



# CCYHC 2007 Annual Symposium

**Child Health Successes:  
The Top 10 Canadian Advances  
in the Last 100 Years**

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# The Question

**What is the most important Canadian discovery which has had the greatest impact, or has the greatest potential for impact, on health outcomes for children and youth in the last 100 years?**

# Process

- **June 13 – August 17, 2007**
  - Call for nominations - 36 distinct submissions received
- **September 12, 2007**
  - Meeting of national expert panel:
    - **Michael Kramer**, Scientific Director for the Canadian Institutes of Health Research (CIHR) - Institute of Human Development, Child and Youth Health
    - **Dr. Alex MacKenzie**, Director, Children's Hospital of Eastern Ontario Research Institute
    - **Dr. Brian Postl**, President and CEO, Winnipeg Regional Health Authority
  - **“Top 10” list**

## Honourable Mention...

- Stem Cells
- CF Gene Cloning
- Sprinkles
- Indomethacin to close patent ductus arteriosus in premature infants
- Link between rickets and vitamin D – application to milk fortification
- Site-directed mutagenesis
- Salter operation for CDH

# Process

- **Top 10 Nominations:**
  - AIDS drug 3TC;
  - Etiology of childhood HUS – verotoxin producing E. coli;
  - Insulin;
  - Mustard operation;
  - Neonatal screening for congenital hypothyroidism;
  - Pablum;
  - Polio vaccine;
  - Universal health insurance;
  - WinRho;
  - Yuzpe regimen of emergency contraception.

# Process

- **September 17, 2007**
  - Members of the child and youth health and health research community were invited to vote for the top advance/discovery on CCYHC website.
  - **526 votes received!**

## #10: Yuzpe regimen of emergency contraception

### – Background:

- The Yuzpe regimen, named for Professor A. Albert Yuzpe was published in 1974.
- post-coital emergency contraception consists of combined estrogen and progestin oral contraceptive taken in two doses.

## #10: Yuzpe regimen of emergency contraception

### – Impact

As recently as the early 1990s, nearly one-third of EPC prescriptions were for rape survivors

- 2000 EPC prevented 50,000 induced abortions in North America
- The Yuzpe method which decreases risk of pregnancy by 74.1% remains the most commonly prescribed postcoital emergency birth control method in the world further resulting in fewer abortions and a reduction in untold numbers of unintended pregnancies.

## #9: Etiology of childhood HUS – verotoxin (Shiga toxin) producing E. coli

– **Key player:** Dr. M. Karmali, Johnson

– **Background:**

- Hemolytic uremic syndrome (HUS) is a serious, occasionally devastating even fatal disorder
- **Dr. Karmali** discovered the etiological role of verotoxin in the development of HUS.
- Dr Johnson and Lior identified O157 E. coli bacteria capable of producing a highly potent cell toxin.
- Outbreaks of STEC infections and ensuing HUS have been subsequently linked to ground beef contaminated foods contaminated water.

## #9: Etiology of childhood HUS – verotoxin (Shiga toxin) producing E. coli

### – Impact

- Their discovery eventually led to important preventive measures to improve food safety and reduce incidence of severe infections and HUS, which preferentially affects young children and the elderly.

## #8: Mustard Operation

– **Key player:** Dr. William Mustard

– **Background:**

- Transposition of the great arteries was a death sentence
- Correction by an intra-arterial baffle that partitions atrium and directs pulmonary venous blood through right ventricular opening and systemic venous blood through mitral valve into left ventricle.
- In 1963, Mustard made medical history when he successfully performed this operation on an 18-month-old 'blue baby' born with transposition of the cardiac arteries - he "made the heart work backwards yet circulate blood to the lungs as effectively as normal hearts."

## #8: Mustard Operation

### – Impact

By the time Mustard died in 1987, his operation had saved more than 500 children at Sick Kids alone, and thousands worldwide.

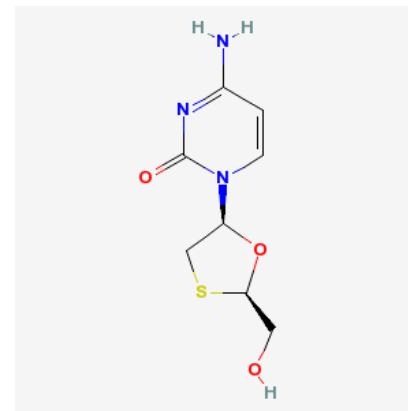
“Rarely has a new operation so profoundly influenced the treatment of a specific congenital heart defect as has the Mustard operation”

As importantly his procedure helped usher in the era of aggressive CVS surgery

## #7: AIDS drug 3TC

### – Background:

- Over 600 000 infants worldwide are infected with HIV from their mothers each year.
- In 1989, players: Francesco Bellini, Gervais Dionne, Bernard Belleau (BioChem Pharma) discovered an anti-retroviral compound, 3TC, effective in combating HIV/AIDS.
- 3TC has become the cornerstone of combination therapy to treat HIV/AIDS and has been shown to dramatically reduce rates of mother-child transmission.



## #7: AIDS drug 3TC

### – Impact

- Transmission rates are as high as 35% when there is no intervention and **below 5%** when antiretroviral treatment and appropriate care are available.
- *“History will likely regard 3TC, next to insulin, as Canada's greatest contribution to medical therapies in the 20th century.”*

Dr. Mark Wainberg, Former president of the International AIDS Society

## #6: Neonatal screening for congenital hypothyroidism

- **Key player:**

Dr. Jean Dussault

- **Background:**

- Dr Jean Dussault developed technology to measure T4, T3, and TSH in filter papers used by Quebec Genetic Network for neonatal screening of PKU.
- His innovative development of comprehensive neonatal screening for congenital hypothyroidism was then adopted worldwide.
- The American Office of Technology Assessment stated that this is one of few programs in preventive medicine with positive cost to benefit ratio (10:1).

## #6: Neonatal screening for congenital hypothyroidism

### – Impact

with an incidence of 1:3,500 newborns and 350,000 live births annually, ~100 Canadian infants have been saved from mental retardation in one year alone

– many 1000's of children as a result of this technology

## #5: WinRho

### – Key player:

Dr. Bruce Chown, Dr. Jack Bowman

### – Background:

- Rh alloimmunization was the single commonest cause of perinatal neonatal mortality and morbidity in Canada.
- 11,000 cases/year in North America
- hydrops fetalis, cardiac failure, or survival following exchange transfusions, sometimes with cerebral palsy and deafness associated with kernicterus.

## #5: WinRho

### – Impact

- The development of WinRho and its administration to Rh negative mothers is effective in preventing Rh alloimmunization in 98% of cases practically eliminating this former scourge from the perinatal-neonatal landscape, in Canada and worldwide.
- Today, WinRho is distributed to over 40 countries. This is a triumph of knowledge translation, from bench to bedside to population.

## #4: Pablum

### – Key players:

Dr. Frederick Tisdall, Dr. Theodore Drake, Dr. Alan Brown

### – Background:

- In 1931, infants were being fed cereal and biscuits consisting mostly of wheat, oats or corn meal. All the bran and germ had to be removed because whole grain cereal was difficult for babies to digest.
- three doctors from Toronto's HSC, developed a a cereal containing all essential nutrients for healthy early growth, including minerals and vitamins A, B1, B2, D and E.

## #4: Pablum

### – Background (cont'd):

- yet wouldn't cause constipation or diarrhea.
- At that time, the practice of drying milk by letting it drip on a red-hot revolving drum and immediately scraping it off was coming into use.
- The mixture came off the drum as a bone-dry, flaky powder - they called it "**Pablum**".
- For 3 months, babies and children in the hospital were fed the mixture – they liked it and their health improved.

## #4: Pablum

### – Impact

- The development of this new, quick-to-prepare, low cost cereal became internationally famous as Pablum and the discovery improved nutrition for infants across the world.
- Pablum also decreased previously high incidence of nutritional rickets

## #3: Polio Vaccine

- **Key players:**

Jonas Salk, Connaught Medical Research Laboratories

- **Background:**

- As one of most feared childhood diseases of early 20th century, Canada's critical role in the development, production and licensing of the Salk polio vaccine warrants national recognition.
- During 1950's, under the efforts of researcher Jonas Salk, Connaught Medical Research Laboratories at U. of T. enabled the polio virus to be cultivated and produced in quantities large enough to facilitate Salk's massive trial involving roughly 1.8 million children...medium 199, culture technique

## #3: Polio vaccine

### – Background (cont'd)

- Despite reservations in the U.S., Canadian Health Minister Paul Martin Sr., supported continuation of the all-Canadian polio vaccine trial in Canada.
- This success enabled the future development and use of IPV vaccine (Sabin vaccine) in control and elimination of polio within Canada.

## #3: Polio vaccine

### – Impact

- Between 1927 and 1953, Canada experienced roughly 47,000 cases of polio.
- With licensing of Salk vaccine in 1955 along with active involvement of provincial and federal governments in management of the disease, Canada reported its last case of polio infection in 1977.

## #2: Insulin

### – Key players:

Frederick Banting, Charles Best,  
John MacLeod, James B. Collip

### – Background:

- In the fall of 1920, **Frederick Banting** “*Ligate pancreatic ducts of the dog. Keep dogs alive till acini degenerate leaving islets. Try to isolate internal secretion of these and relieve glycosurea*”
- Working at a U. of T. laboratory in 1921, Banting and **Charles Best** made the pancreatic extract with anti-diabetic characteristics and were successful in testing their extract on diabetic dogs.

## #2: Insulin

### – Background (cont'd):

- Within months **Dr. J. MacLeod**, who provided lab space and general scientific direction to Banting and Best, put his entire research team to work on production and purification of insulin.
- **J.B. Collip** joined the team and with his technical expertise the four were able to purify insulin for use on diabetic patients.
- The first tests were conducted early in 1922 and were a spectacular success. Word spread quickly around the world giving immediate hope to many diabetic persons who were near death. Nobel in 1923.

## #2: Insulin

### – Impact

- No uniquely Canadian medical story with greater global health impact than discovery of insulin.
- 100% of children with type 1 diabetes died prior to 1921; children with type 1 diabetes now lead long, productive, happy lives.
- insulin continues to save millions of lives world-wide; especially important as diabetes has continued to increase at an alarming rate of 3-5% per year in developed countries.

# #1: Universal health insurance

## – Background:

- There was a time before Medicare when many Canadian families could not afford the essential care needed for their children
- Today a sick child can get the care they need for without consideration of whether or not they can pay.
- This universal right to care is seen by Canadians as a fundamental defining feature of our nation - an advance Canadians take great pride in.

# #1: Universal health insurance

## – Background (cont'd):

- The establishment of publicly funded health care has also supported the evolution of health care systems focused on newborns and children and has led to introduction of improved treatment, prevention and promotion activities.
- The growth of Children's Hospitals and associated maternity hospitals provides an organized and efficient system of care that has supported broad improvement in child health over the years.

## – Impact:

- The impact of **not** having universal access to health care can be seen in the significantly worse health outcomes of children living in these conditions including developing world environments and even the United States.

# #1: Universal health insurance

## – Key players:

- **Tommy Douglas** introduced public health insurance as the Premier of Saskatchewan and credited **Emmett Hall** as real “father of Medicare”.
- **Hall** was Chair of 1964 Royal Commission on Health Care in Canada which recommended nationwide adoption of Saskatchewan model of public insurance for hospital and out-of-hospital care.
- Paul Martin Sr. and **Lester B. Pearson** was Prime Minister (1963 – 1968) at the time Medicare was introduced nationally.

# Final Tally

1. **Universal health insurance**
2. **Insulin**
3. **Polio vaccine**
4. **Pablum**
5. **WinRho**
6. **Neonatal screening for congenital hypothyroidism**
7. **AIDS drug 3TC**
8. **Mustard operation**
9. **Etiology of childhood HUS – verotoxin producing E. coli**
10. **Yuzpe regimen of emergency contraception**

# Future Problems, Future Paths

- Perinatal and pediatric response to a changing environment.. climactic and otherwise
- Burgeoning obesity and metabolic diseases, mental health
- 25% of Canadians...5% of funding
- Coming together of scientists with appropriate infrastructure and resources will be critical