

Course E Milestones in Public Health and Biotechnology: Canadian Connections

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This course traces major milestones in Canadian public health and biotechnology, including the discovery and development of insulin, Canadian contributions to the control of diphtheria, tuberculosis, polio, and smallpox and, more recently, SARS, Ebola and Zika. The course highlights the personal and political impacts of major disease threats and Canadian biotech efforts to contain and prevent them.

Week 1: Sept. 15 Preludes in Canadian Public Health

The course begins by highlighting the impact of smallpox from the early 17th century and efforts to control its spread through inoculation and then vaccination. Cholera was a major public health threat during the 19th century and also a major driver of public health development, particularly in Toronto. The devastation of diphtheria, the hope of diphtheria antitoxin, and a resurgence of smallpox amidst vaccination challenges in the late 19th century will conclude class #1.

Week 2: Sept. 22 Plagues and Pioneers (1910-1919)

This class will focus on the 1910s and the transformative public-health-building efforts led by pioneers like Dr. John G. FitzGerald in response to diphtheria and the need for a Canadian source of affordable antitoxins and vaccines. FitzGerald's initiative led to the establishment of Connaught Laboratories at U of T in 1914. Especially transformative to Canada's public health system during and after World War I were venereal disease and the great influenza pandemic.

Week 3: Sept. 29 Defeating Diphtheria, Preventing Pertussis, Taming Tuberculosis (1920s-1930s)

Class three will focus on three plagues of the 1920s-30s, diphtheria, pertussis (whooping cough) and tuberculosis, and the divergent stories of the vaccines developed and uniquely deployed in Canada to prevent them. Canadian scientists were able to test and apply new vaccine discoveries more effectively than their original discoverers. The public health success was most dramatic against diphtheria, slowest against pertussis, and perhaps most frustrating against TB.

Week 4: Oct. 6 From Insulin to Heparin (1920s-1930s)

These decades saw two transformative advances in made-in-Canada biotechnology. One is well known – the discovery of insulin. The other, less known, but more broadly significant, was the development of heparin at the U of T's Connaught Labs. Heparin, like insulin, is an extract of animal tissue and is used to control blood coagulation, making possible open-heart surgery, heart- lung machines and kidney dialysis. Indeed, heparin sparked a surgical revolution.

Week 5: Oct. 13 War Work: From Dried Blood to Penicillin (1940s)

This class focuses on Canada's public health and biotechnology contributions to World War II. Of most significance was the expedited production of the new miracle drug, penicillin, at Connaught Labs in time for the invasion of France in June 1944. Penicillin would have a miraculous, yet ultimately mixed, impact on the treatment of TB and VD.

Also significant to the war effort was the preparation of dried blood serum, ensuring a safe and well-preserved blood supply at the Front. The Labs were also essential to producing influenza, typhus and tetanus vaccines for the military, and pioneering new combined vaccines at home.

Week 6: Oct. 20 Polio: Conquering the Crippler (1950s-1960s)

This class highlights the major impact of polio, the “middle class plague,” and the essential biotechnology contributions made in Canada to enable its prevention and control. “The Crippler” emerged as an increasingly serious summer plague by the early 20th century, an ironic result of rising sanitary standards. However, it didn’t always hit in the summer, as was underscored by a tragic winter epidemic that struck many Arctic Inuit in the NWT in 1949. Canada was among the countries hardest hit by polio until the Salk vaccine was launched in 1955. A safe and plentiful supply of the vaccine would have been impossible without advances made at Connaught Labs.

Week 7: Oct. 27 Smallpox: Eradicating the Speckled Monster (1960s-70s)

Although smallpox was brought under control in Canada by the 1940s, it remained a major threat in many parts of the world. Connaught Labs played a decisive role in a sophisticated global smallpox eradication program that began in 1967. It was critical in establishing a standard vaccine production method and in assisting local producers meet it. The ultimate result was the declaration in 1979 that smallpox was dead.

Week 8: Nov. 3 Transformations and Shifting Targets (1970s-80s)

In class eight we explore how the eradication of smallpox underscored the belief that infectious diseases were safely under control and that other public health or “community medicine” issues could receive more attention. Biotechnology was also undergoing significant change during the 1970s, exemplified by the U of T selling Connaught Labs in 1972. In 1975, U of T also closed its School of Hygiene, which had been intimately connected to Connaught, absorbing it into a new Community Medicine department. In 1976, amidst this period of transformation, the threat (ultimately unrealized) of another influenza pandemic prompted an unprecedented effort in the US and Canada to undertake a mass vaccination program.

Week 9: Nov. 10 New Threats and Strategies: From AIDS to SARS (1980s-2000s)

Class nine traces the resurgence of infectious disease threats in Canada, beginning with AIDS in the early 1980s and ending with SARS in Toronto in 2003. In between, a deadly bacterial contamination threatened the water supply of Walkerton, ON, and smallpox re-emerged as a potential bioterrorist weapon after 9/11. While vaccines to prevent AIDS and SARS were not forthcoming, a new smallpox vaccine for a Canadian stockpile was prepared from vaccine production materials frozen at Connaught Labs when smallpox was eradicated. The SARS crisis showed that Canada’s public health system was ill prepared for such an infectious disease threat. This prompted the creation of the Public Health Agency of Canada and Public Health Ontario.

Week 10: Nov. 17 Legacies and Challenges

Some historic public health threats, such as polio, are close to joining smallpox in being eradicated from the planet, although polio’s paralytic legacy haunts many of its victims in the form of post-polio syndrome. Pertussis remains a persistent public health threat despite a modern acellular vaccine developed by Connaught Labs. And measles, a disease that has been close to eradication, has often returned as a result of the refusal by some of a safe and effective vaccine. Alarming recent outbreaks of Ebola in Africa and Zika in Latin America have prompted urgent efforts in Canada and elsewhere to develop new vaccines. Such efforts are being frustrated by political and economic complications as much as scientific ones.