenteritis due to rotavirus are examples of some of the newer products that are changing the health of Canadians. Continued future investment in Canadian innovation will lead to progress in the development of new vaccines against major diseases such as HIV and malaria, as well as treatments for cancer and other degenerative diseases.

For more information on vaccines: www.biotech.ca

2003 AVENTIS PASTEUR OPENS A STATE-OF-THE-ART FACILITY DEDICATED TO THE DEVELOPMENT OF CANCER VACCINES IN TORONTO, HOME TO THEIR GLOBAL CANCER VACCINE RESEARCH PROGRAM.

2005 THE CANADIAN GOVERNMENT ANNOUNCES A DONATION OF \$160 MILLION TO THE GLOBAL ALLIANCE FOR VACCINES AND IMMUNIZATION (GAVI).

2006 MERCK FROSST'S QUADRIVALENT HUMAN PAPILOMAVIRUS (HPV) VACCINE FOR THE PREVENTION OF CERVICAL CANCER AND GENITAL WARTS CAUSED BY HPV IS APPROVED FOR USE IN CANADA.

CANADA APPROVES THE FIRST ORAL PENTAVALENT ROTAVIRUS VACCINE FOR THE PREVENTION OF ROTAVIRUS GASTROENTERITIS IN INFANTS.

2007 CANADA ANNOUNCES \$111 MILLION IN FUNDING TO THE CANADIAN HIV VACCINE INITIATIVE. THE FEDERAL GOVERNMENT INCLUDES \$300 MILLION IN ITS BUDGET FOR AN HPV VACCINATION PROGRAM.

