Making a Difference:

Milestones in Public Health & Biotechnology: Canadian Connections

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Lecture #3 – Defeating Diphtheria, Preventing Pertussis, Taming TB & Facing Polio (1920s-30s)

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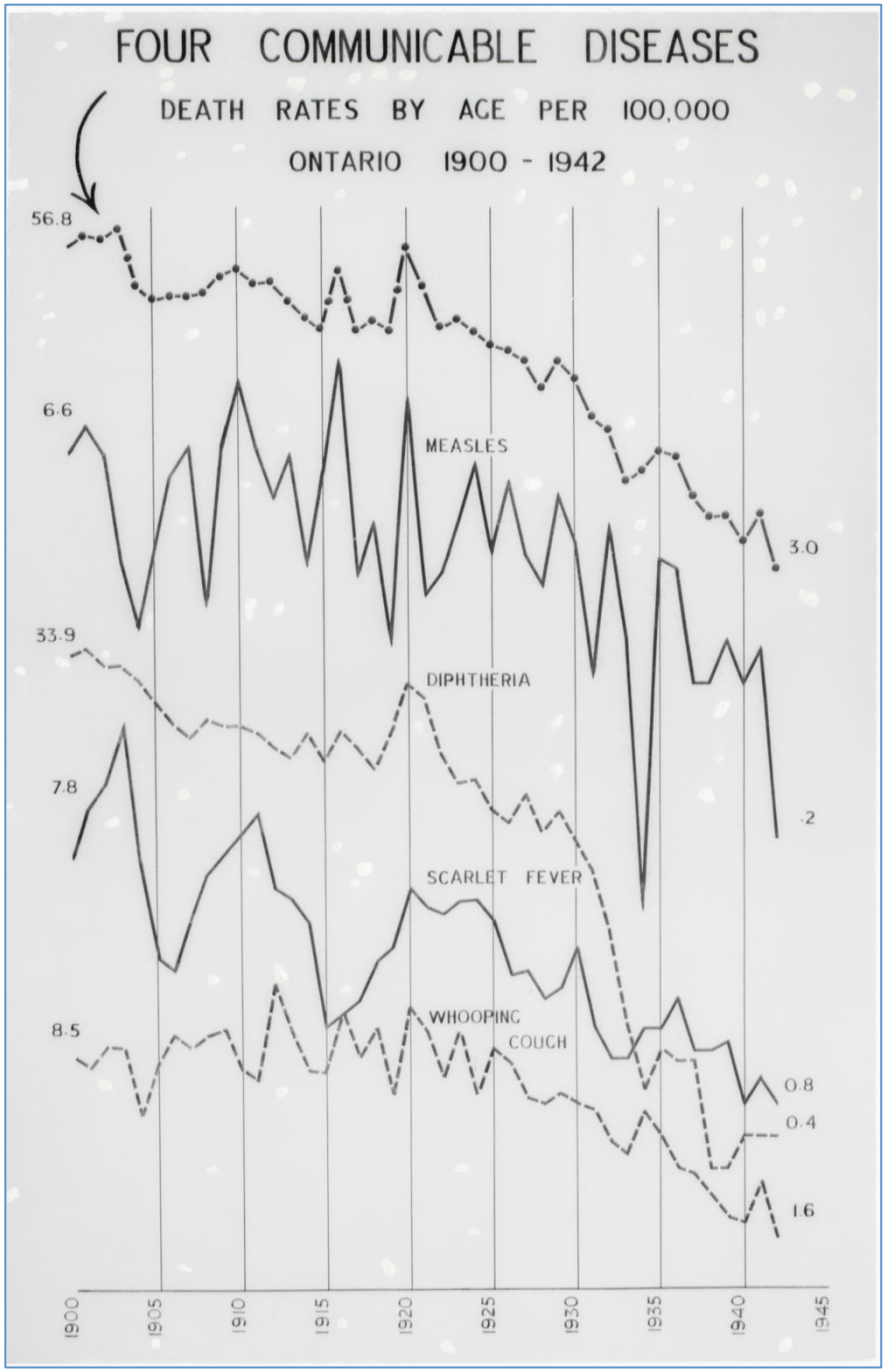
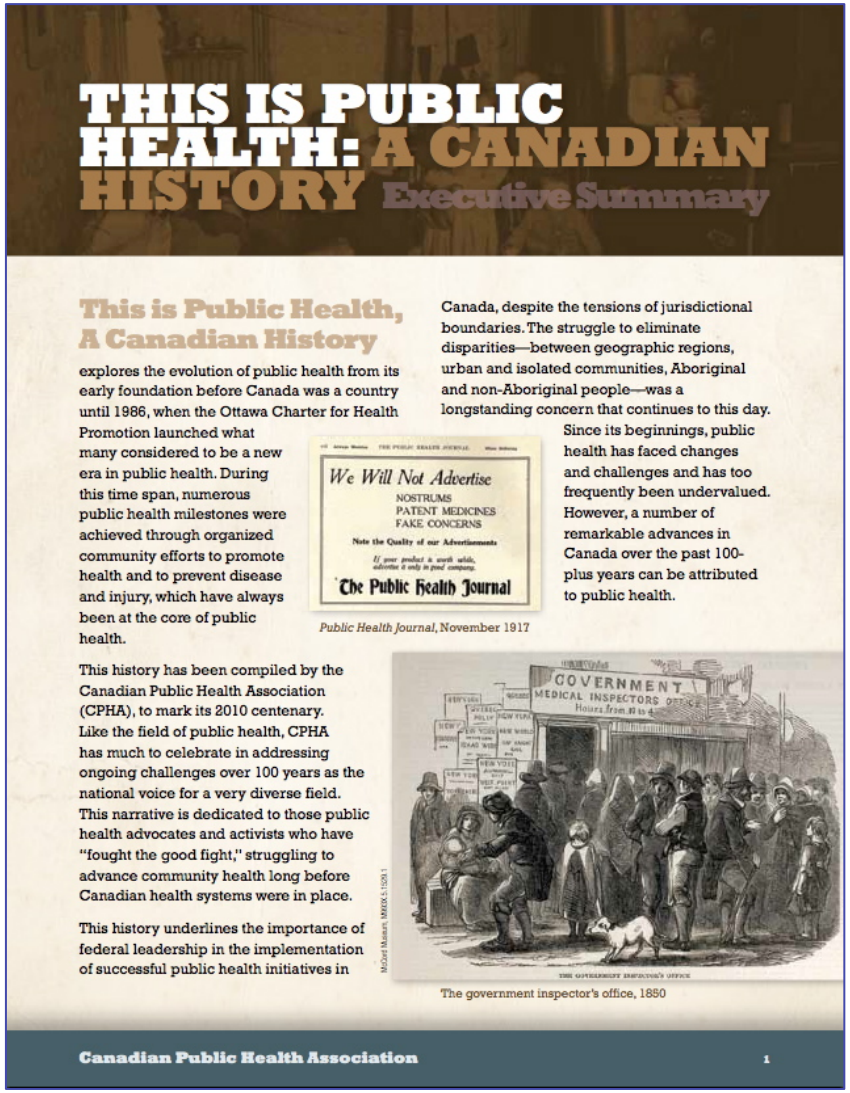
Living and Learning in Retirement, Course E
Class #2, September 29, 2017
Glendon College, York U., Room A002



Introduction

- Class #3 will focus on three plagues of the 1920s-30s, diphtheria, pertussis (whooping cough) and tuberculosis, and the dramatic, dynamic and quite divergent stories of the vaccines that were developed and uniquely deployed in Canada to prevent them.
- Amidst persistent high incidence of each disease, Canadian scientists were able to test and apply new vaccine discoveries more effectively than their original discoverers had done.
- The public health success was most dramatic against diphtheria, slowest against pertussis, and perhaps most frustrating against TB.
- This was a creative and fearless period in Canadian public health, but the limits of progress sometimes became apparent.
- However, two other diseases shared the public health spotlight during this period for different reasons: polio was a growing and unchecked challenge, while smallpox remained persistent largely because it could be checked but too often wasn't…


THIS IS PUBLIC HEALTH: A CANADIAN HISTORY Executive Summary

This is Public Health, A Canadian History explores the evolution of public health from its early foundation before Canada was a country until 1986, when the Ottawa Charter for Health Promotion launched what many considered to be a new era in public health. During this time span, numerous public health milestones were achieved through organized community efforts to promote health and to prevent disease and injury, which have always been at the core of public health.

Canada, despite the tensions of jurisdictional boundaries. The struggle to eliminate disparities—between geographic regions, urban and isolated communities, Aboriginal and non-Aboriginal people—was a longstanding concern that continues to this day. Since its beginnings, public health has faced changes and challenges and has too frequently been undervalued. However, a number of remarkable advances in Canada over the past 100-plus years can be attributed to public health.

Public Health Journal, November 1917

This history has been compiled by the Canadian Public Health Association (CPHA), to mark its 2010 centenary. Like the field of public health, CPHA has much to celebrate in addressing ongoing challenges over 100 years as the national voice for a very diverse field. This narrative is dedicated to those public health advocates and activists who have "fought the good fight," struggling to advance community health long before Canadian health systems were in place.

This history underlines the importance of federal leadership in the implementation of successful public health initiatives in

The government inspector's office, 1850

Canadian Public Health Association 1

C.J. Rutty, *This is Public Health: A Canadian History* (Canadian Public Health Association eBook, 2010) - https://www.cpha.ca/history-e-book

1919-24 – Still, Smallpox

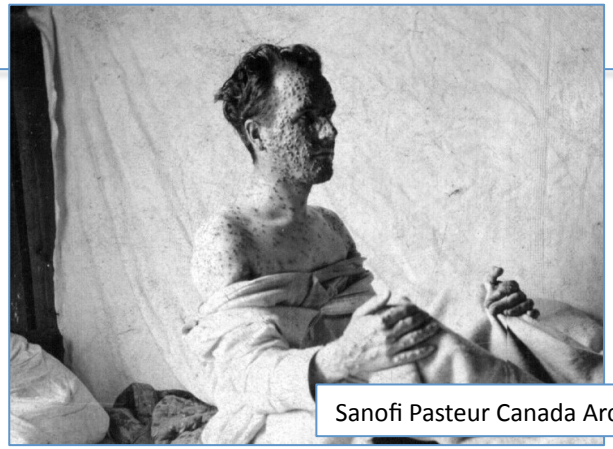
- **1919-20** – As highlighted at the end of class #2, smallpox incidence rose alarmingly, especially in parts of Ontario, including Toronto

- The last significant outbreak had been in 1906 and there was significant resistance building since 1900 to enforcement of provincial and local legislation for compulsory smallpox vaccination of children prior to entering school

Public Health Journal (Dec 1919), p. 583

Smallpox in Toronto

A widespread outbreak of smallpox occurred in Toronto early in November. The cases were mainly of a mild type. The rush of citizens to be vaccinated was so great that those responsible both for the production of smallpox vaccine virus and for the vaccinations had great difficulty in coping with the demand. A small but noisy minority in the city rushed into print to express the condemnation of the Health Department in organizing a campaign of vaccination. A member of the Board of Control is reported in the daily press to have declared that he would refuse to pay his school taxes if his child was not permitted to attend school without a certificate of vaccination. This highly edifying spectacle of a member of one of the municipal governing bodies indicating his intention of defying the law should have but one result. All good citizens who are interested in the furtherance of the best interests of public health work in Toronto are advised to see to it that the controller regains his status as a private citizen on January first next.

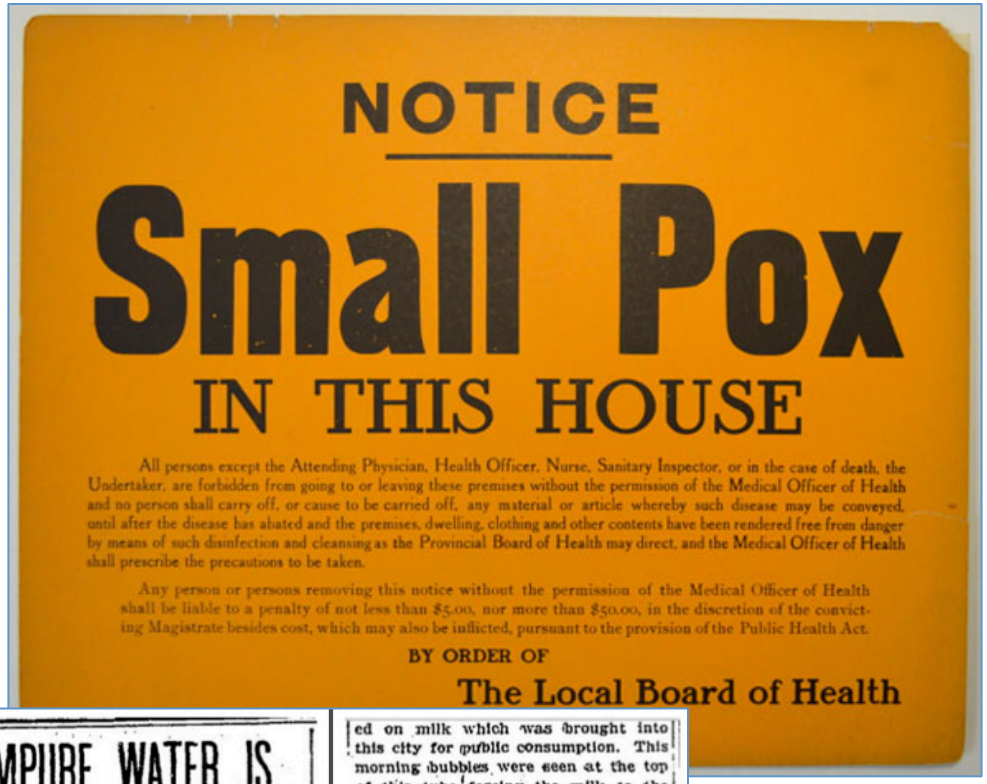


Sanofi Pasteur Canada Archives

1919-24 – Still, Smallpox

- **1900-06** - The main source of anti-vaccination concern, in addition to the compulsory enforcement issue, was the public perception of the vaccine being made from cows kept in “filthy” farm conditions

- Such “filthy” farm conditions were often pointed to by public health authorities as a breeding ground for other diseases, especially tuberculosis, which was spread to children through infected, “unpasteurized” milk



NOTICE

Small Pox

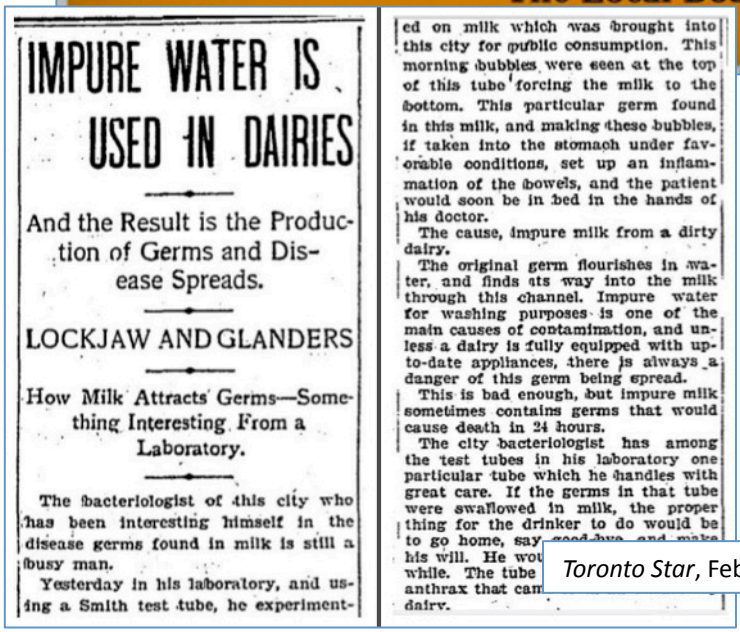
IN THIS HOUSE

All persons except the Attending Physician, Health Officer, Nurse, Sanitary Inspector, or in the case of death, the Undertaker, are forbidden from going to or leaving these premises without the permission of the Medical Officer of Health and no person shall carry off, or cause to be carried off, any material or article whereby such disease may be conveyed, until after the disease has abated and the premises, dwelling, clothing and other contents have been rendered free from danger by means of such disinfection and cleansing as the Provincial Board of Health may direct, and the Medical Officer of Health shall prescribe the precautions to be taken.

Any person or persons removing this notice without the permission of the Medical Officer of Health shall be liable to a penalty of not less than $5.00, nor more than $50.00, in the discretion of the convicting Magistrate besides cost, which may also be inflicted, pursuant to the provision of the Public Health Act.

BY ORDER OF

The Local Board of Health



IMPURE WATER IS USED IN DAIRIES

And the Result is the Production of Germs and Disease Spreads.

LOCKJAW AND GLANDERS

How Milk Attracts Germs—Something Interesting From a Laboratory.

The bacteriologist of this city who has been interesting himself in the disease germs found in milk is still a busy man.

Yesterday in his laboratory, and using a Smith test tube, he experimented on milk which was brought into this city for public consumption. This morning bubbles were seen at the top of this tube forcing the milk to the bottom. This particular germ found in this milk, and making these bubbles, if taken into the stomach under favorable conditions, set up an inflammation of the bowels, and the patient would soon be in bed in the hands of his doctor.

The cause, impure milk from a dirty dairy.

The original germ flourishes in water, and finds its way into the milk through this channel. Impure water for washing purposes is one of the main causes of contamination, and unless a dairy is fully equipped with up-to-date appliances, there is always a danger of this germ being spread.

This is bad enough, but impure milk sometimes contains germs that would cause death in 24 hours.

The city bacteriologist has among the test tubes in his laboratory one particular tube which he handles with great care. If the germs in that tube were swallowed in milk, the proper thing for the drinker to do would be to go home, say good-bye and make his will. He wou
while. The tube
anthrax that can
dairy.

Toronto Star, Feb 1, 1901, p. 2

1919-24 – Still, Smallpox

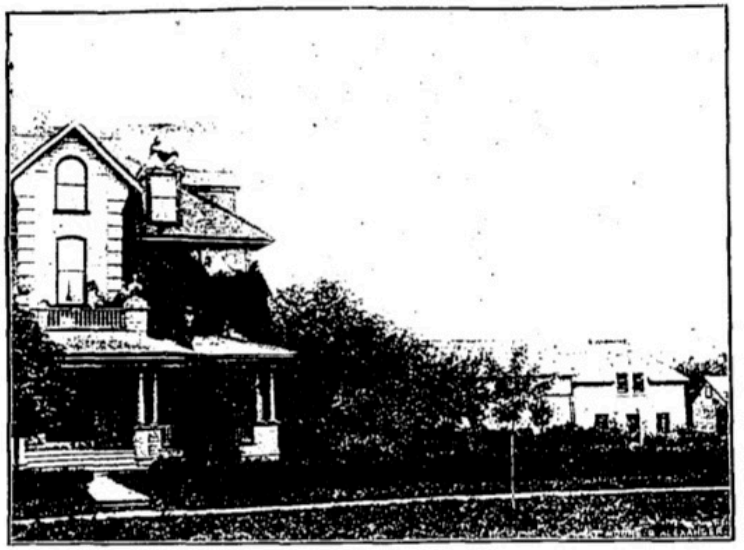
- To help counter the perception of vaccine from dirty animals, an April 1901 *Globe* newspaper feature article focused on the "Pure Vaccine" prepared at the Ontario Vaccine Farm, where "cleanliness everywhere" was their motto

LABORATORY OF THE ONTARIO VACCINE FARM.

PURE VACCINE, WHERE IT IS MADE.

The recent outbreak of smallpox at several points in this Province have emphasized more than ever to the public mind the necessity of taking precautions to prevent the spread of the dread disease. Cleanliness and orderly habits of life are, of course, great factors in warding off any sickness, but in the case of smallpox it is recognized that something more is required, and this something more is now admitted to be vaccination. Time was when an apparently insurmountable prejudice existed against vaccination, but the most prominent in the medical profession the world over now advocate it as the one sure preventive, and that prejudice has almost entirely disappeared. To be a sure preventive, however, two qualities are required in erected on a light elevation, thus ensuring thorough drainage of the stables and operating room, a matter very necessary for the proper sanitary working of the farm. The buildings are substantially erected of white brick, the stables being concreted, while an artesian well affords an abundance of water for flushing purposes and pure drinking water for the animals.

It is in the operating-room itself that the visitor finds most to interest him, for here is done the work of charging the vaccine points with the virus, direct from the vesicle produced by the operation on the animal. This is done with a sterilized camel's-hair brush. The operating-room itself is concreted and kept absolutely free from all impurities. Constant washing and flushing and frequent fumigating render it practically impossible for germs to exist. In the treatment of the animals,



ONTARIO VACCINE FARM AND RESIDENCE OF DR. STEWART.

The Globe, April 6, 1901, p. 7

1919-24 – Still, Smallpox

- **1919-20** – In the context of the post World War I period, the primary issue driving anti-vaccination sentiments was the perception of the strong arm of the state – provincial and local government health boards – fighting against parental freedom with respect to protecting the health of their children

- There were still concerns about the effectiveness and safety of the vaccine, but they were secondary in the face of the vaccine's wide use, despite the loud controversy, and the lower incidence of smallpox

Oppose Compulsory Vaccination

Vaccination is not a sure preventive of smallpox. Vaccination is, in fact, more dangerous than smallpox. When you allow your children to be vaccinated you are taking a terrible risk. You may cripple your children for life, inflict upon them some loathsome and incurable disease, or even accomplish their death in a short time. And in spite of all these risks your child will not be proof against contracting smallpox.

Come to Massey Hall Wed., Nov. 19 - 8 p.m.

Chairman : His Worship Mayor Church

His Worship the Mayor has called a public meeting of protest against compulsory vaccination. We believe that 80% of the adult population of Toronto are opposed to compulsory vaccination. Let those who believe in vaccination be vaccinated. But why should any public official have the power to force it upon those who doubt its efficiency as a preventive and are positively convinced of its danger?

Come Along! The Meeting is FREE TO ALL

: DR. HASTINGS is Especially Invited :

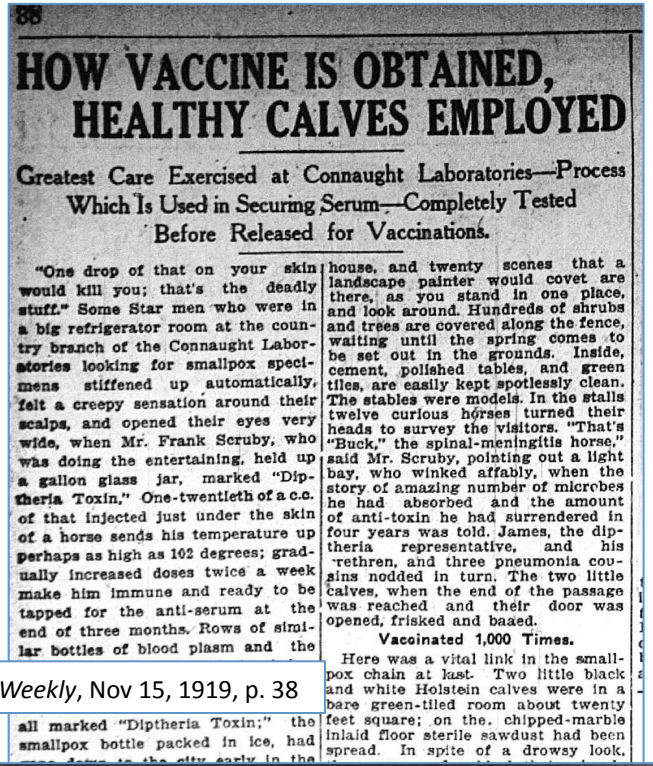
It costs money to fight entrenched privilege. Send your best campaign contribution to the Secretary-Treasurer of the Campaign Committee, Anti-Vaccination League, A. B. Farmer, 378 Markham Street.
All committee members serving without any fees or charges whatsoever.

The Globe, Nov 19, 1919, p. 2

1919-24 – Still, Smallpox

- **1919-20** – Another key element was the presence of Connaught Laboratories and its assuming responsibility in 1916 for preparing smallpox vaccine of a much higher quality, and for the whole country

- Connaught's work as a unique public service part of the University of Toronto was widely respected, particularly after its war work, which included production of smallpox vaccine for the military



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HOW VACCINE IS OBTAINED, HEALTHY CALVES EMPLOYED

Greatest Care Exercised at Connaught Laboratories—Process Which Is Used in Securing Serum—Completely Tested Before Released for Vaccinations.

"One drop of that on your skin would kill you; that's the deadly stuff." Some Star men who were in a big refrigerator room at the country branch of the Connaught Laboratories looking for smallpox specimens stiffened up automatically, felt a creepy sensation around their scalps, and opened their eyes very wide, when Mr. Frank Scruby, who was doing the entertaining, held up a gallon glass jar, marked "Diptheria Toxin." One-twentieth of a c.c. of that injected just under the skin of a horse sends his temperature up perhaps as high as 102 degrees; gradually increased doses twice a week make him immune and ready to be tapped for the anti-serum at the end of three months. Rows of similar bottles of blood plasm and the all marked "Diptheria Toxin;" the smallpox bottle packed in ice, had

house, and twenty scenes that a landscape painter would covet are there, as you stand in one place, and look around. Hundreds of shrubs and trees are covered along the fence, waiting until the spring comes to be set out in the grounds. Inside, cement, polished tables, and green tiles, are easily kept spotlessly clean. The stables were models. In the stalls twelve curious horses turned their heads to survey the visitors. "That's "Buck," the spinal-meningitis horse," said Mr. Scruby, pointing out a light bay, who winked affably, when the story of amazing number of microbes he had absorbed and the amount of anti-toxin he had surrendered in four years was told. James, the diptheria representative, and his brethren, and three pneumonia cousins nodded in turn. The two little calves, when the end of the passage was reached and their door was opened, frisked and baaed.

Vaccinated 1,000 Times.

Here was a vital link in the smallpox chain at last. Two little black and white Holstein calves were in a bare green-tiled room about twenty feet square; on the chipped-marble inlaid floor sterile sawdust had been spread. In spite of a drowsy look,

Toronto Star Weekly, Nov 15, 1919, p. 38

THE TORONTO STAR WEEKLY

PREPARING VACCINE TO FIGHT SMALLPOX EPIDEMIC

The lower picture shows the farm section of the Connaught Laboratories, situated twelve miles north of the centre of the city, near Dufferin street. This picture was taken from the north-east, and shows the superintendent's residence on the left. Above on the right-hand corner are illustrated the incubators in which broths for the propagation of diphtheria anti-toxin and spinal meningitis serum are kept at blood heat, 98 degrees Fahrenheit, at which temperature they thrive best. There is very little difference in construction from an incubator for eggs. To the left of the latter a calf is shown receiving her preliminary shampoo, preparatory to being shaved. On the exertme left of the picture is shown the 'pulpit,' or pustulated area from the calf's abdomen, a green material, which is sent in this sealed jar to the laboratories at the University to be refined.

Sanofi Pasteur Canada Archives

1919-24 – Still, Smallpox

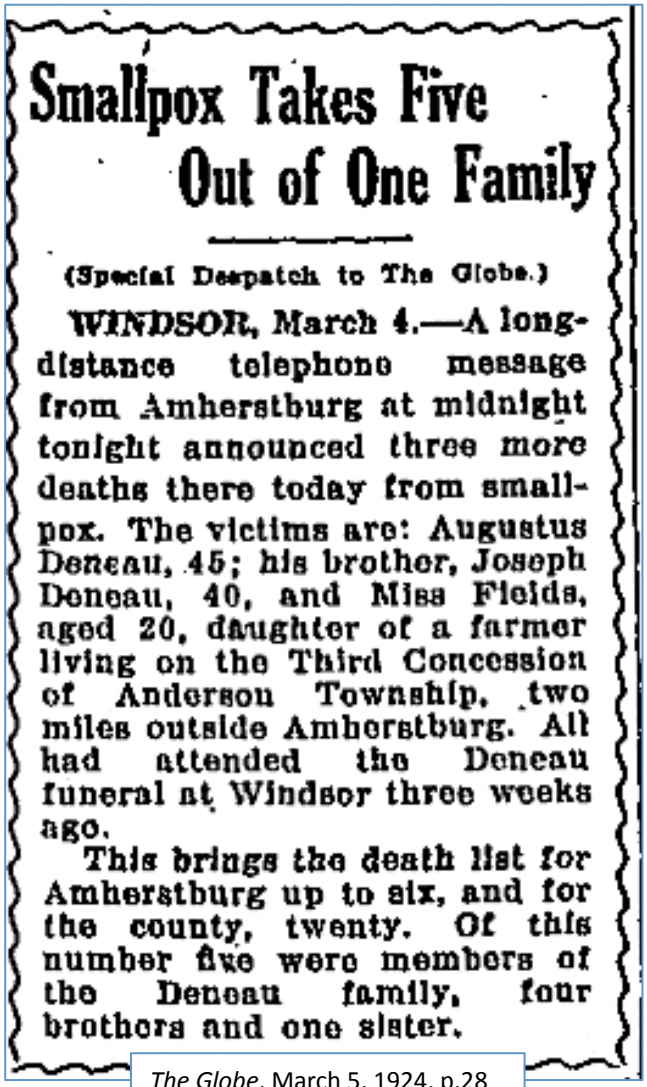
- While the political intensity surrounding compulsory vaccination eased, smallpox remained a serious threat when enough people in a particular area (or family) neglected, or refused, to be vaccinated

- **1923-24** - Such was the case when smallpox spread from Detroit into the Windsor area, leading to the worst outbreak since 1885

- **Feb 1924** – A particularly virulent case that had not been recognized initially resulted in a man's death.

- Similarly virulent cases then occurred among those who attended his funeral; in all, 67 cases were reported and 32 died.

- The mortality rate among the unvaccinated was 71%, while no one vaccinated over the previous 12 years contracted the disease and no one who had ever been vaccinated died of smallpox.



Smallpox Takes Five Out of One Family

(Special Despatch to The Globe.)

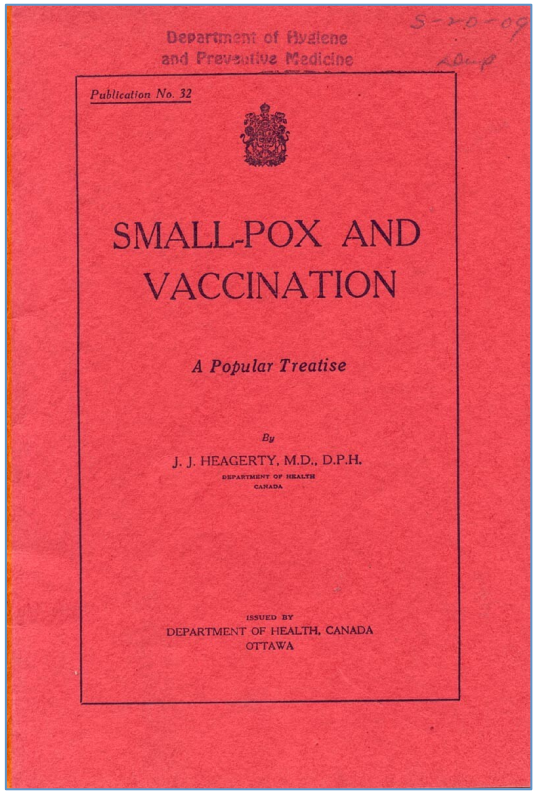
WINDSOR, March 4.—A long-distance telephone message from Amherstburg at midnight tonight announced three more deaths there today from small-pox. The victims are: Augustus Deneau, 45; his brother, Joseph Deneau, 40, and Miss Fields, aged 20, daughter of a farmer living on the Third Concession of Anderson Township, two miles outside Amherstburg. All had attended the Deneau funeral at Windsor three weeks ago.

This brings the death list for Amherstburg up to six, and for the county, twenty. Of this number five were members of the Deneau family, four brothers and one sister.

The Globe, March 5, 1924, p.28

1919-24 – Still, Smallpox

- Vaccination of most of the population in and around Windsor stopped the epidemic abruptly and completely
- When the emergency was over, local health officials concluded, "the value of vaccination as a means of prevention has been proven as never before."
- The Windsor outbreak re-invigorated smallpox vaccination and re-vaccination initiatives in other parts of the country.
- J.J. Heagerty, Chief Health Officer of the federal Department of Health, used the Windsor smallpox story in a 27-page illustrated booklet, *Small-Pox and Vaccination: A Popular Treatise*


Department of Hygiene and Preventive Medicine

Publication No. 32

SMALL-POX AND VACCINATION

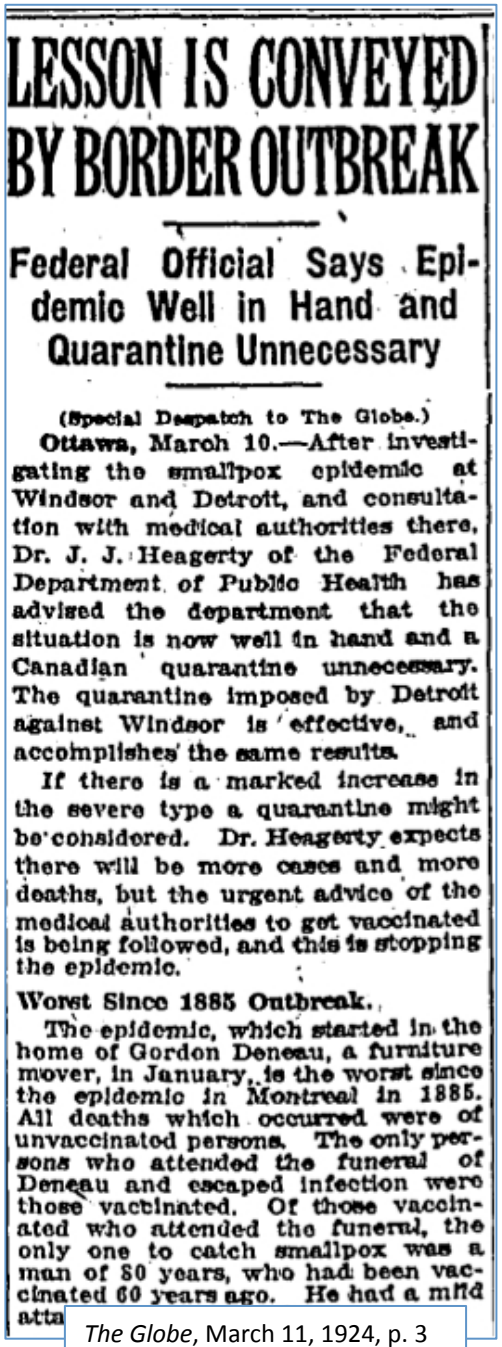
A Popular Treatise

By

J. J. HEAGERTY, M.D., D.P.H.

DEPARTMENT OF HEALTH CANADA

ISSUED BY DEPARTMENT OF HEALTH, CANADA OTTAWA


LESSON IS CONVEYED BY BORDER OUTBREAK

Federal Official Says Epidemic Well in Hand and Quarantine Unnecessary

(Special Despatch to The Globe.)

Ottawa, March 10.—After investigating the smallpox epidemic at Windsor and Detroit, and consultation with medical authorities there, Dr. J. J. Heagerty of the Federal Department of Public Health has advised the department that the situation is now well in hand and a Canadian quarantine unnecessary. The quarantine imposed by Detroit against Windsor is effective, and accomplishes the same results.

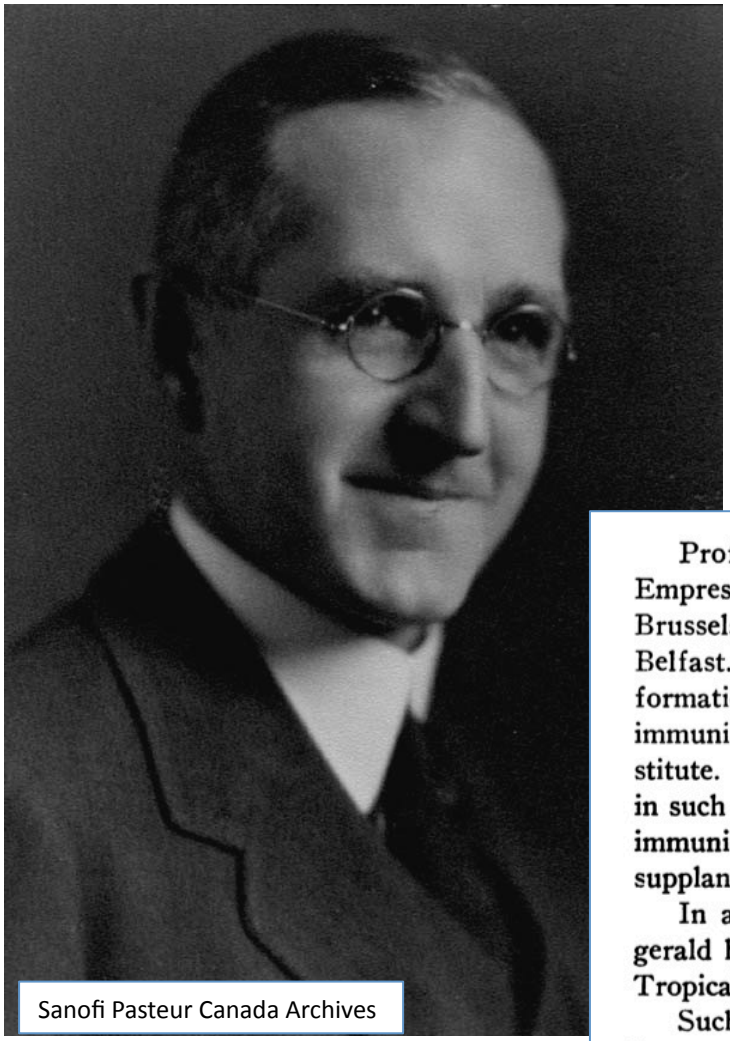
If there is a marked increase in the severe type a quarantine might be considered. Dr. Heagerty expects there will be more cases and more deaths, but the urgent advice of the medical authorities to get vaccinated is being followed, and this is stopping the epidemic.

Worst Since 1885 Outbreak.

The epidemic, which started in the home of Gordon Deneau, a furniture mover, in January, is the worst since the epidemic in Montreal in 1885. All deaths which occurred were of unvaccinated persons. The only persons who attended the funeral of Deneau and escaped infection were those vaccinated. Of those vaccinated who attended the funeral, the only one to catch smallpox was a man of 80 years, who had been vaccinated 60 years ago. He had a mild atta

The Globe, March 11, 1924, p. 3

Defeating Diphtheria: Canadian Leadership



Sanofi Pasteur Canada Archives

- **July-Aug 1924** – Soon after the Windsor area smallpox epidemic was brought under control, with considerable effort from Connaught Labs providing vaccine, the Lab's Director, Dr. J.G. FitzGerald, set off on a significant trip to Europe with a fresh determination focused on investigating new possibilities aimed at finally preventing diphtheria

Professor J. G. Fitzgerald sailed for Europe, July 30th, on the Empress of Scotland. His itinerary included visits to Paris, Lyons, Brussels, Copenhagen, Lund, Stockholm, London, Edinburgh, Dublin and Belfast. It is understood that the purpose of his trip is to gather information in regard to the new developments in research in diphtheria immunization with anatoxin, developed by Ramon at the Pasteur Institute. (Anatoxin is a term used to designate diphtheria toxin modified in such a way as to diminish greatly the toxic effects and yet preserve its immunizing power. It is anticipated that this anatoxin will eventually supplant the use of toxin-antitoxin for purposes of active immunization).

In addition to study of this problem at first hand, Professor Fitzgerald hopes to see the plans of the London School of Hygiene and Tropical Medicine.

Such a comprehensive itinerary, to be carried out in a very short time has necessitated literally a flying visit. Professor Fitzgerald has many flying hours to his credit.

Public Health Journal, Sept 1924, p. 434

Defeating Diphtheria: Canadian Leadership

- FitzGerald had heard that Dr Gaston Ramon at the Pasteur Institute in Paris, had very recently discovered that treating a potent diphtheria toxin with formaldehyde and heat made it non-toxic and could stimulates active immunity in humans

- Ramon was a veterinarian and an expert with diphtheria toxin and preparing antitoxin, but could only test the the effectiveness of the "anatoxine" in the lab on a small scale.

Defeating Diphtheria: Canadian Leadership

- **1924** – FitzGerald's visit with Ramon in Paris was very timely since FitzGerald was ideally able to facilitate further development of the "diphtheria anatoxine" in an expeditious way that Ramon couldn't at the time

- Indeed, FitzGerald was so impressed by Ramon's discovery (translated to "diphtheria toxoid") that he immediately contacted Dr. Peter Moloney at Connaught, who, like Ramon, was a scientist well experienced with handling diphtheria toxin

- FitzGerald described Ramon's methods to Moloney and asked him to drop everything and immediately begin preparing the toxoid


Sanofi Pasteur Canada Archives

- Moreover, by the time FitzGerald returned to the Labs, plans were developing to test the toxoid in a series of local field trials

Defeating Diphtheria: Canadian Leadership

- **Oct 1925** - After preliminary studies, the new toxoid was ready to be given to children in six cities, primarily in Ontario, where a total of 15,000 pre-school and school-age children were targeted with two doses in Brantford, Windsor and Hamilton

Sanofi Pasteur Canada Archives

University of Toronto Medical Bulletin, 10 (1930), p. 5

Reprint from University of Toronto Medical Bulletin, vol. X, 1930, p. 5.

Diphtheria Toxoid in the Prevention of Diphtheria in Canada

By

J. G. FitzGerald

(Connaught Laboratories, University of Toronto)

Since the first of October, 1925, diphtheria toxoid has been very extensively used in Canada for vaccination against diphtheria and it has now almost completely taken the place of toxin-antitoxin.

In Canada, as elsewhere, diphtheria continues to be a very serious public health problem, in spite of the existence of many public health diagnostic laboratories and the free distribution in each province of toxoid and antitoxin for the prevention and treatment of this disease. It would seem that the general use of antitoxin in the course of the last thirty-four years has not appreciably modified diphtheria morbidity. In Ontario in the five year period 1921 to 1925, diphtheria was the cause of one death in six in children aged from two to fourteen years. In 1920-1924, in all Canada, the total number of deaths among children from two to fourteen years was 20,892 and of this number 3,214 deaths, that is 15.3 per cent., were caused by diphtheria.

The introduction of toxin-antitoxin of Park and his colleagues of New York in 1913 opened a new period in the control of diphtheria. Owing to the World War which came the following year, the introduction into Canada of this method of vaccination against diphtheria was delayed until 1919-20. From 1920 to 1925 toxin-antitoxin was employed on a large scale in different parts of the Dominion, particularly in the province of Saskatchewan and in the city of Hamilton.

However, until the publication of Ramon's work on diphtheria anatoxin in 1923 and 1924, only moderate progress had been made throughout Canada in the specific prevention of diphtheria by toxin-antitoxin. The introduction, due especially to Ramon, of a method to determine the flocculation power of modified diphtheria toxin (anatoxin) was a contribution not only of theoretical interest but of considerable practical value. The publications of Moloney and Fraser and their colleagues have given in detail the results of the research undertaken in the Connaught Laboratories of the University of Toronto during the past four years. This work has included the Ramon flocculation reaction, the method of preparation and purification of toxoid, as well as the most careful and complete study of its antigenic value. The means of control of the so-called "reaction" to toxoid and the immunization of subjects sensitive to toxoid have also been elaborated by Moloney and his colleagues.

As a result of research, we have concluded that toxoid is superior to toxin-antitoxin for various reasons. One of the most important is perhaps the fact that while possessing absolute innocuity, it is also antigenic, while toxin-antitoxin retains slight specific toxicity. Moreover, the immunizing value of toxoid is easily determined, as shown by Ramon, Moloney and others. Finally, toxoid does not contain any foreign or heterologous serum. It seems to us that there are many advantages in effecting detoxification without using such a serum.

Investigations carried on for over a year and a half in the laboratory and various clinics and institutions preceded the general distribution of toxoid by the Connaught Laboratories throughout Canada. The following table

Defeating Diphtheria: Canadian Leadership: *Hamilton Slays the Dragon*

- **1890s-1910s** - Hamilton was hit especially hard by diphtheria outbreaks

- **1911** - As Hamilton's Medical Officer of Health, Dr. James Roberts, wrote, of particular concern was the school population "derived from the districts of the city where the industrial classes are centred, where the housing is inferior, the sewer accommodation insufficient, the families large, and where overcrowding exists…"

DIPHTHERIA—HAMILTON, CANADA

1905-1927

Year	*Population	Cases		Deaths	
		Number	Rate per 100,000 population	Number	Rate per 100,000 population
1905	57.561	218	379	22	38.1
1906	59.543	180	302	21	35.3
1907	61.443	146	238	14	22.8
1908	64.067	92	144	8	12.5
1909	66.967	182	272	18	26.9
1910	70.221	152	217	23	32.7
1911	73.542	89	121	9	12.2
1912	82.095	130	158	10	12.2
1913	88.918	126	142	12	13.5
1914	100.808	194	192	16	15.9
1915	101.314	210	207	20	19.7
1916	100.461	223	222	35	34.8
1917	104.491	255	244	27	25.8
1918	107.832	128	119	20	18.5
1919	110.137	185	168	14	12.7
1920	108.143	596	551	44	40.7
1921	114.766	608	530	41	35.7
1922	118.243	747	632	32	27.1
1923	120.234	381	317	26	21.6
1924	120.945	501	414	32	26.5
1925	122.238	232	190	14	11.5
1926	122.459	121	99	3	2.4
1927	123.359	11	8.9	1	.8

*According to assessment of previous year.

Defeating Diphtheria: Canadian Leadership: *Hamilton Slays the Dragon*

- Dr. James Roberts served as Hamilton's Medical Officer of Health from 1905 until his death in 1940.
- He not only transformed public health in Hamilton, but was a leader in public health advancement in North America
- Indeed, his successes in reducing infant mortality and tuberculosis, and especially in controlling diphtheria, made Hamilton internationally known.

James Roberts, M.D., M. O. H., Hamilton, Ontario,

Defeating Diphtheria: Canadian Leadership: *Hamilton Slays the Dragon*

- **Jan 1922** - Encouraged by recent U.S. experience, Roberts established a clinic in Hamilton to administer diphtheria toxin-antitoxin to children.

- **1914** - Diphtheria toxin-antitoxin, which carefully blended the two materials, had been the first biological for active diphtheria immunization, but it was risky

Diphtheria toxin-antitoxin clinic in New York City, early 1920s

- There were no serious reactions reported to the toxin-antitoxin, which Connaught Laboratories had prepared since 1919

- But the immunization program was limited in scope and risky and Roberts hoped for something better

Defeating Diphtheria: Canadian Leadership: *Hamilton Slays the Dragon*

- **1925-27** − Hamilton's success with the initial use of diphtheria toxoid was the most dramatic and widely recognized

- 20,000 pre-school and school age children immunized by public health & private physicians

- 1915-1919 − 1,001 cases, 116 deaths
- 1920-1924 − 2,833 cases, 175 deaths
- 1925-1927 − 363 cases, 18 deaths
- Nov 1, 1926 − Sept 30, 1927 − 10 cases, 1 death

- **1931** - Roberts uniquely captured the Hamilton diphtheria success story into a dramatic and popular public health exhibit

PUBLIC HEALTH ADMINISTRATION

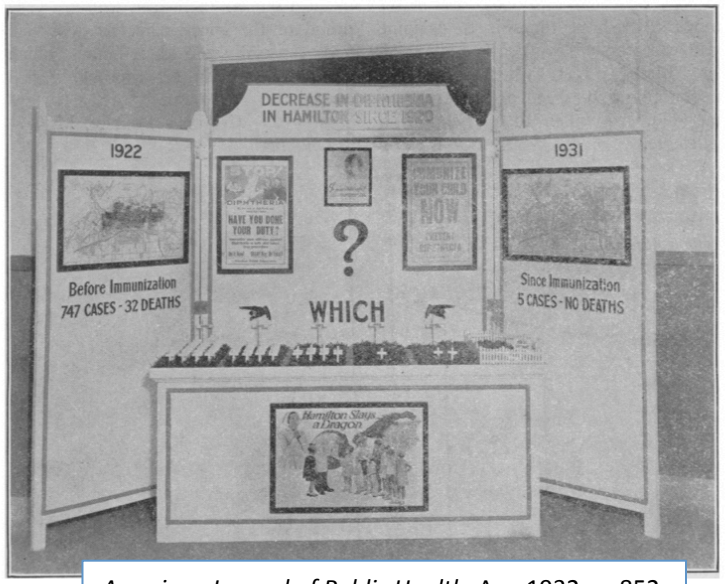
DIPHTHERIA IMMUNIZATION EXHIBIT, HAMILTON, ONTARIO

JAMES ROBERTS, M.D., F.A.P.H.A.
Medical Officer of Health, Hamilton, Ontario

IN spite of the success of our diphtheria immunization work since 1922 it was found essential to awaken, or I might say re-awaken interest in the subject, so that the almost absence of diphtheria in the city would not lull parents into such a sense of security that they would neglect to have their children immunized; and to depict to them in a manner that would leave no doubt in their minds that the work had resulted in a great decrease in cases and deaths.

To do this something had to be evolved that could be easily transported from place to place, that would fit into store windows and similar positions where accommodation was limited, and, above all, that would immediately arrest attention so that the passer-by would stop to look.

The background is made up of three



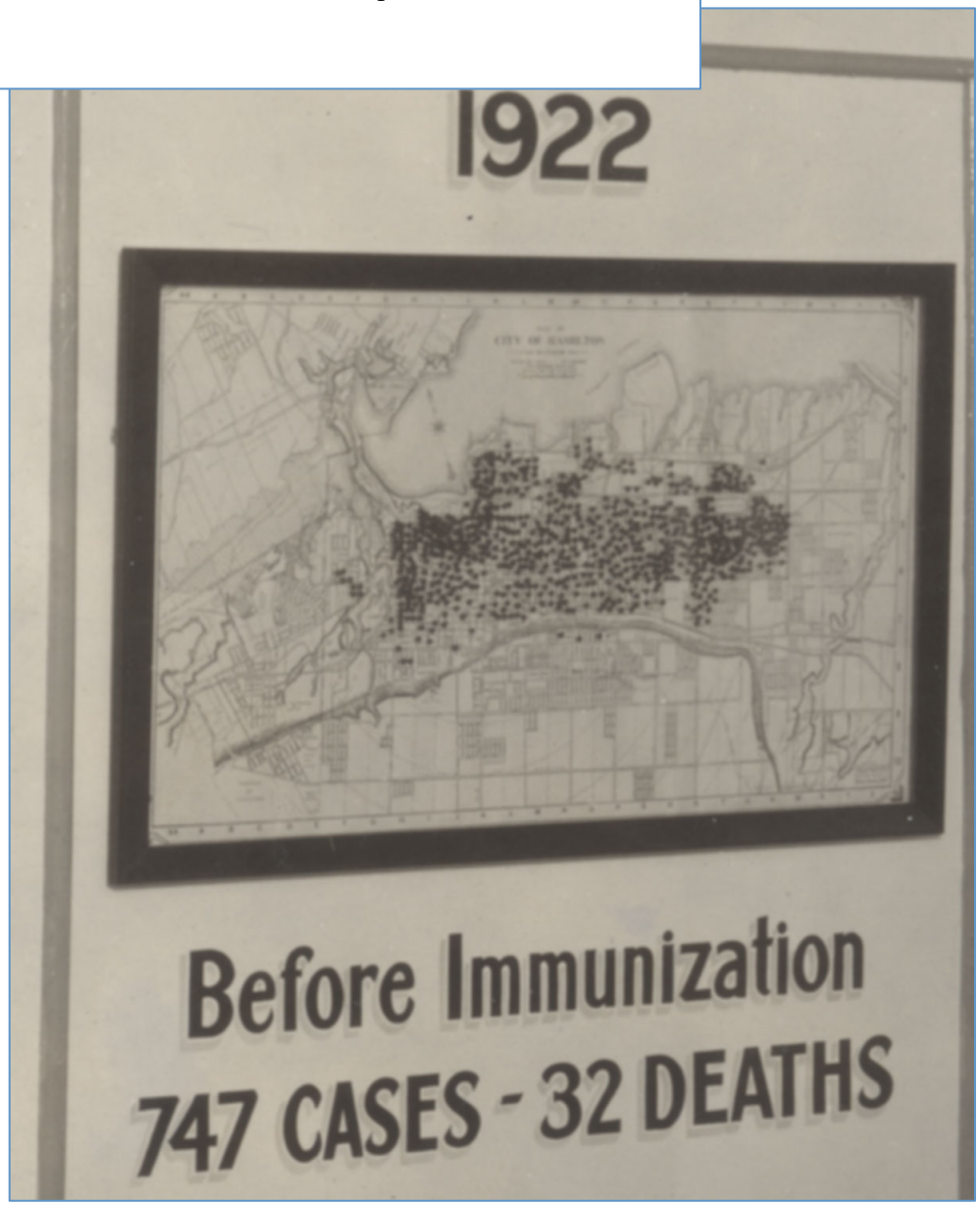
American Journal of Public Health, Aug 1932, p. 852

Defeating Diphtheria: Canadian Leadership:
Hamilton Slays the Dragon

Sanofi Pasteur Canada Archives

Defeating Diphtheria: Canadian Leadership: *Hamilton Slays the Dragon*

- Under Dr. James Robert's leadership, Hamilton set the example for demonstrating the value of diphtheria toxoid in bringing the disease under control

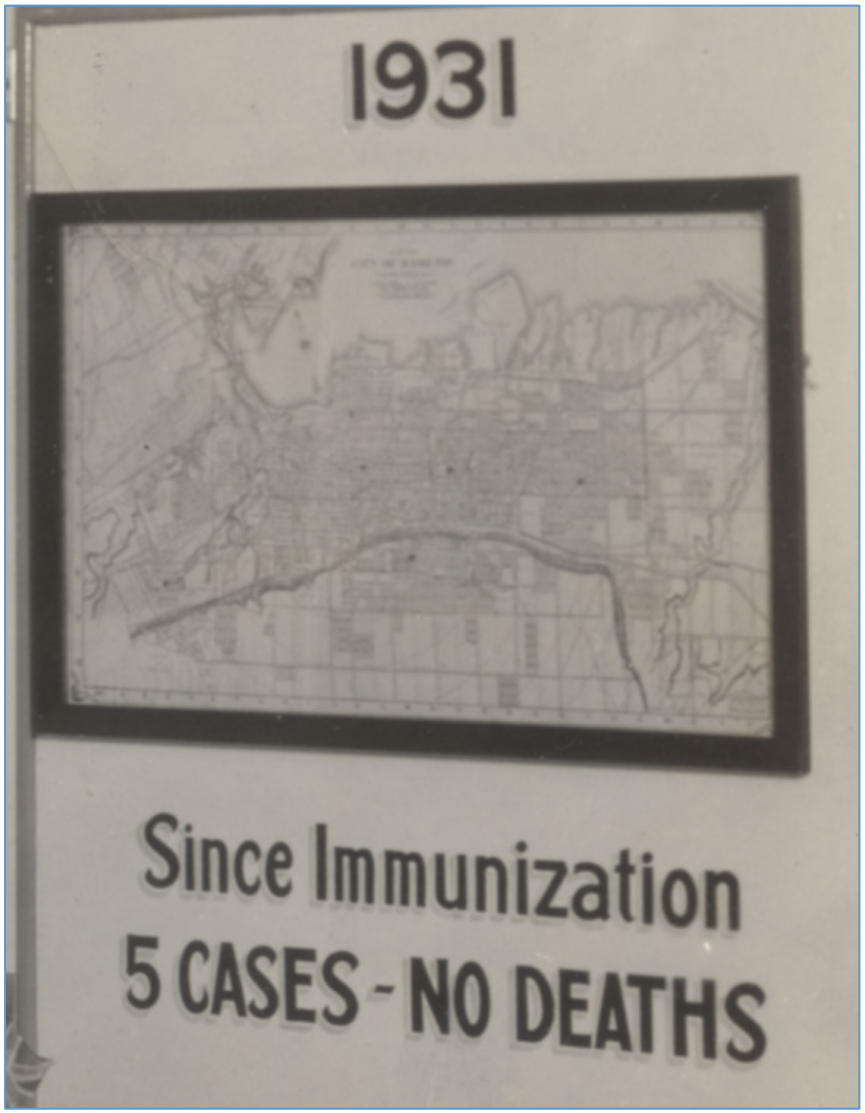


Defeating Diphtheria: Canadian Leadership: *Hamilton Slays the Dragon*

- "The striking decrease in both cases and deaths from diphtheria for the past five years we confidently feel has been the result of the campaign steadily, but persistently, carried on by the health department against the disease."

- This decline through the use of diphtheria toxoid "is scarcely accidental or illusory, and is, we believe, the answer to our challenge against diphtheria."

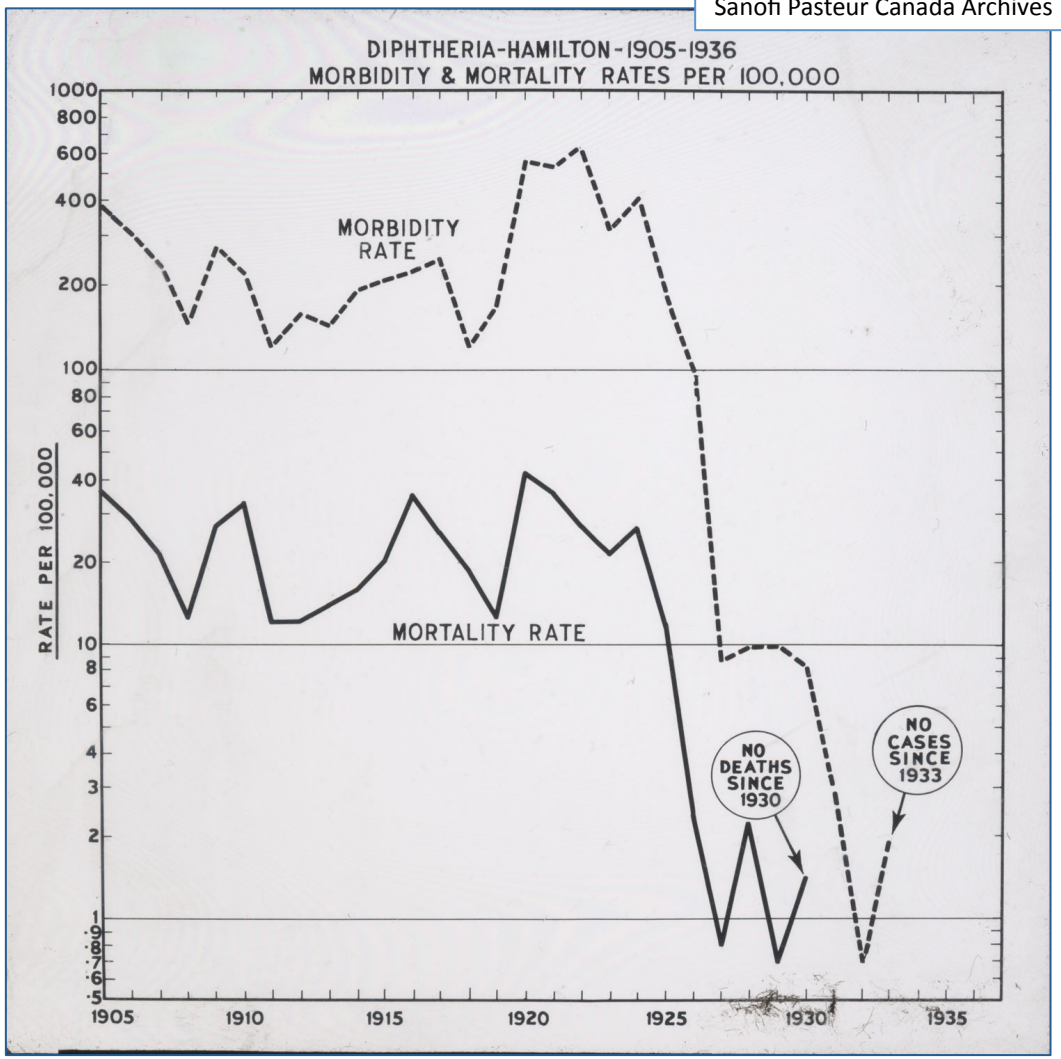
- Dr. James Roberts, "A Campaign Against Diphtheria", *The Canadian Journal of Medicine & Surgery* (Feb 1931)



Defeating Diphtheria: Canadian Leadership: *Hamilton Slays the Dragon*

- Hamilton's success was largely due to the foresight and commitment of Dr. Roberts
- The challenge now was applying elsewhere Hamilton's experience and Dr. Robert's passion for slaying the diphtheria dragon.

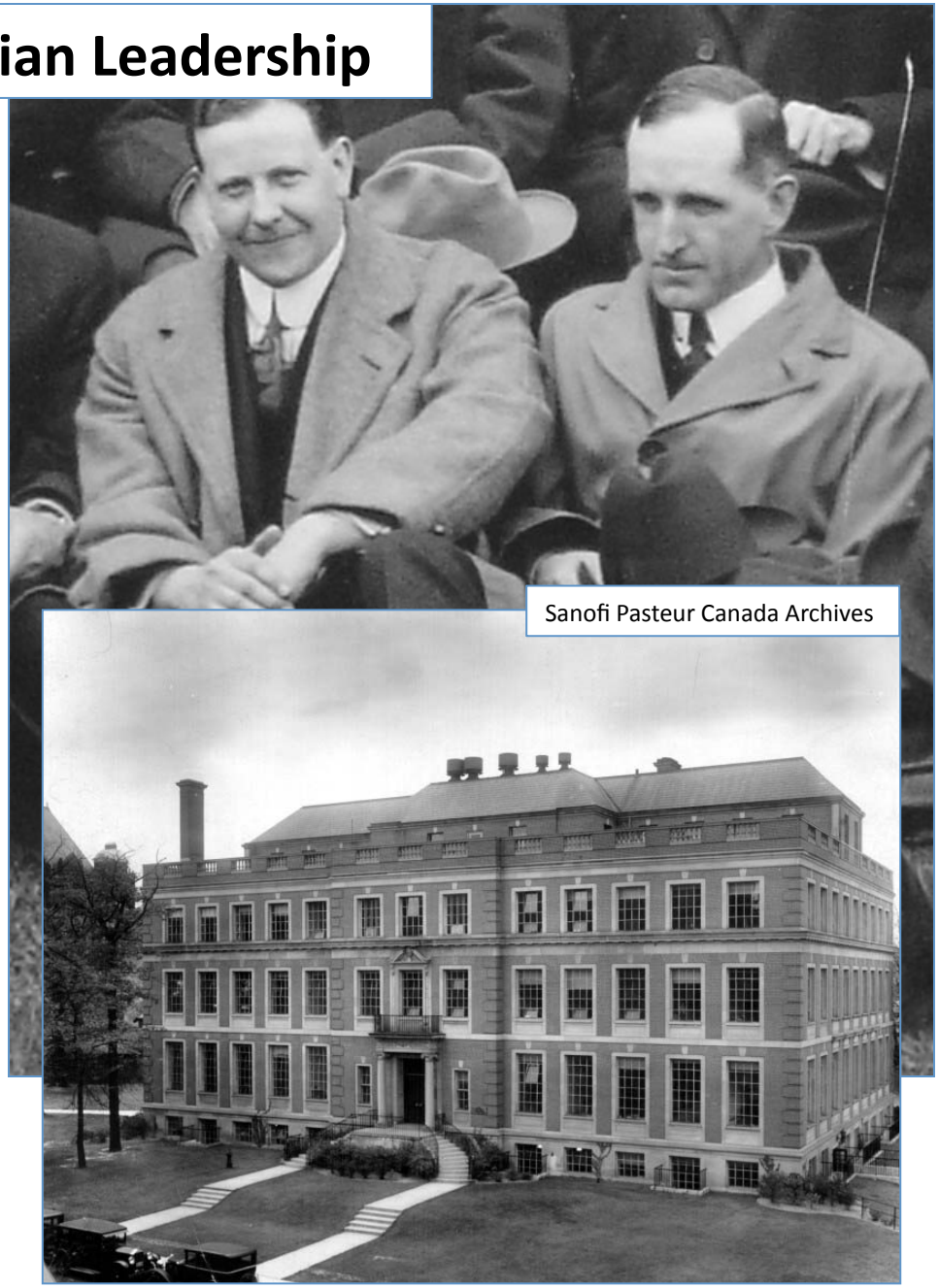
Sanofi Pasteur Canada Archives



Defeating Diphtheria: Canadian Leadership

- To build on the first toxoid trials, FitzGerald was able to utilize the resources of the new School of Hygiene @UofT, which opened in 1927 and shared its administration with Connaught, to develop a more detailed plan to evaluate the toxoid

- He also wasted little time in bringing the story of the toxoid to the public health community, including in the U.S., through papers and presentations, particularly by his chief lieutenant at Connaught and the School, Dr. Robert Defries, who had also become editor of the *Canadian Public Health Journal* in 1928

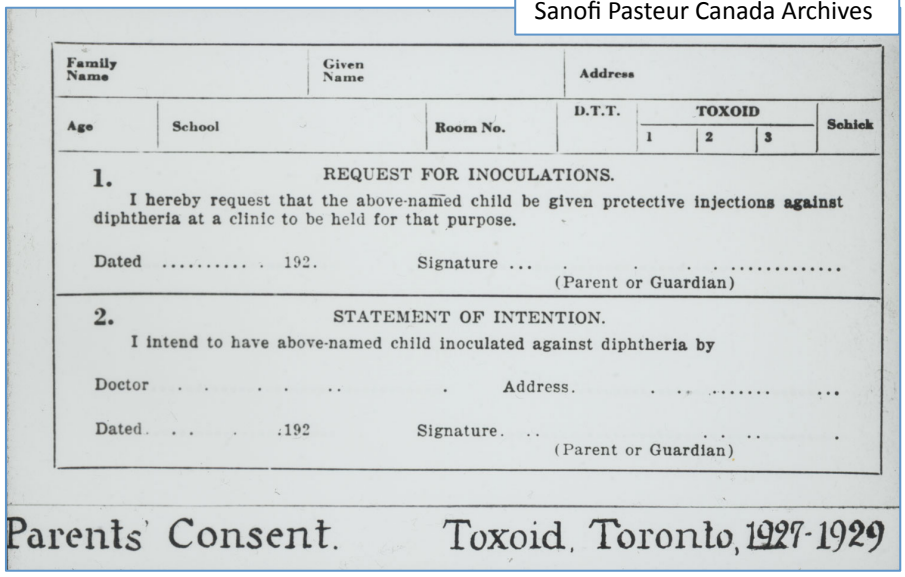


Sanofi Pasteur Canada Archives

Defeating Diphtheria: Canadian Leadership

- **1927-29** - Encouraged by Hamilton's success, Dr. FitzGerald's team next focused on Toronto with an unprecedented scientific, statistical and public health attack on diphtheria.
- Some 36,000 children were involved in this controlled study, which conclusively proved that the toxoid reduced diphtheria incidence by at least 90% among those given three doses.

Sanofi Pasteur Canada Archives



Family Name	Given Name	Address					
Age	School	Room No.	D.T.T.	TOXOID 1	TOXOID 2	TOXOID 3	Schick

1. REQUEST FOR INOCULATIONS.

I hereby request that the above-named child be given protective injections against diphtheria at a clinic to be held for that purpose.

Dated ..... 192. Signature ... (Parent or Guardian)

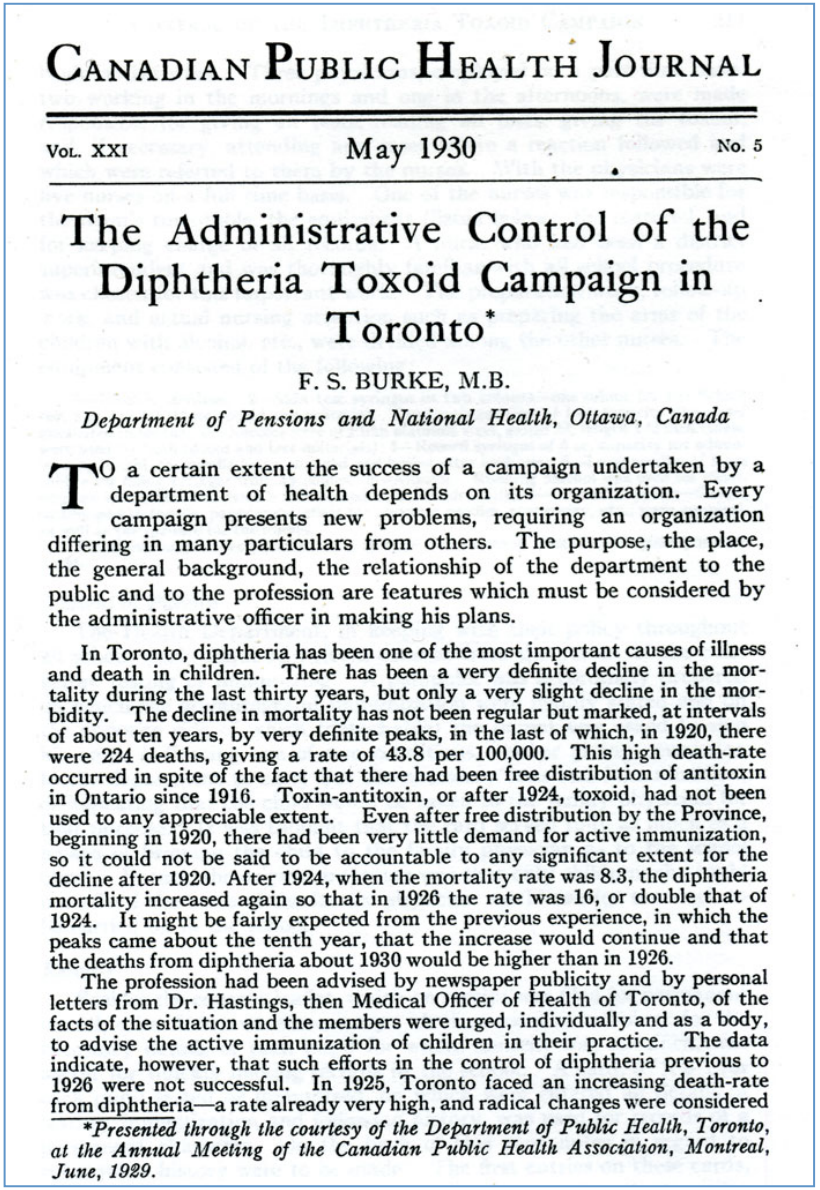
2. STATEMENT OF INTENTION.

I intend to have above-named child inoculated against diphtheria by

Doctor . . . . . Address. . . . .

Dated . . . . :192 Signature. . . . . (Parent or Guardian)

Parents' Consent. Toxoid, Toronto, 1927-1929



CANADIAN PUBLIC HEALTH JOURNAL

VOL. XXI May 1930 No. 5

The Administrative Control of the Diphtheria Toxoid Campaign in Toronto*

F. S. BURKE, M.B.

Department of Pensions and National Health, Ottawa, Canada

TO a certain extent the success of a campaign undertaken by a department of health depends on its organization. Every campaign presents new problems, requiring an organization differing in many particulars from others. The purpose, the place, the general background, the relationship of the department to the public and to the profession are features which must be considered by the administrative officer in making his plans.

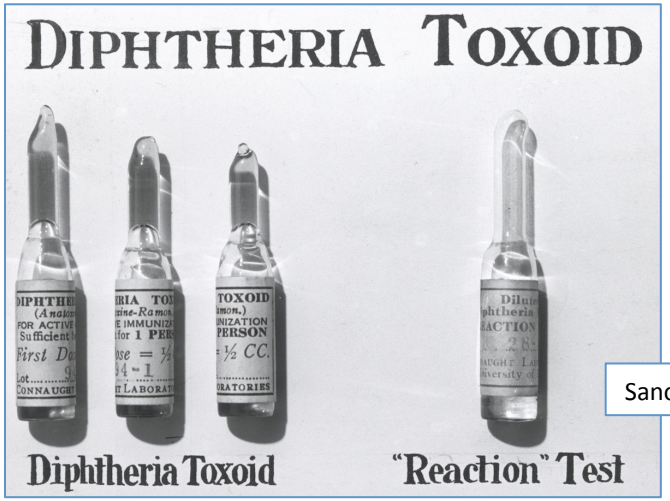
In Toronto, diphtheria has been one of the most important causes of illness and death in children. There has been a very definite decline in the mortality during the last thirty years, but only a very slight decline in the morbidity. The decline in mortality has not been regular but marked, at intervals of about ten years, by very definite peaks, in the last of which, in 1920, there were 224 deaths, giving a rate of 43.8 per 100,000. This high death-rate occurred in spite of the fact that there had been free distribution of antitoxin in Ontario since 1916. Toxin-antitoxin, or after 1924, toxoid, had not been used to any appreciable extent. Even after free distribution by the Province, beginning in 1920, there had been very little demand for active immunization, so it could not be said to be accountable to any significant extent for the decline after 1920. After 1924, when the mortality rate was 8.3, the diphtheria mortality increased again so that in 1926 the rate was 16, or double that of 1924. It might be fairly expected from the previous experience, in which the peaks came about the tenth year, that the increase would continue and that the deaths from diphtheria about 1930 would be higher than in 1926.

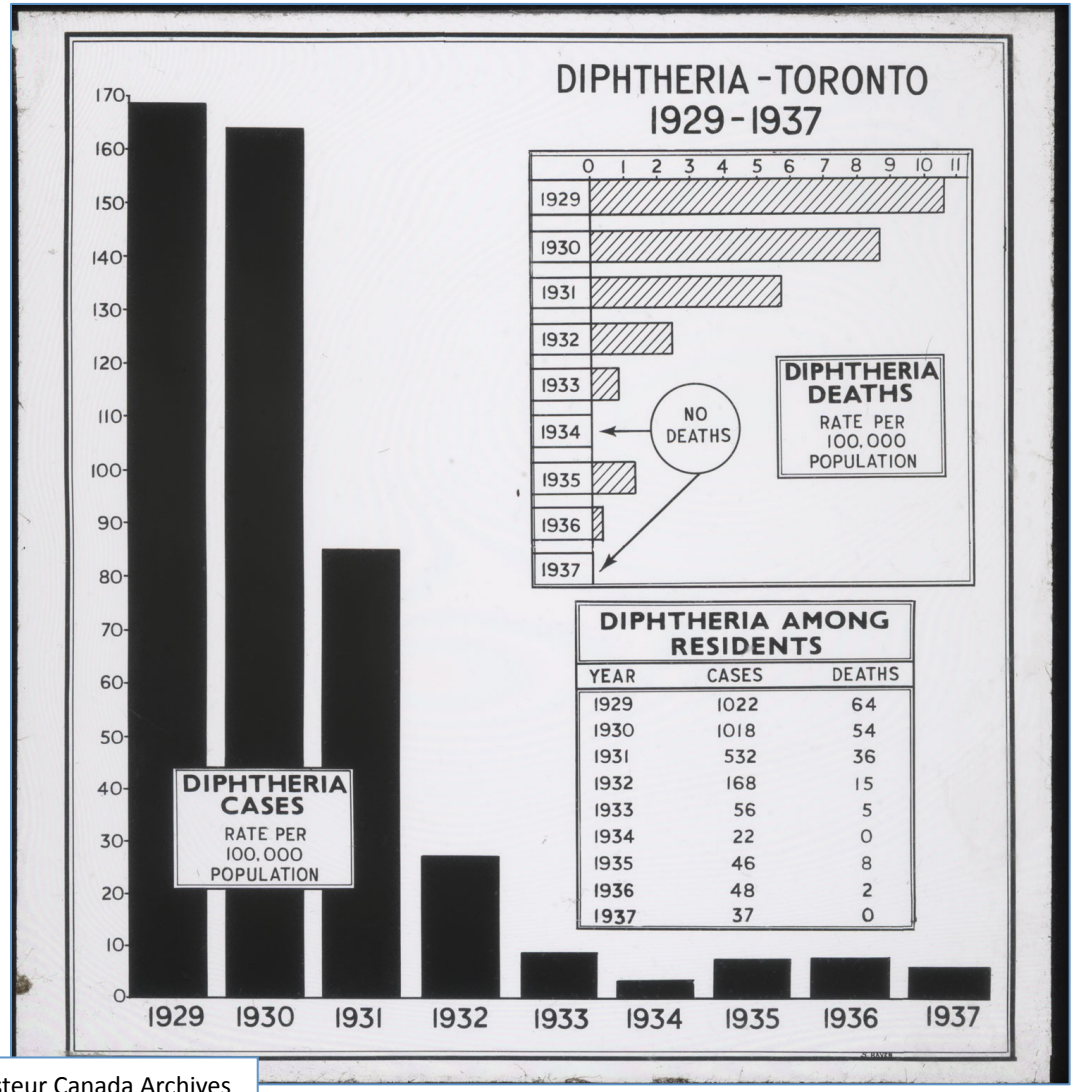
The profession had been advised by newspaper publicity and by personal letters from Dr. Hastings, then Medical Officer of Health of Toronto, of the facts of the situation and the members were urged, individually and as a body, to advise the active immunization of children in their practice. The data indicate, however, that such efforts in the control of diphtheria previous to 1926 were not successful. In 1925, Toronto faced an increasing death-rate from diphtheria—a rate already very high, and radical changes were considered

**Presented through the courtesy of the Department of Public Health, Toronto, at the Annual Meeting of the Canadian Public Health Association, Montreal, June, 1929.*

Defeating Diphtheria: Canadian Leadership

- In the wake of these trials, diphtheria incidence declined sharply in Toronto, as in other Canadian cities, reducing deaths to zero and often the numbers of cases to zero during the 1930s
- This pioneering Canadian public health effort represented the first statistical demonstration of the value of a non-living vaccine in preventing a specific disease





Sanofi Pasteur Canada Archives

Defeating Diphtheria: Canadian Leadership

- Symbolic of this new confidence and public engagement sparked by the success of diphtheria toxoid was “The No Diphtheria Town Express,” put together by the St. Catharines Department of Public Health

Sanofi Pasteur Canada Archives

“The No Diphtheria Town Express” St. Catharines, c. 1932

1927-1932 – Polio Rising

- One infectious disease that diphtheria could not overshadow during the last years of the 1920s was poliomyelitis
- Polio epidemics surged to new levels in many provinces, seeming to move from west to east, starting on the west coast
- **1927** – British Columbia (182 cases and 37 deaths)
- **1927** - Alberta (313 cases and 65 deaths)

CANADIAN PUBLIC HEALTH JOURNAL

VOL. XX May, 1929 No. 5

Some Findings in the Epidemic of Poliomyelitis in Alberta, 1927

R. B. JENKINS, M.D.

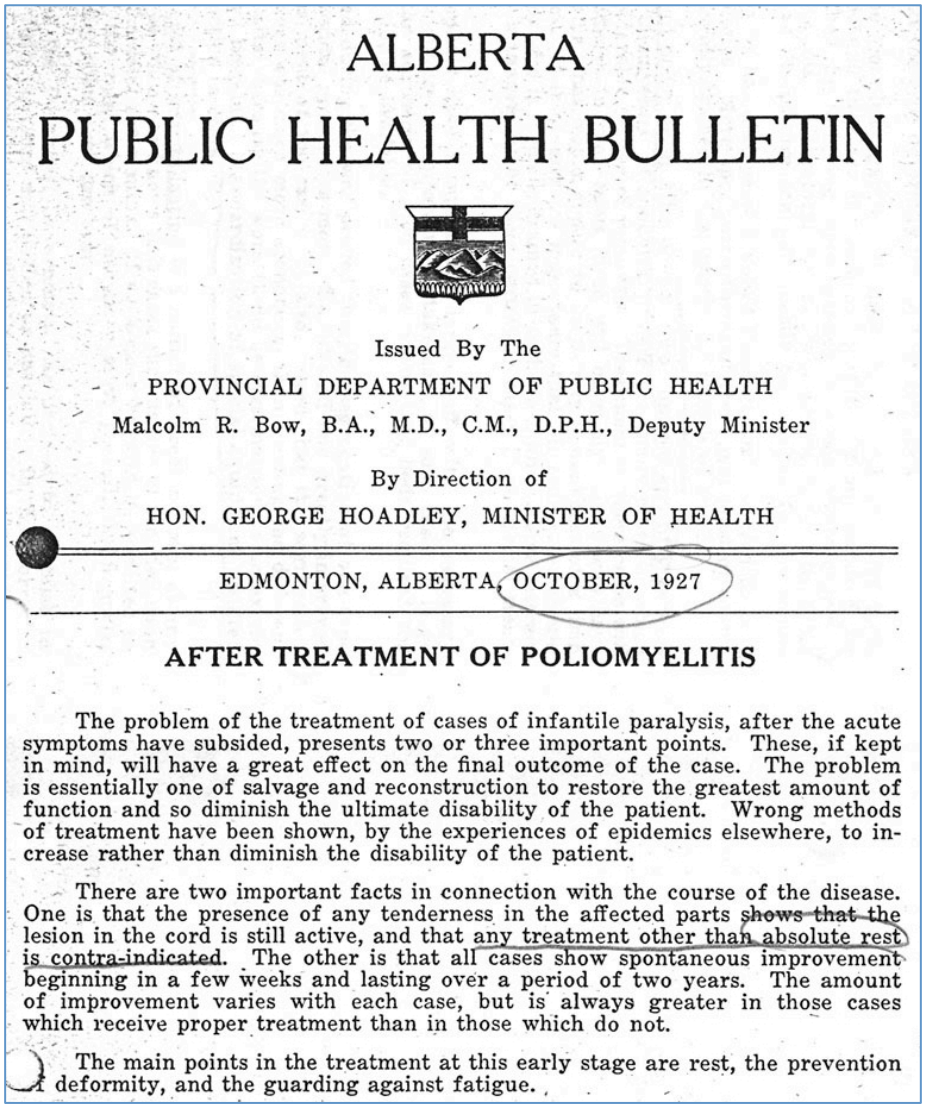
Provincial Inspector of Health, Alberta

DURING the year 1927 an epidemic of poliomyelitis occurred in Alberta. Considerable information was gathered which it is believed will be of interest to the profession. For some years prior to 1927 there had been sporadic cases in one part of the Edmonton district. In order to get fairly complete information of the situation a questionnaire was prepared, asking, among other things, for the following data concerning the patient: name, age, sex, date and nature of first symptoms, date of onset of paralysis, source of water supply, source of milk supply, presence of other illness in the family, nature of such illness, the number of cases of poliomyelitis in the family, whether there were cases amongst school-mates or friends, whether or not the patient had been away from home during the previous month, names and addresses of recent visitors at patient's home, names of employees in household. This questionnaire was used in collecting data when, in the 1927 epidemic, some two hundred copies were returned.

In all there were 354 cases reported during the year, 101 of these occurring in Edmonton and the greater part of the remainder in the district surrounding Edmonton, a district with a radius of about 100 miles, which is, in most part, tributary to that city. Fifty-three deaths occurred.

1927-1932 – Polio Rising

- While managing the acute crisis of a polio epidemic echoed that of the great Spanish Flu pandemic, with similar public health helplessness, the unique personal, economic and political challenges of paralytic polio continued long after the epidemic emergency passed



ALBERTA

PUBLIC HEALTH BULLETIN

Issued By The
PROVINCIAL DEPARTMENT OF PUBLIC HEALTH
Malcolm R. Bow, B.A., M.D., C.M., D.P.H., Deputy Minister

By Direction of
HON. GEORGE HOADLEY, MINISTER OF HEALTH

EDMONTON, ALBERTA, OCTOBER, 1927

AFTER TREATMENT OF POLIOMYELITIS

The problem of the treatment of cases of infantile paralysis, after the acute symptoms have subsided, presents two or three important points. These, if kept in mind, will have a great effect on the final outcome of the case. The problem is essentially one of salvage and reconstruction to restore the greatest amount of function and so diminish the ultimate disability of the patient. Wrong methods of treatment have been shown, by the experiences of epidemics elsewhere, to increase rather than diminish the disability of the patient.

There are two important facts in connection with the course of the disease. One is that the presence of any tenderness in the affected parts shows that the lesion in the cord is still active, and that any treatment other than absolute rest is contra-indicated. The other is that all cases show spontaneous improvement beginning in a few weeks and lasting over a period of two years. The amount of improvement varies with each case, but is always greater in those cases which receive proper treatment than in those which do not.

The main points in the treatment at this early stage are rest, the prevention of deformity, and the guarding against fatigue.

1927-1932 – Polio Rising

- **1928** – In the wake of the epidemic, the Alberta Department of Health established a "Provincial Special Hospital" in Edmonton, where specialized orthopedic treatment was provided at cost

1927-1932 – Polio Rising

- **1928** – Marching eastward, polio next struck Manitoba, leaving 434 cases and 37 deaths, mostly in the Winnipeg area

- The primary focus of public health attention was on studying the early use of "convalescent serum" as a means to minimize, or perhaps prevent, the onset and severity of muscle weakness or paralysis

- The serum was similar to diphtheria antitoxin, but was prepared from blood donated from people who had "convalesced" from polio and were thought to have immunity to the poliovirus

Résumé of the Report on the Poliomyelitis Epidemic in Manitoba, 1928

THIS report was prepared by the Medical Research Committee of the University of Manitoba, with appendices on the Method of Control Employed by Dr. A. J. Douglas, Medical Officer of Health of Winnipeg, and Dr. T. A. Pincock, Deputy Minister, Department of Health and Public Welfare of the Province. It has been published for the Department of Health and Public Welfare by the Great-West Life Assurance Company.

Full of information obtained directly from the experience of this epidemic, the report is of probably the greatest significance in that section dealing with the use of convalescent serum, which is reproduced in full on pages 235 to 240. The other sections,—on organization; on the preparation of convalescent serum; on the epidemiology of the disease as shown in Manitoba, the extent in time and place, the age groups involved, the multiple of cases in families, the apparent incubation period; the symptoms and physical signs as found on careful examination; and the control methods employed—all these add much to our knowledge. The main features are shown in the extracts which comprise this review, chosen freely from the various sections.

The Chairman of the Committee was C. R. Gilmour, M. D., and the Secretary, A. T. Cameron, D.Sc.

Canadian Public Health Journal, May 1929, p. 225

1927-1932 – Polio Rising

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Canadian Public Health Journal, May 1929, p. 225

- However, the lack of a clear diagnostic test prior to the onset of muscle weakness or paralysis, and patients often recovering with no treatment, made scientifically assessing the serum difficult

1927-1932 – Polio Rising

- **1929** – Epidemic polio next struck in Ontario, with 558 cases and 26 deaths during 1929, focused mostly in the Ottawa area and the eastern part of the province

- The Ontario Department of Health followed the prevailing public health approach during polio outbreaks, with a reliance on providing convalescent serum for free to all reported cases; Connaught Labs prepared the serum

CANADIAN PUBLIC HEALTH JOURNAL

VOL. XXI February 1930 No. 2

Report of an Epidemic of Poliomyelitis in Ottawa, 1929

DR. T. A. LOMER,
Medical Officer of Health, Ottawa
AND
DR. W. T. SHIRREFF,
Superintendent of Strathcona Hospital

ON account of the prevalence of poliomyelitis in Manitoba in 1928, it was considered probable by the Ontario Department of Health that the Province of Ontario might be visited by the disease in 1929, and local health authorities were warned to be on the lookout for cases and to prepare lists of possible donors of convalescent serum.

Incidence

The first case of poliomyelitis reported in Ottawa was on July 28th,

TABLE I
POLIOMYELITIS—OTTAWA, 1929
CASES BY WEEKS

Week Ending	Number	Per cent
August 3	4	2.3
August 10	7	4.0
17	1	.6
24	16	9.1
31	14	7.9
September 7	25	14.2
14	24	13.6
21	23	13.1
28	23	13.1
October 5	18	10.2
12	11	6.2
19	7	4.0
26	2	1.1
	1	.6
Total	176	100.0

although subsequent investigation showed that there had been at least two cases in the vicinity during the previous week.

53

1927-1932 – Polio Rising

- **1930** – Polio struck Ontario again and more severely, especially in the Toronto area, with 671 cases and 71 deaths reported

- The focus on providing convalescent serum became problematic with more demand for it than could be met due to some physicians giving it without waiting for an official diagnosis

Infantile Paralysis No Longer Reported Since Group Formed

Accuracy of Diagnosis in Previous List Doubted by Dr. John M. Robb and Poliomyelitis Committee

SUPPLY OF SERUM SERIOUSLY TAXED

The Ontario Department of Health's distribution of convalescent serum for treatment of infantile paralysis was so abused by physicians in one municipality, recently, that, according to Hon. Dr. John M. Robb, it was necessary for his department to form a local Poliomyelitis (infantile paralysis) Committee "to prevent all the children in the municipality being registered as poliomyelitis cases.

"A very considerable number of cases," said Dr. Robb, in a statement to the press, yesterday, "were listed from this community prior to the formation of the committee. Since the committee has been formed, not a case has been reported which causes considerable doubt in one's mind as to the accuracy of the diagnosis in the previous list. This is an interesting observation because it, no doubt, explains the reason for the excess in the number of cases which have occurred this year over those which occurred last year, the department being fully convinced

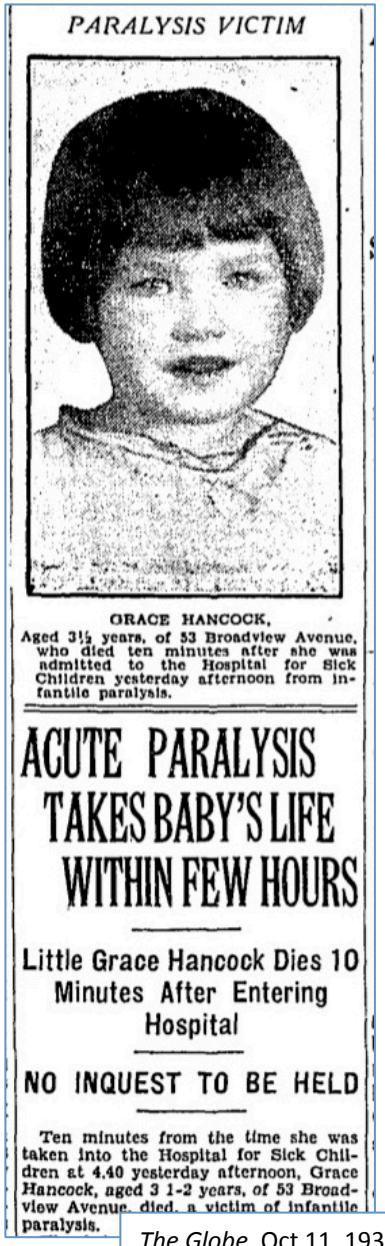
(Continued on Next Page.)

The Globe, Oct 11, 1930, p. 13

1927-1932 – Polio Rising

- Also alarming were tragic stories of deaths due to polio, such as a 3-year-old girl dying of polio 10 minutes after arriving at the Hospital for Sick Children, most likely of lung paralysis

- The hospital would get an iron lung in 1930 (the first in the country), but there was no time for this little girl to get to it



PARALYSIS VICTIM

GRACE HANCOCK,
Aged 3½ years, of 53 Broadview Avenue, who died ten minutes after she was admitted to the Hospital for Sick Children yesterday afternoon from infantile paralysis.

ACUTE PARALYSIS TAKES BABY'S LIFE WITHIN FEW HOURS

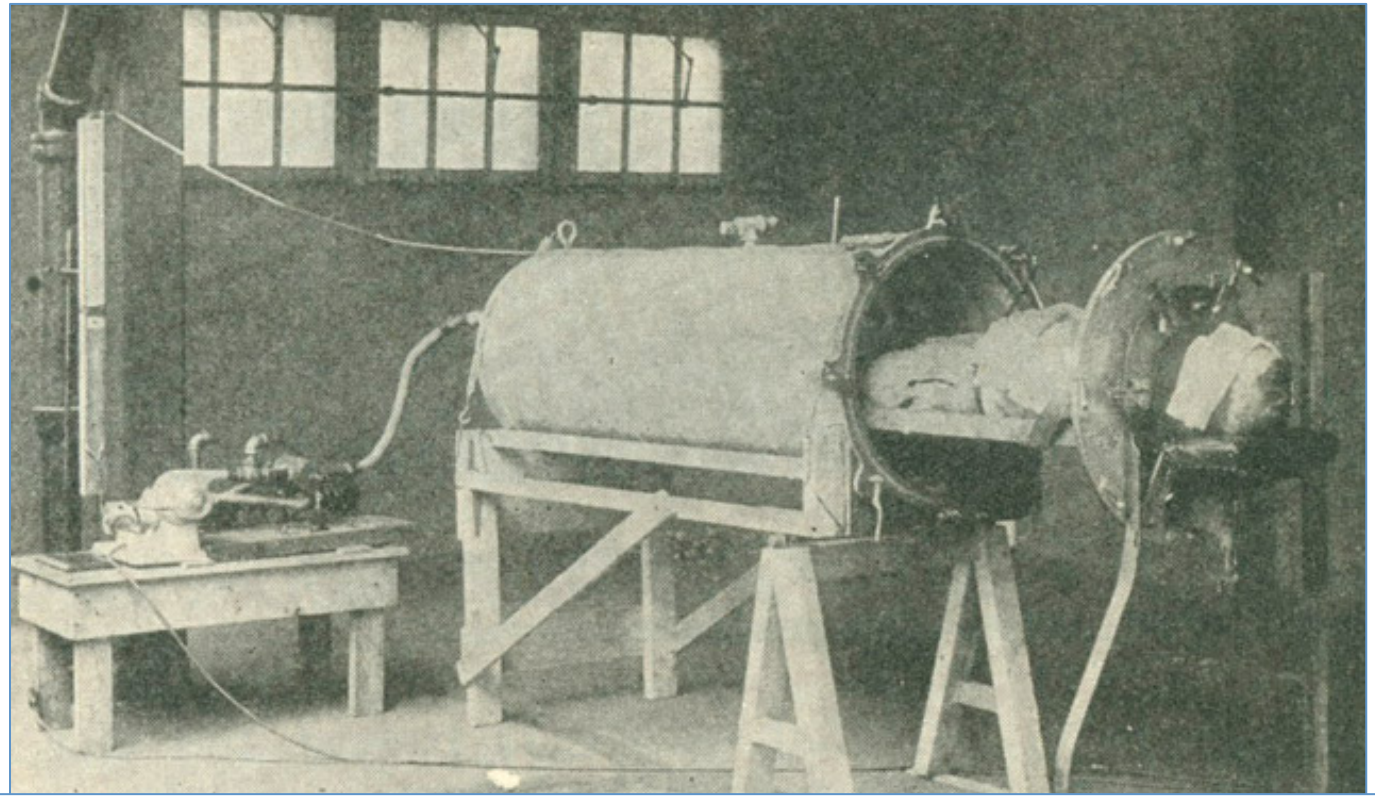
Little Grace Hancock Dies 10 Minutes After Entering Hospital

NO INQUEST TO BE HELD

Ten minutes from the time she was taken into the Hospital for Sick Children at 4.40 yesterday afternoon, Grace Hancock, aged 3 1-2 years, of 53 Broadview Avenue, died, a victim of infantile paralysis.

The Globe, Oct 11, 1930, p. 13

1927-1932 – Polio Rising



- **1928** - The first "iron lung" for polio treatment developed at Harvard University

- It was essentially a metal tank into which all but the head of the patient was sealed. A motor, or hand crank, operated a set of bellows and the negative and positive pressure inside the iron lung forced the patient's lungs to expand and contract to enable breathing

1927-1932 – Polio Rising

- **1931** – Polio's relentless march across Canada from west to east continued, hitting Quebec next, resulting in 1,105 cases, 744 of which and 74 deaths occurring in the Montreal area

- **1932** – Quebec City hardest hit in the province, with 784 cases and 105 deaths

- The Quebec Bureau of Health followed Ontario's approach, relying on convalescent serum and evaluating its effects in each case

Canadian Public Health Journal, Oct 1932, p. 494

EPIDEMIOLOGY AND VITAL STATISTICS

A. L. McKay, B.A., M.D., D.P.H., and F. W. Jackson, M.D., D.P.H.

The Present Outbreak of Poliomyelitis in Quebec

A. R. Foley, M.D., Dr. P.H.

Epidemiologist of the Provincial Bureau of Health, Quebec

Spread of the Disease

For the second consecutive year, acute anterior poliomyelitis appears in the epidemic form in the province of Quebec. Since 1926, the western provinces were one after the other paid a visit by the dreaded disease. In 1930 a few cases were scattered through Quebec and, in 1931, the wave swept over the city and the district of Montreal: nearly half the population of the province was thus closely exposed to the attack of the disease and some eleven hundred cases occurred.

It was to be expected that the eastern part of the province would not be spared this year. In July, the Director of the Provincial Bureau of Health issued a circular letter, advising the medical profession to be on the look out for cases of poliomyelitis and offering for each case the "convalescent" serum free of charge. Some days later, the first cases were diagnosed and to date—October 8th—540 cases have been reported to the Division of Epidemiology.

Date of Onset

It is interesting to compare the distribution of cases, by week of onset of the disease, in 1931 and in 1932. Of course, the eleven hundred cases for 1931 are distributed over the period of July to December and occurred in a dense population, while the 1932 cases are crowded within a period of three months and the disease affects a larger area but a lesser population. The peak of the epidemic —mode of the curve—has been reached three weeks earlier this year—that is, in the week ending August 17th—with 98 cases, against the week ending October 3rd, 1931, with 148 cases.

It must also be borne in mind that figure II has been drawn from preliminary reports and that they may have to be slightly altered. This is specially true for the last bar, in figure II, representing the number of cases for the week ending October 8th. When reports yet to come are included, this last week is expected to show a higher number of cases. If we may depend on last year's progress of the epidemic, a material decrease in the weekly number of cases will soon be observed, though we know that the disease will still be with us late in the autumn.

Geographical Distribution

Since the beginning of the month of July, 540 cases have been reported in the whole province. Of these, 240 cases occurred in the urban and 300 in the rural population. Out of the 240 cases in the urban population, 201 occurred in the city of Quebec. The focus of the epidemic this year has been the city of Quebec, though small communities, such as L'Ancienne-Lorette and Saint-Charles-de-Bellechasse, have a higher attack-rate.

It is to be noticed from figure III that the peak of the epidemic also occurred three weeks earlier in the city of Quebec than in the whole province. The population of the city of Quebec being nearly 140,000, the attack-rate has been—with the number of known cases—143 per 100,000 inhabitants; or, should we consider

494

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- The Quebec Bureau of Health followed Ontario's approach, relying on convalescent serum and evaluating its effects in each case

- Despite fears in the Maritimes, this wave of polio epidemics finally ended in 1932 in Quebec, although the eastern provinces would not remain immune for long…

Canadian Public Health Journal, Oct 1932, p. 494

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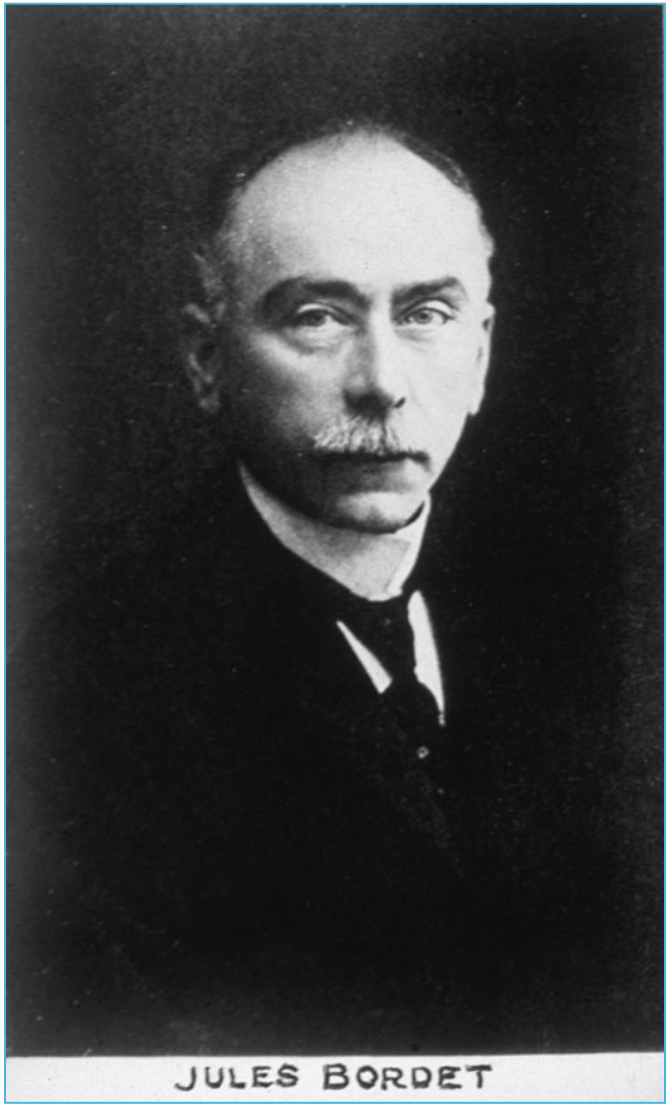
494

Preventing Persistent Pertussis: *Canadian Contributions*

- **1924** – Soon after he had visited Gaston Ramon to learn of Diphtheria Toxoid, John FitzGerald also visited the laboratory of Jules Bordet at the Pasteur Institute in Brussels

- Bordet had pioneered research into pertussis (whooping cough), and in 1906 first isolated the *B. pertussis* bacterium

- Various pertussis vaccines based on standard strains of *B.* pertussis were then produced, mostly as a treatment of the disease, and also for prevention, but with limited success; Connaught Labs began producing the vaccine in 1920



Preventing Persistent Pertussis: *Canadian Contributions*

- Pertussis is a stubborn respiratory disease and better known as “whooping cough” because of the deep “whooping” sound it causes

- Pertussis affects people of all ages, although it is of most concern among very young children

- At the turn of the 20th century, pertussis killed 5 out of every 1,000 children before their fifth birthday, mostly infants younger than 12 months of age.

- Before the first effective pertussis vaccine became available in Canada in the late 1930s, pertussis case incidence rates reached some 156 per 100,000 nationally in most years, reaching a peak of over 19,878 cases in 1940

WHOOPING COUGH

ONTARIO FROM 1880 - 1929.

Deaths by Age Groups

Years	0-1	1-4	5-9	10 +	N. S.	Total
1880	175	109	8	3	2	297
1881	150	116	1	2	1	270
1882	116	51	8	5	3	183
1883	94	23	3	1	2	123
1884	98	46	5	5	-	154
1885	126	55	9	2	-	192
1886	140	57	8	-	-	205
1887	85	37	1	1	-	124
1888	117	57	8	5	-	187
1889	138	73	11	3	-	225
1890	112	65	12	1	-	190
1891	75	26	2	-	2	105
1892	99	34	5	2	5	145
1893	127	56	6	1	3	193
1894	109	47	4	2	3	165
1895	84	47	8	5	3	147
1896	127	56	4	2	-	189
1897	113	46	3	1	-	163
1898	75	48	3	-	-	126
1899	80	42	-	2	-	124
1900	123	54	5	2	1	185
1901	110	48	5	2	1	166
1902	139	62	7	2	-	210
1903	152	43	5	3	1	204
1904	69	36	4	-	-	109
1905	115	56	2	1	7	181
1906	165	61	8	5	-	239
1907	141	68	1	2	2	214
1908	143	85	15	3	-	246
1909	158	84	12	5	3	262
1910	112	66	3	5	-	186
1911	102	58	5	2	2	169
1912	284	120	9	4	2	419
1913	185	79	6	2	-	272
1914	119	64	9	4	-	196
1915	143	43	5	2	1	194
1916	210	115	11	4	1	341
1917	173	52	7	1	-	233
1918	163	108	18	11	3	303
1919	111	47	5	1	-	164
1920	215	136	21	4	-	376
1921	211	89	9	1	-	310
1922	112	81	4	3	-	200
1923	191	111	10	6	-	318
1924	92	48	4	3	-	147
1925	169	94	7	3	-	273
1926	153	78	10	4	-	245
1927	121	53	5	2	-	181
1928	114	53	7	-	1	175
1929	121	64	6	3	-	194
						10419

Preventing Persistent Pertussis: *Canadian Contributions*

- By the early 1920s, researchers, particularly Louis Sauer, had discovered that pertussis vaccines prepared using "fresh" strains of *B. pertussis* collected from "whooping cough" patients, seemed to be more effective in preventing the disease that using the standard strains

- When FitzGerald left Bordet's lab, he returned to Connaught with fresh samples of *B. pertussis* and a clearer understanding of their importance to a more effective Pertussis Vaccine

American Journal of Public Health, Nov 1935, p. 1226

The Known and Unknown of Bacillus Pertussis Vaccine*

LOUIS SAUER, M.D., PH.D.
Northwestern University Medical School and the Evanston Hospital, Evanston, Ill.

DANISH State Serum Institute investigators and clinicians have made valuable contributions on *B. pertussis* vaccine since 1916. Miller [1] says:

The strains are kept on Bordet-Gengou medium until inoculated on the "vaccine medium" (3 parts nutrient agar (calf), 2 parts potato-glycerin agar, and 2 parts defibrinated horse blood). The 3 day growth is washed into 1 per cent formalin in physiological sodium chloride. After formalization for 1 week the suspension is centrifuged, resuspended in 0.5 per cent phenol in physiological sodium chloride and standardized to 10,000 million bacteria per c.c.

For nearly 20 years a standard technic has been in use—the total dosage of 2.2 c.c. is divided into 3 injections (0.5, 0.7 and 1.0 c.c.), given at intervals of 3 or 4 days. Madsen,[2, 3] found this ineffective as a curative agent; given as a prophylactic, 1 to 3 months before exposure, it failed to prevent the disease in 364 nonimmunes. The course was more frequently mild, however, and the percentage of deaths was lower when injections were completed a few weeks before symptoms appeared. Discussing F. McDonald's [4] summary on *B. pertussis* vaccine, R. Smith [5] cautions against hasty conclusions on pertussis immunization. He says:

Pertussis is such a dread disease that physicians and parents easily take "the will for the deed" so far as proof in relation to prevention is concerned. Enthusiasm has waxed and waned many times. . . . One is certainly justified in using vaccine in an attempt to produce immunity against whooping cough, but one must be honest with himself and with his patients in acknowledging that proof of its protective efficacy is lacking. One must guard against drawing conclusions from a few cases, from clinical impressions, or from uncontrolled statistical reports.

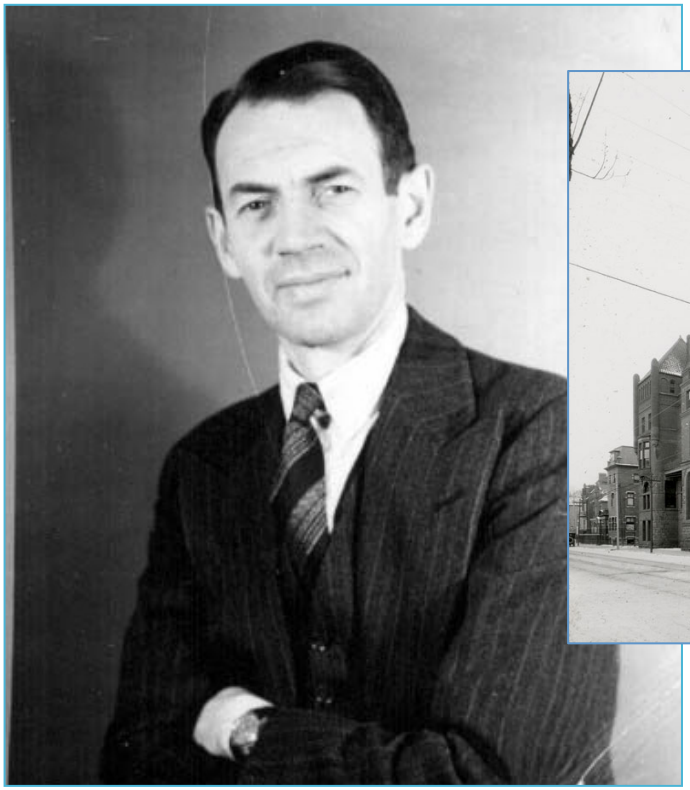
When whooping cough occurs during the first few years of life, its course is often influenced by age, previous health, nutritional state, stability of the nervous system, hygienic care (aseptic nursing), climate and season. In the vaccinated and nonvaccinated the duration and severity often vary greatly. In a crucial study of immunization only nonimmunes between 8 months and 3 years of age should be used. Children should be excluded if they ever had any persistent cough. The very young may not yet possess the power to elaborate immunity from injected antigen, regardless of its potency and dosage; children over 3 may require a larger dosage of antigen, or may already be immune. Because the communicability index for pertussis is about 75 per cent, appreciably more than 25 per cent of the vaccinated should escape the disease

* Read before the Laboratory Section of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 8, 1935.

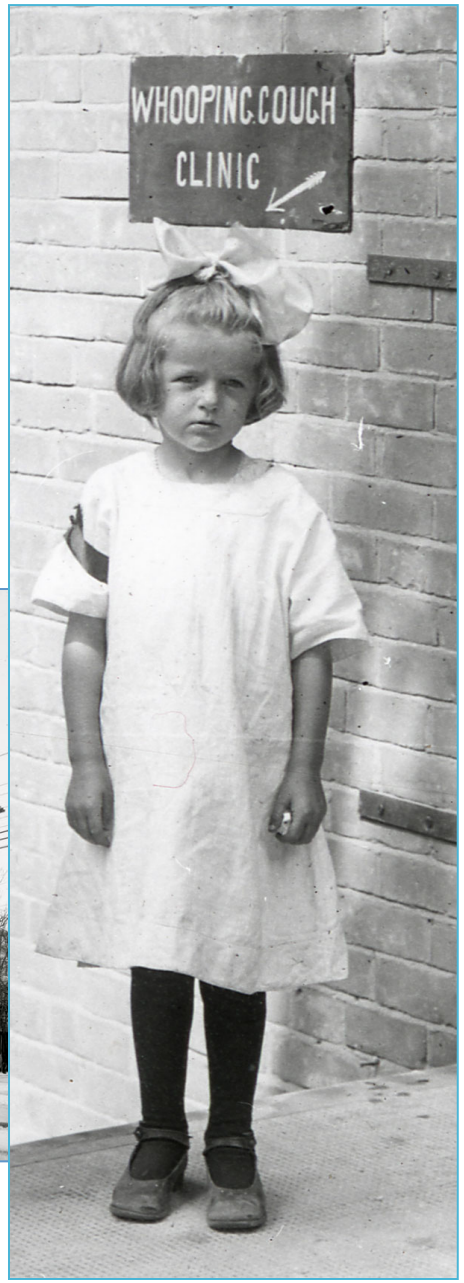
[1226]

Preventing Persistent Pertussis: *Canadian Contributions*

- **1931-32** - Encouraged by the work of Sauer and others, Nelles Silverthorne, a Senior Research Fellow at Connaught, began important Canadian work with fresh pertussis strains at his Hospital for Sick Children clinic in Toronto

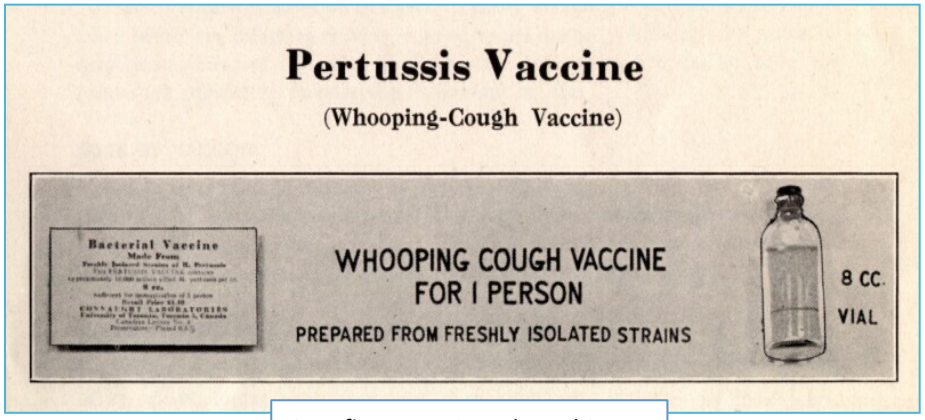


Sanofi Pasteur Canada Archives



Preventing Persistent Pertussis: *Canadian Contributions*

- Based on the fresh strains of *B. pertussis*, Silverthorne and his Connaught colleagues prepared a whole cell Pertussis Vaccine that was subjected to a series of field trials
- **1936-37** – With encouraging results, Connaught's fresh strain Pertussis Vaccine was ready for distribution through public health departments



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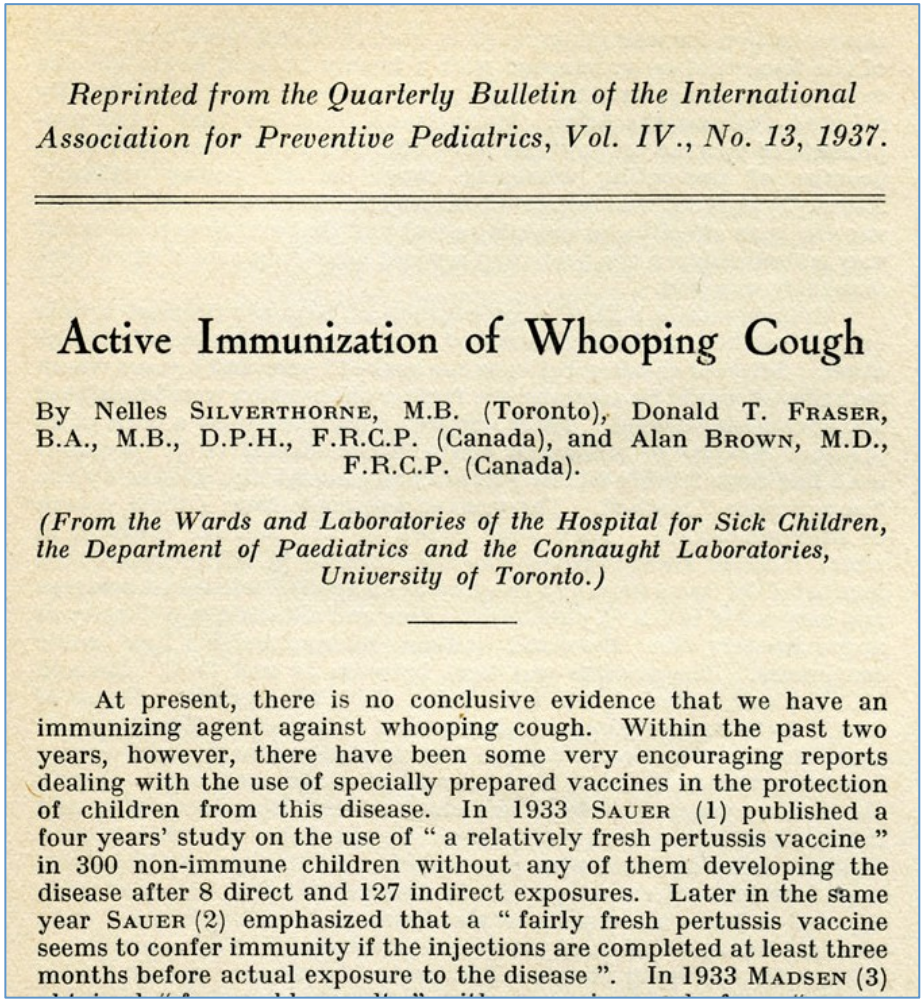


Reprinted from the Quarterly Bulletin of the International Association for Preventive Pediatrics, Vol. IV., No. 13, 1937.

Active Immunization of Whooping Cough

By Nelles Silverthorne, M.B. (Toronto), Donald T. Fraser, B.A., M.B., D.P.H., F.R.C.P. (Canada), and Alan Brown, M.D., F.R.C.P. (Canada).

(From the Wards and Laboratories of the Hospital for Sick Children, the Department of Paediatrics and the Connaught Laboratories, University of Toronto.)

At present, there is no conclusive evidence that we have an immunizing agent against whooping cough. Within the past two years, however, there have been some very encouraging reports dealing with the use of specially prepared vaccines in the protection of children from this disease. In 1933 Sauer (1) published a four years' study on the use of " a relatively fresh pertussis vaccine " in 300 non-immune children without any of them developing the disease after 8 direct and 127 indirect exposures. Later in the same year Sauer (2) emphasized that a " fairly fresh pertussis vaccine seems to confer immunity if the injections are completed at least three months before actual exposure to the disease ". In 1933 Madsen (3)

1937 – Polio Rising, Dramatically

- **1937** – While vaccines to prevent diphtheria and pertussis were now available, prospects for a polio vaccine seemed a long way off as polio incidence reached an alarming new peak, especially in Ontario:
- 2,546 cases (750 in Toronto)
- 119 deaths (31 in Toronto)

Globe & Mail, Aug 25, 1937, p. 13

DEATH TOLL OF PARALYSIS NOT BOOSTED

But Twenty New Cases in Toronto and London

300 IN ONTARIO

Small Centres Also Plan to Postpone School Reopening

Ontario's infantile paralysis death toll remained at sixteen last night, no additional deaths being reported from the widespread areas affected by the disease, which, in some sections, has reached epidemic proportions.

Hospital for Sick Children Archives

1937 – Polio Rising, Dramatically

- Ontario Department of Health in crisis mode
- Convalescent serum & standardized splints provided to all cases

Hospital for Sick Children Archives

ONTARIO

Department of Health of Ontario

"INFANTILE PARALYSIS"

(POLIOMYELITIS)

The Department of Health has a sufficient supply of Convalescent Serum for present demands. This serum is obtained from persons who have previously suffered from an attack of "infantile paralysis".

In anticipation of further requirements the Department now requests that persons who are willing to provide blood for this purpose (donors) register with the medical officer of health in their district.

The Department remunerates donors on the basis of Ten Dollars for 100 cubic centimeters; the usual amount withdrawn from one donor is 200 cubic centimeters. This can be readily obtained without discomfort or ill effects to the donor.

Children under fourteen years of age are not eligible. Persons who have suffered an attack of the disease during the present year are also not eligible. Those persons fourteen years of age and over who have suffered an attack within the past twenty-five years and who show some definite evidence of resulting paralysis, are requested to provide the medical officer of health with their name and address.

Those who have already acted as donors need not register again.

When a clinic is to be held, donors will be notified through their medical officer of health.

MINISTER OF HEALTH

1937 – Polio Rising, Dramatically

- Definitive trial of a hopeful preventive nasal spray in Toronto
- But in the end, spray had no effect on preventing polio and it damaged sense of smell in many cases

Nasal Spray Hoped To Prevent Infantile Paralysis

London Free Press, Sept 2, 1937

High hopes are held by many Toronto doctors that the zinc sulphate nasal spray, which has proved a definite preventative of poliomyelitis in monkeys and other animals, may ward off the same danger from Toronto children. Dr. Max Minor Peet, professor of surgery at the University of Michigan, who developed the spray, has offered to come to Toronto to aid health authorities in administering it. Shown above is one of the first children in Toronto to have the spray injected at the Hospital for Sick Children. The injection is made at a certain point well within the nostril, and is said to cause little discomfort.

Paralysis Nose Spray Just Squirt And Smile

Sit, squirt, and a smile—sometimes a squirm. That's just about all there is to spraying a child's nose to protect it against infantile paralysis.

Once in a while a scared youngster howls and struggles. But the doctors who are spraying 5,000 young Toronto noses don't argue.

The little howler is just asked to stand aside. "Next" gets into the chair, the squirt is over. The howler gets the idea nothing serious is happening after a few more patients have been treated.

Two long halls and a large waiting room were filled with parents and children when The Star visited a spraying clinic at the Hospital for Sick Children.

"Scared, sonny?" the reporter asked several young patients. There was always a "no," but it wasn't always convincing.

"I know it won't hurt. My mother used to be a nurse and she told me it wouldn't hurt," volunteered one eight-year-old miss.

She wriggled in her chair a bit when the doctor's pincer spread her nostril and the long, silver-pointed syringe went high up her nose.

Her hands convulsed upward as a sudden "pffff" came from the sprayer; but it was all over before she knew it. She grinned, scrambled off the hard little chair and ran out laughing.

"Most children are really a lot better if their parents stay outside," one of the four nurses helping one doctor explained. "At first we let the mothers come in, but that nearly always makes more fuss.

A few fathers had brought their children. One explained his wife was at work. He didn't have a job. One father, who said he came from Italy, had brought his wife and three children.

Brave Young Indians

Bravery prize for the session at this clinic went to John and Stanley Canoe. Eight and 10 years of age, they stalked in with a grin on their faces, held back their heads without a touch from the nurse, let the long slim tube go up in their nose opposite their eyes, didn't shiver when the thing "pffft-ed," and were still smiling going out.

"They're good youngsters," said Mrs. Canoe, small and very dark. "They should be brave. They're Indians."

Dr. Basil Bradley, who was doing treatments at the rate of about 30 an hour, admitted there were a few "tricks to the trade."

"The syringe looks pretty sharp," he said, showing a six-inch long silvery tube attached to the end of a little bottle with a bluish fluid inside.

"I let the child have a good
at it, tell him it isn't sharp,
point along his arm to let him
the feel of it."

Every patient gets a definite
pointment, but "most of them
a long time ahead," a nurse
"We try to prevent crowding
keep the children from getting
bunches, but when they come
long ahead of time there
great deal you can do about

For very small children who
scared, doctors sometimes use
entirely different method.
of the long silvery tube up
nose, the child is put lying
back on a table, its head
over the end. Then the fluid
poured in the nostril, the
head is held down for a few
onds and it's all over.

Several mothers were asked
they brought their children
you think your child was
to the disease? Did you
was going to get it?"

"No, I thought they were
all right, but an ounce of
tion is, I figured, worth a
pounds of cure," said one
speaking for all

Every Care Taken

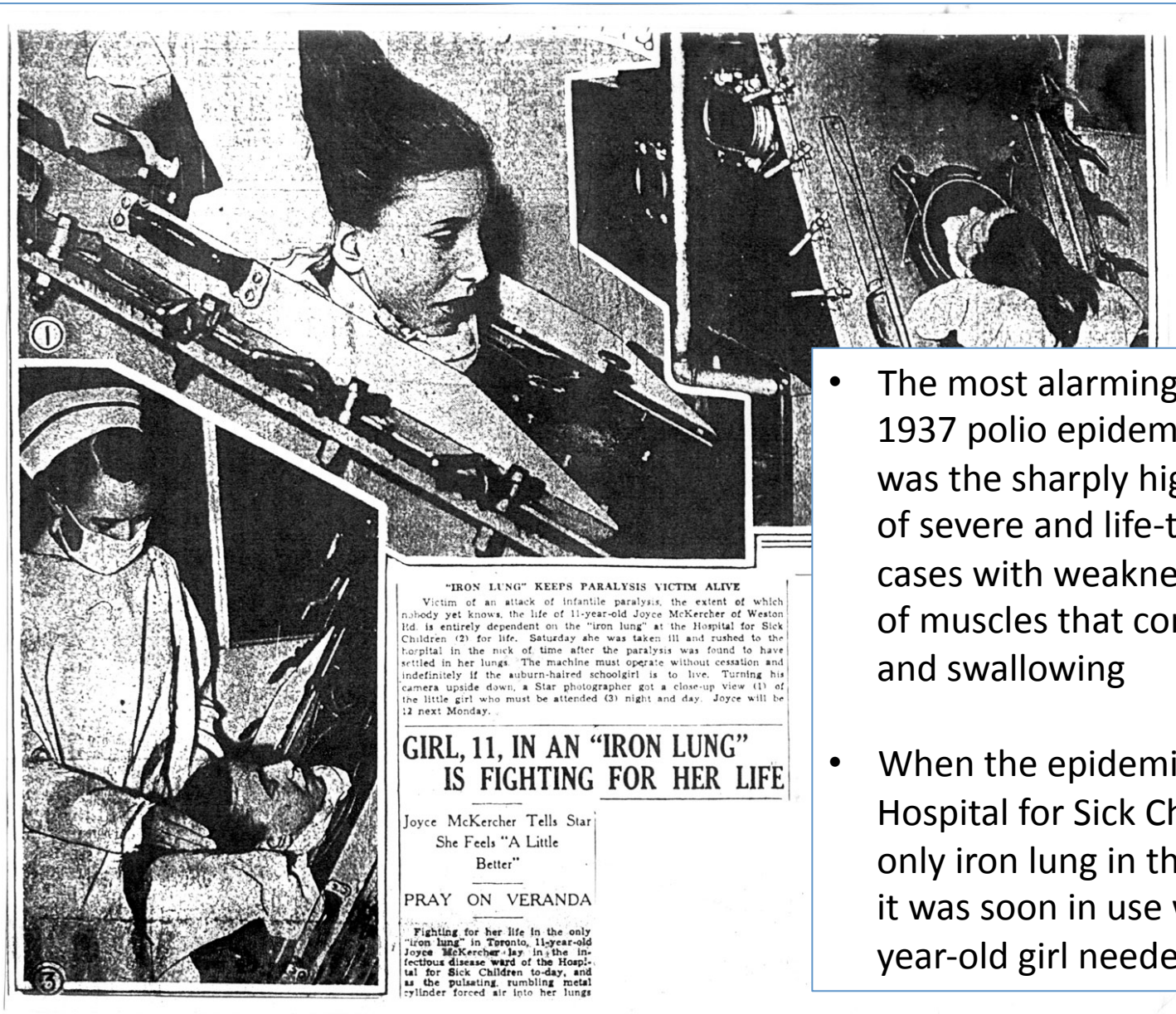
The procession came into
little room, with hardly a
doctors, wearing little more
big white "kimono" and
mask, dripped with
"The mask is to protect the
dren from us, not us from the
dren," one explained.
mirror flashed a beam of light
up the child's nostril, the
gun" squirted, the nozzle
screwed and tossed into
izer, the next child was
waiting.

Watching every more the
made were several other
Just watching — learning
done, they explained. One
practitioner from another
city. So many of his patients
ed him to spray their children's
noses that he "grabbed a
day" and came to Toronto
exactly how the job is done.

"Sure, I'd far sooner
children than on adults,"
tor declared. "Working on
is like being a garage
never works on anything
cars. Children usually
one thing wrong with them.
can usually fix them up,
a kick out of doing that.
are like old cars. You put
generator or a spark-plug,
thing still rattles and knocks
then you find you need
else. You're never done.
al for kids."

Toronto Star, Sept 2, 1937

1937 – Polio Rising, Dramatically



"IRON LUNG" KEEPS PARALYSIS VICTIM ALIVE

Victim of an attack of infantile paralysis, the extent of which nobody yet knows, the life of 11-year-old Joyce McKercher of Weston ltd. is entirely dependent on the "iron lung" at the Hospital for Sick Children (2) for life. Saturday she was taken ill and rushed to the hospital in the nick of time after the paralysis was found to have settled in her lungs. The machine must operate without cessation and indefinitely if the auburn-haired schoolgirl is to live. Turning his camera upside down, a Star photographer got a close-up view (1) of the little girl who must be attended (3) night and day. Joyce will be 12 next Monday.

GIRL, 11, IN AN "IRON LUNG" IS FIGHTING FOR HER LIFE

Joyce McKercher Tells Star She Feels "A Little Better"

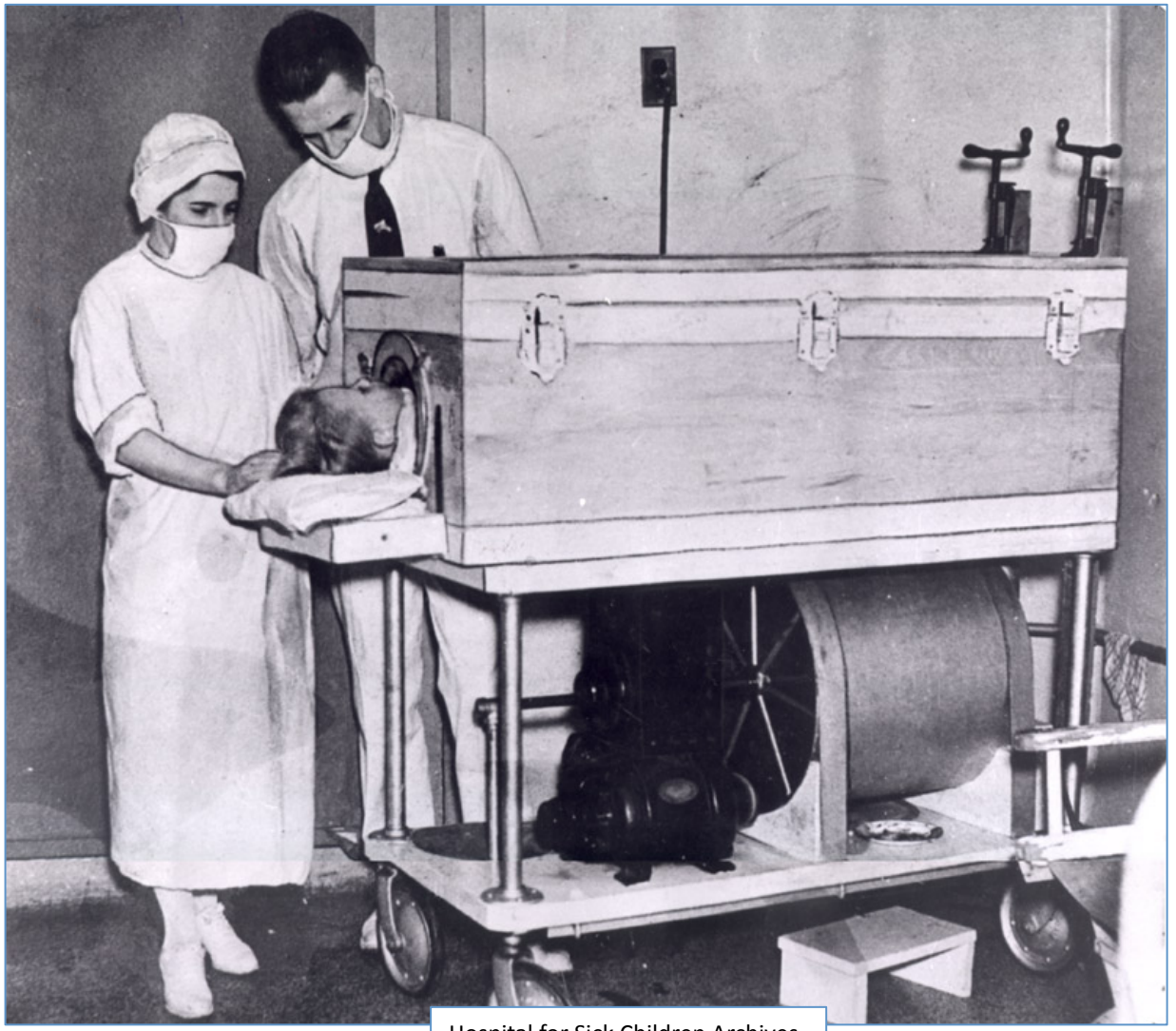
PRAY ON VERANDA

Fighting for her life in the only "iron lung" in Toronto, 11-year-old Joyce McKercher lay in the infectious disease ward of the Hospital for Sick Children to-day, and as the pulsating, rumbling metal cylinder forced air into her lungs

- The most alarming aspect of the 1937 polio epidemic in Ontario was the sharply higher numbers of severe and life-threatening cases with weakness or paralysis of muscles that control breathing and swallowing
- When the epidemic started, the Hospital for Sick Children had the only iron lung in the country and it was soon in use when an 11-year-old girl needed it

1937 – Polio Rising, Dramatically

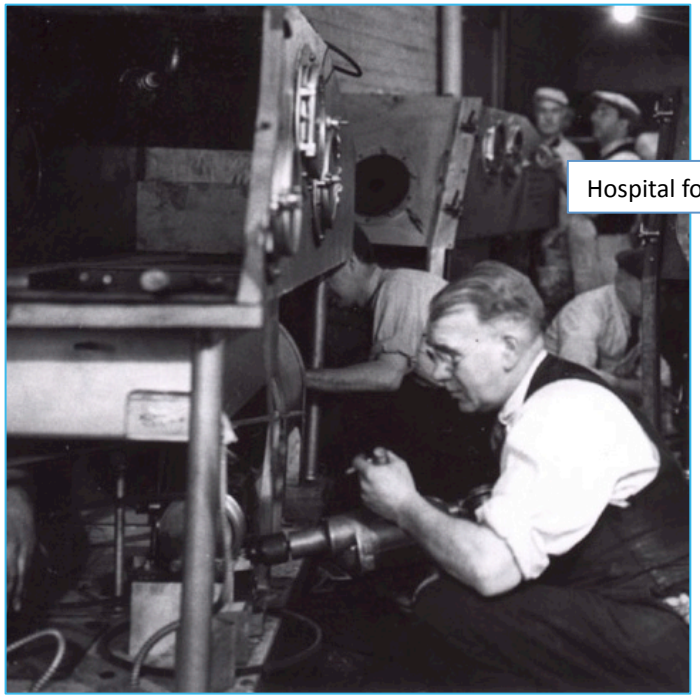
- However, when a young boy arrived at HSC with respiratory weakness and the iron lung was still occupied, hospital staff scrambled and were able to assemble a "wooden lung" from another smaller respirator and it saved the boy's life

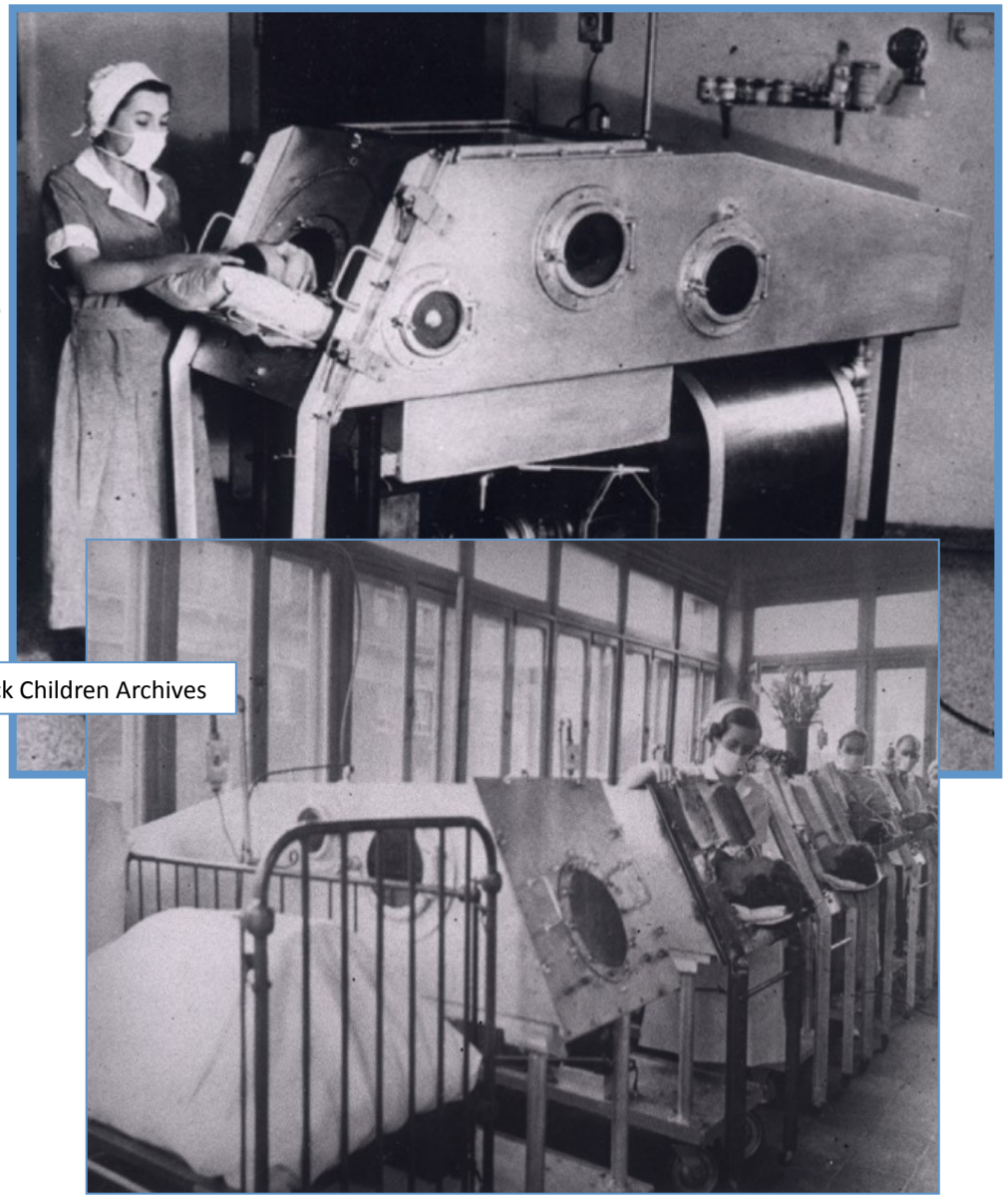


Hospital for Sick Children Archives

1937 – Polio Rising, Dramatically

- Fearful of many more such cases, this effort was followed by the construction of 27 iron lungs in the basement of HSC, paid for by the Ontario Department of Health; some "lungs" were distributed elsewhere in the province, and beyond.





Hospital for Sick Children Archives

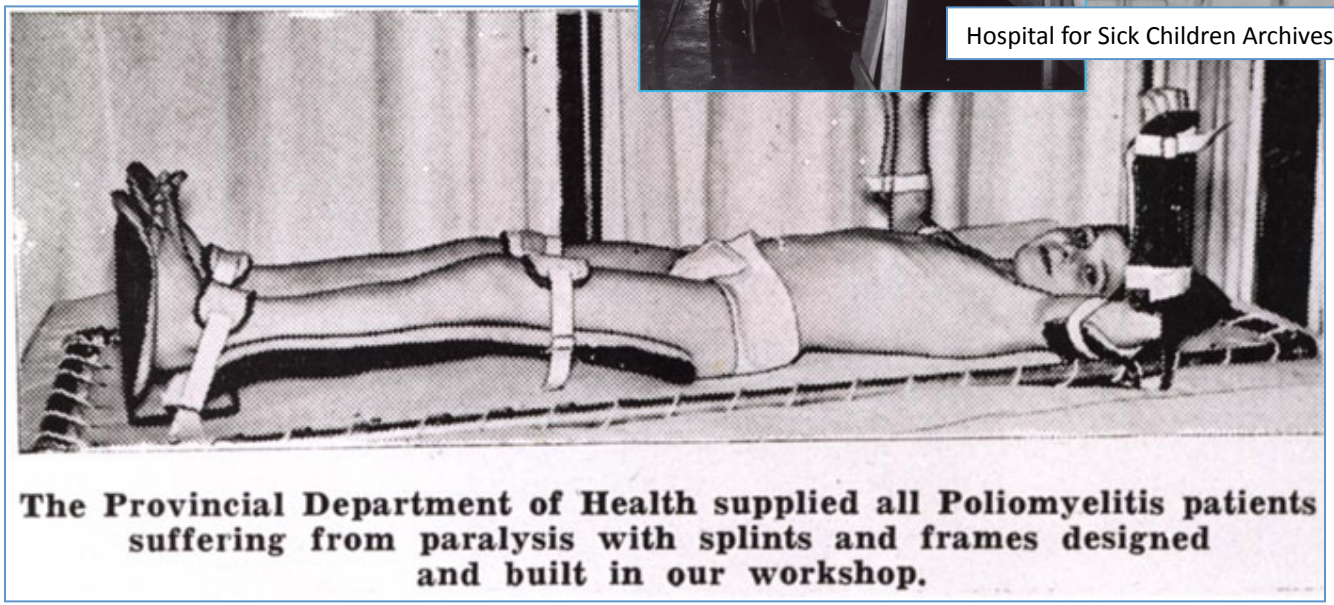
1937 – Polio Rising, Dramatically

An iron lung built at HSC in 1937 has been restored and is the centerpiece of an exhibit I guest-curated on the history of vaccines at the Museum of Health Care in Kingston. An online version of this exhibit can be seen at: http://www.museumofhealthcare.ca/explore/exhibits/vaccinations/polio.html

1937 – Polio Rising, Dramatically

- Managing the crippling effects of polio was a major challenge
- Strict immobility was the standard of medicine for polio after-care until the early 1940s

Hospital for Sick Children Archives

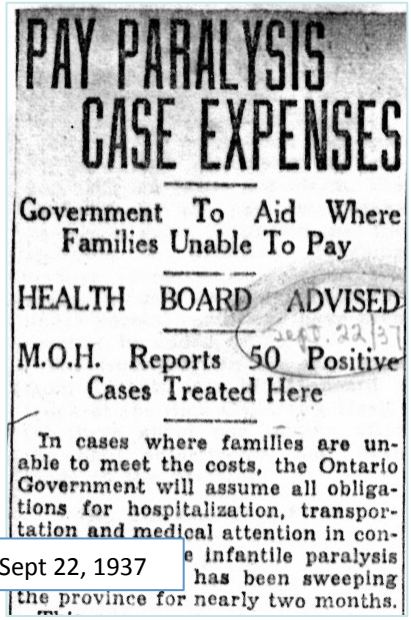


The Provincial Department of Health supplied all Poliomyelitis patients suffering from paralysis with splints and frames designed and built in our workshop.

1937 – Polio Rising, Dramatically

- The severity of the 1937 polio epidemic prompted the Ontario government to establish a distinctive program to cover the costs of specialized polio treatment and hospitalization

- Similar polio treatment policies began in other provinces in the late 1930s, particularly in Alberta and Saskatchewan



PAY PARALYSIS CASE EXPENSES

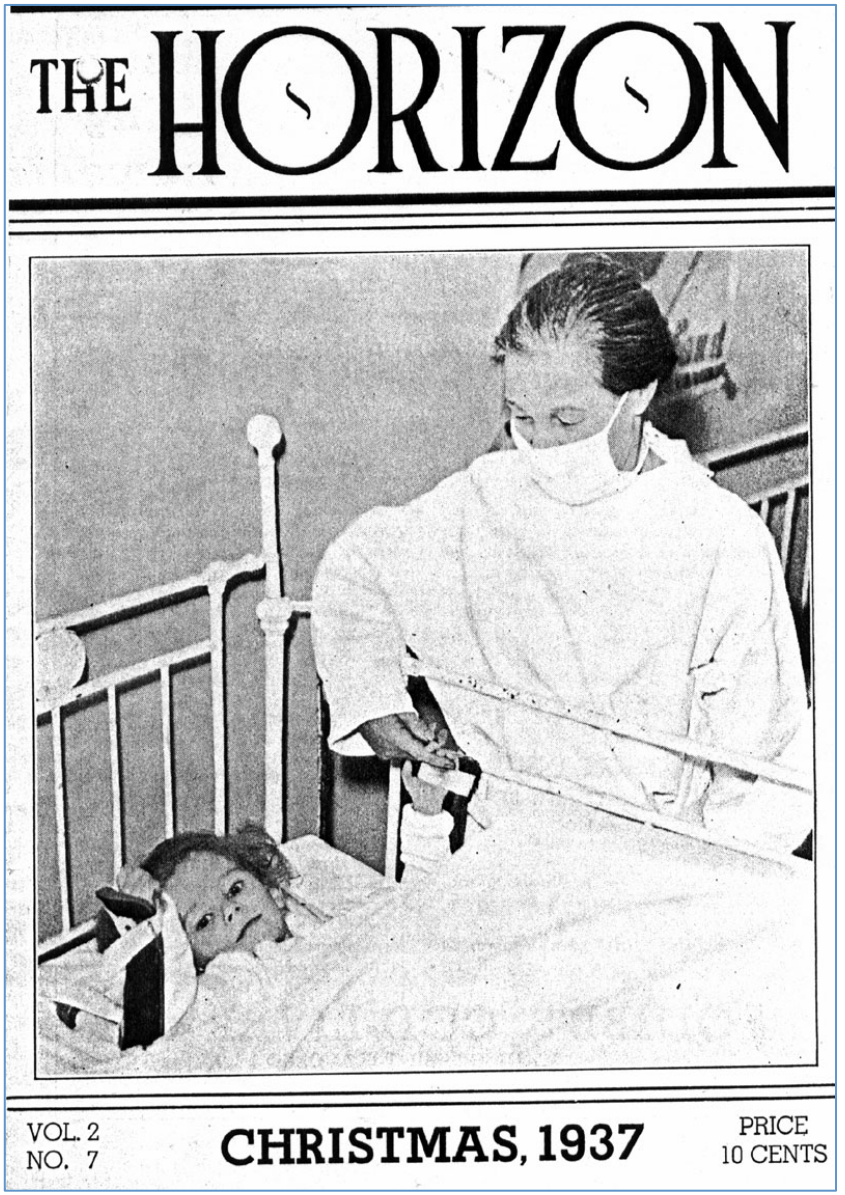
Government To Aid Where Families Unable To Pay

HEALTH BOARD ADVISED

M.O.H. Reports 50 Positive Cases Treated Here

In cases where families are unable to meet the costs, the Ontario Government will assume all obligations for hospitalization, transportation and medical attention in con- e infantile paralysis has been sweeping the province for nearly two months.

London Free Press, Sept 22, 1937



THE HORIZON

VOL. 2 NO. 7 CHRISTMAS, 1937 PRICE 10 CENTS

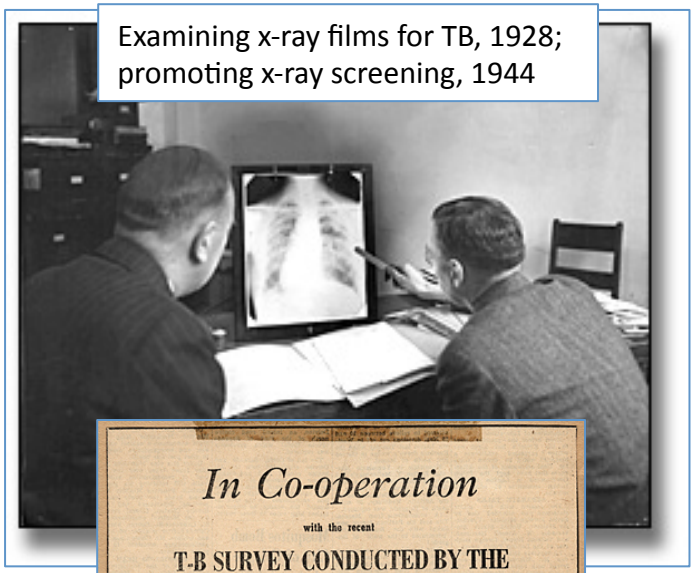
Tuberculosis Treatment & Prevention

- Provincial polio treatment policies developed within a context of varying provincial strategies to diagnose, treat and prevent tuberculosis, ie:

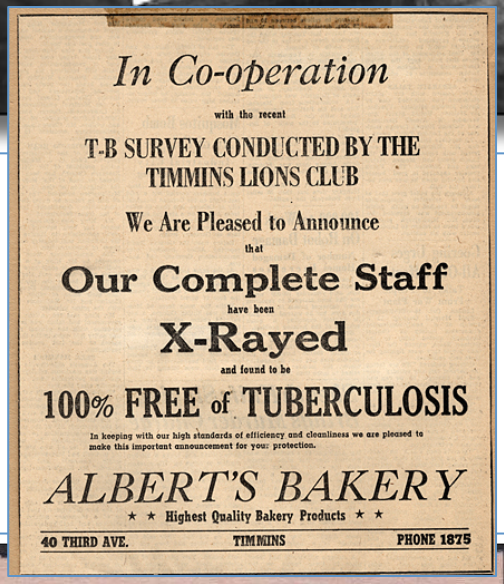
- **1921** – Saskatchewan launched the first TB school survey in the country; 170,000 children surveyed, 56% found to be TB+

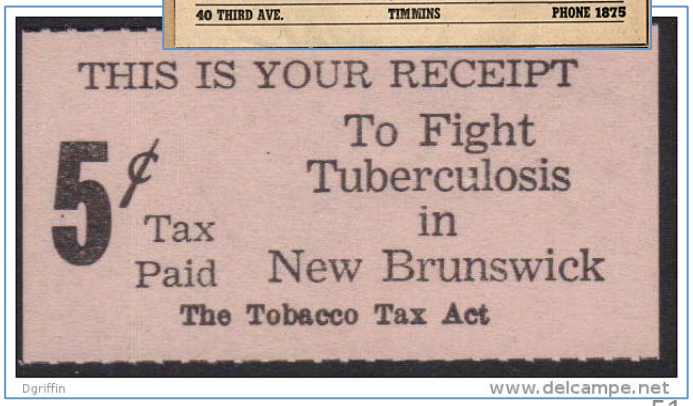
- **1923** – Ontario Board of Health launched the first travelling TB clinic utilizing mobile x-ray machines, providing diagnosis, treatment and follow up

- **1940** – New Brunswick government imposed a unique "Tobacco Tax" on the retail price of all forms of tobacco, the proceeds distributed to municipalities to directly pay for sanatoria treatment @$1/patient-day



Examining x-ray films for TB, 1928; promoting x-ray screening, 1944





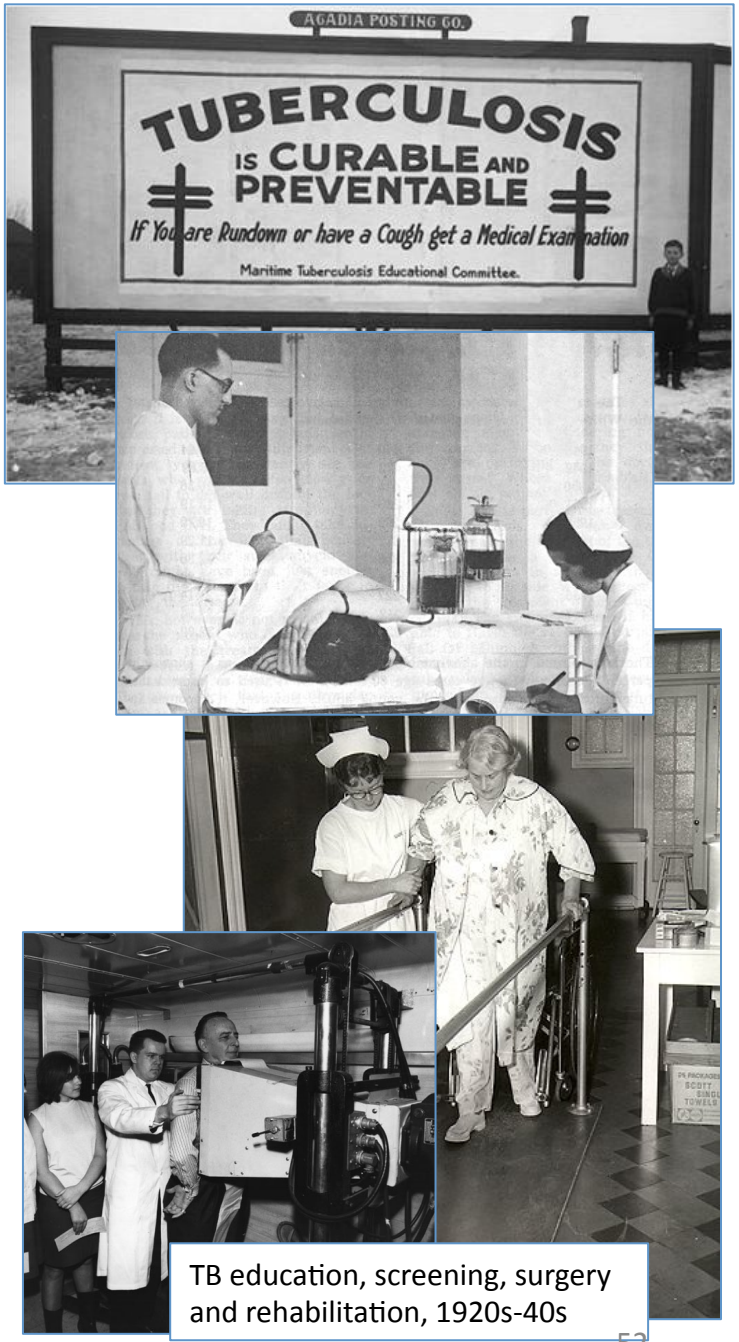
Tuberculosis Treatment & Prevention

- Recognizing that TB was primarily a disease of poverty and that private resources, voluntary efforts and local governments were inadequate to meet the costs of TB treatment, provincial governments assumed greater financial responsibility for management of the disease

- **1929** – Saskatchewan first province to treat all TB patients without any charges to the individual, the costs met by taxation

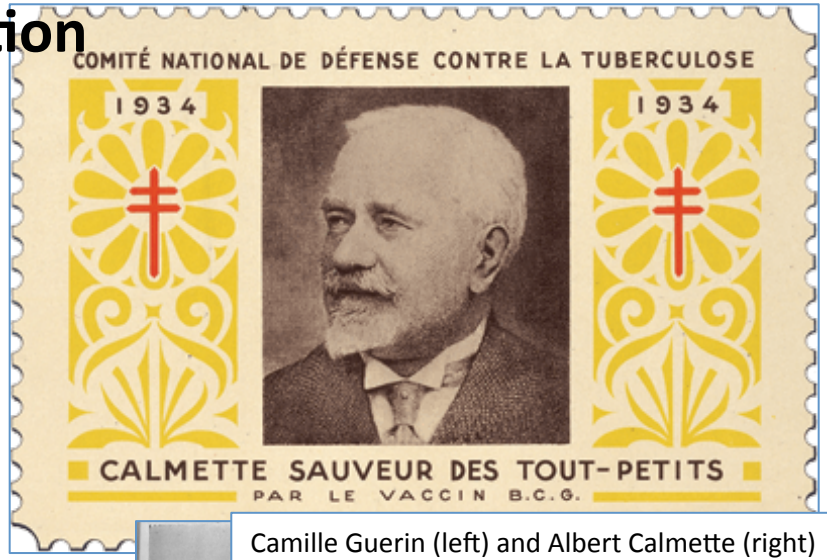
- **1936** – Alberta was second to offer free TB treatment through the passing of The Tuberculosis Act

- **1939** – The Manitoba government assumed all costs of TB treatment (except for veterans and the indigenous population, who were under federal jurisdiction)



TB education, screening, surgery and rehabilitation, 1920s-40s

Tuberculosis Treatment & Prevention

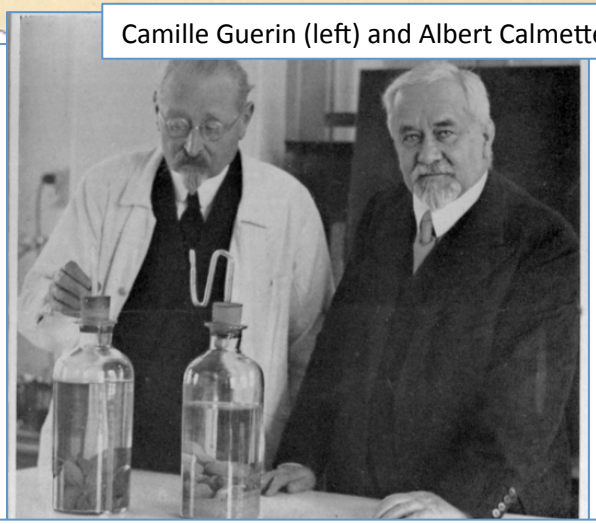


- **1921** – Prospects for TB prevention through immunization began with the first human use of "BCG vaccine", named after Albert Calmette and Camille Guerin, based at the Pasteur Institute in France

- Calmette was a student of Luis Pasteur and had developed a TB diagnostic test

- Guerin was studying to be a veterinarian and had lost his father and then his wife to TB before fully focusing on working with Calmette on a vaccine after WWI

Camille Guerin (left) and Albert Calmette (right)



- They discovered that successive cultures of a bovine tubercule bacteria strain weakened it enough that it could stimulate an immune response, but not cause illness

- Important to BCG's success was vaccination prior to exposure to TB

Tuberculosis Treatment & Prevention

- From its introduction, BCG has remained controversial, although today BCG is the most widely used vaccine in the world
- **1924-28** – In France, some 114,000 infants vaccinated with BCG without serious complications
- **Late 1920s** – BCG vaccine taken up with enthusiasm in Spain, and especially in the Scandinavian countries
- However, considerable skepticism prevailed in the UK based on low confidence in Calmette & Guerin's original statistics, and doubts in the US about its safety when virulent TB bacilli was discovered in BCG supplied to the Trudeau Sanatorium

Packaging BCG vaccine, Pasteur Institute, Paris, 1931

Tuberculosis Treatment & Prevention

- In Canada there has been a more mixed approach to BCG

- **1925** – Close scientific connections between Quebec and France led to initial BCG studies involving infants that proved encouraging

- **1931-32** – Armand Frappier, driven by the death of his mother and brother of TB, dedicates himself to its defeat; he studies at Pasteur Institute to learn how to prepare it

- In Quebec there were few sanatoria and the public campaign against TB was less well developed as in other provinces; thus more interest in TB immunization as a public health strategy

Dr. Armand Frappier (1904-1991)

- **1935** – Frappier helped establish a BCG clinic in Montreal designed to vaccinate newborn children of TB positive families

- BCG proved effective in stimulating TB immunity if infants were kept isolated until a tuberculin test became positive

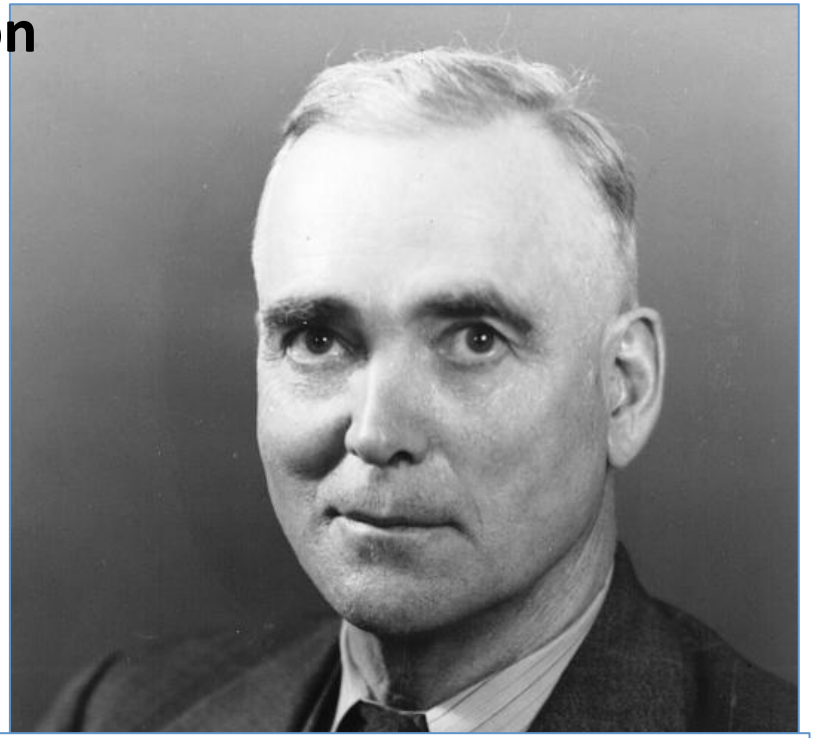
Tuberculosis Treatment & Prevention

- **1928** – Meanwhile, the Canadian government funded research into BCG led by Dr. R. George Ferguson, Director of the Fort Qu'Appelle Sanatorium in Saskatchewan

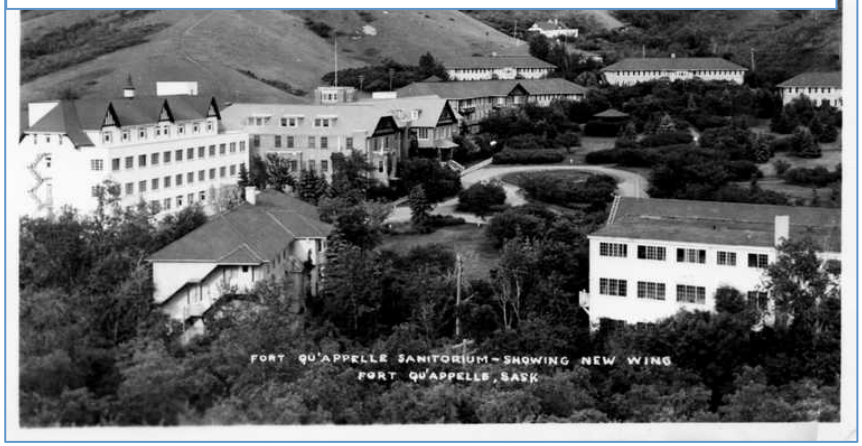
- The sanatorium was literally surrounded by poverty-stricken Treaty-Four "Indian" reserves

- The native population was not offered TB treatment in the sanatorium and until they caught up to the "white races" as they were seen as a disease threat to them

- Ferguson hoped to prove that BCG could provide an opportunity to speed up the evolutionary process of civilizing the indigenous population at very little cost



Dr. R. George Ferguson (1883-1964) headed the Fort Qu'Appelle Sanatorium for 31 years and was President of the Canadian Tuberculosis Association during 1935-36



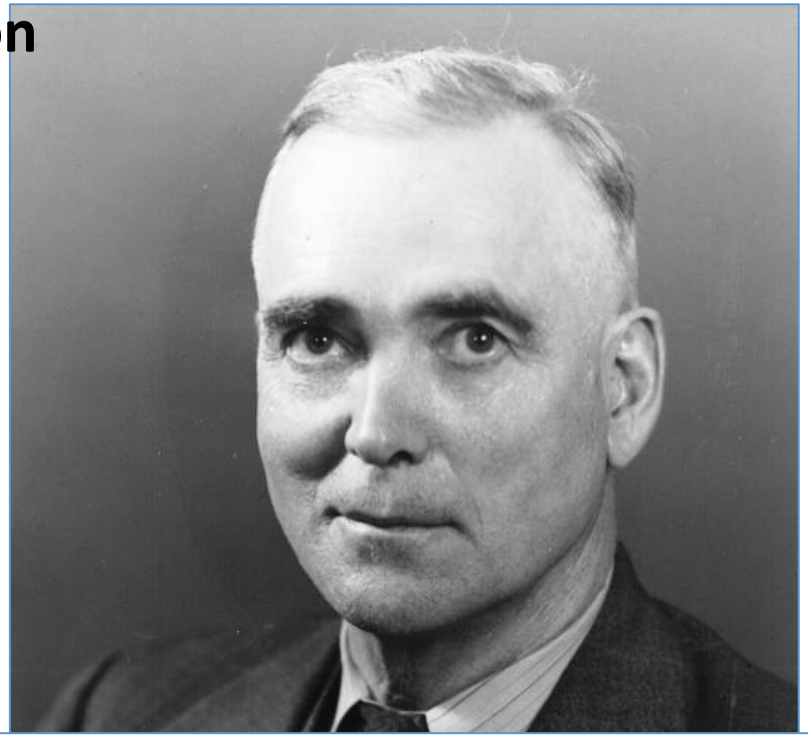
Tuberculosis Treatment & Prevention

- **1933** – Aware of Frappier's work in Quebec, Ferguson began a 12-year BCG trial involving indigenous infants

- The trial was an apparent success: 6 of the children vaccinated developed TB with 2 deaths, while 29 of the 303 in the unvaccinated control group developed TB, with 9 deaths

- However, the trial also found that 77 of the 609 native children in the trial died before their first birthday, but only 4 were due to TB; nearly 1/5 of the children died from other diseases

- While BCG lived up to its promise to control TB, poverty was the greatest threat to indigenous children



Built in 1936 near Fort Qu'Appelle Sanatorium, the Provincial Indian Hospital accommodated the aboriginal TB patients and infant children in the BCG experiment on the 3rd floor

Tuberculosis Treatment & Prevention

- **1938** – Frappier established the Institut de Microbiologie et d'hygiène at the Université de Montréal

- The Institut was initially created to produce BCG vaccine used for school immunization programs in Quebec, and it would later produce a few other vaccines along similar lines as Connaught Labs at the University of Toronto

Diphtheria Toxoid & Vaccine Promotion

- **1920-39** – Much had changed in Canadian public health and immunization during the 1920s and 1930s

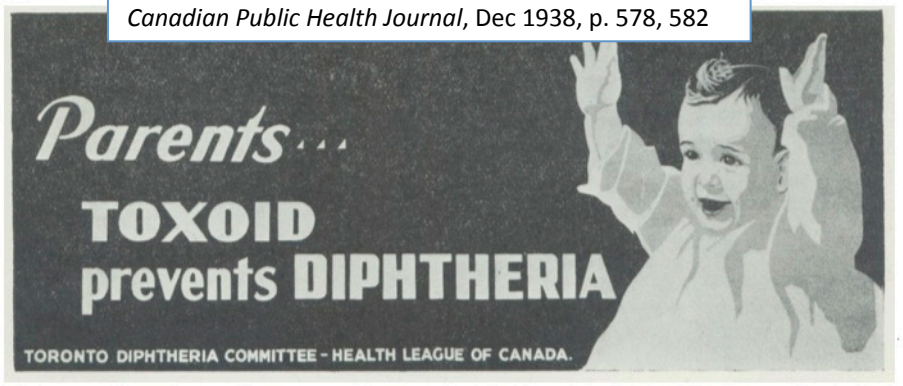
- Perhaps most dramatic was the difference between the politically and emotionally charged anti-vaccination efforts surrounding smallpox vaccination during the 1919-20 Toronto outbreak, and the annual mounting of "Diphtheria-Toxoid Week" in Toronto, which started in 1937 and enjoyed broad parental, public health and political appeal

"Diphtheria-Toxoid Week" in Toronto

GORDON BATES, M.B.
General Director, the Health League of Canada
Toronto

THE Department of Public Health of Toronto has established an enviable record in diphtheria immunization. Commenced in 1928, the work has been systematically and effectively conducted, utilizing the schools and supplementing the immunization conducted by physicians in their private practice. In 1895, when Toronto's population was 177,000, there were 147 deaths from diphtheria. If that rate had continued, in 1937, 735 deaths would have been recorded in Toronto from diphtheria; actually in that year there were no deaths from diphtheria in the city. For ten years the Department of Public Health has provided convenient centres for the immunization of pre-school children; and through the co-operation of the press of Toronto daily announcements have been published, since the establishments of these clinics, of the number of preschool children attending.

Canadian Public Health Journal, Dec 1938, p. 578, 582



The "toxoid-week" is largely a publicity effort but its value lies in the successful enlistment of an enthusiastic committee of prominent citizens and the co-operation of the entire community. Careful planning is, of course, essential. The plan in general is suitable for use in smaller municipalities.

Diphtheria Toxoid & Vaccine Promotion

- **1920-39** – "Toxoid Week" was the brainchild of Dr. Gordon Bates, who after his leadership in building a national educational campaign to prevent venereal diseases, established the Health League of Canada in 1935 based largely on public education in support of diphtheria immunization

- Indeed, in many ways the introduction of diphtheria toxoid had a transformative impact on Canadian public health and infectious disease prevention during the 1920s and 1930s

Globe & Mail, May 2, 1938, p. 19

Follow Toronto's Example In Prevention of Diphtheria

With the realization that diphtheria is preventable in at least 95 per cent of children comes concerted effort on the part of several communities to completely banish the disease. Toronto itself has proved beyond dispute that this can be done. Diphtheria is such a serious disease that every parent should follow the advice given by the Department of Public Health, Toronto.

Diphtheria attacks mostly children under five years of age, although those up to ten years are within that marked group from which it selects almost all its victims.

It is ... germ, w... spread ... the disc... an app...

(called a diphtheria carrier) who carries the germs in his throat and nose. The germs lodge in the nose or throat of the unprotected individual and multiply, producing their deadly poison.

The disease has an insidious onset, that is, a child may appear just a little pale or out of sorts, or appear to have swollen glands, with little or no noticeable fever. He seldom complains of the sore throat, the real site of the trouble. Often before a physician is called, it is too late. The diphtheria poison has done its work, having reached the heart.

ognized early.

The process of prevention of diphtheria is a very simple one, not attended by any danger or by any great inconvenience. Three small doses of diphtheria toxoid, given at three-week intervals will give the child a prolonged protection against the disease. This treatment should be started shortly after the child reaches six months of age. The child's immunity usually is established within two to three months after the last dose has been given.

There are unfortunately a few children who apparently receive ... toxoid ... the ... of the ... ve, it ... ian at ... ven.

Toxoid Week Due in April

Ontario Government to Co-operate With Canada Health League

An Ontario Toxoid Week will be held during the first week of April under the sponsorship of the Health League of Canada, and with the co-operation of the Provincial Departments of Health and Education.

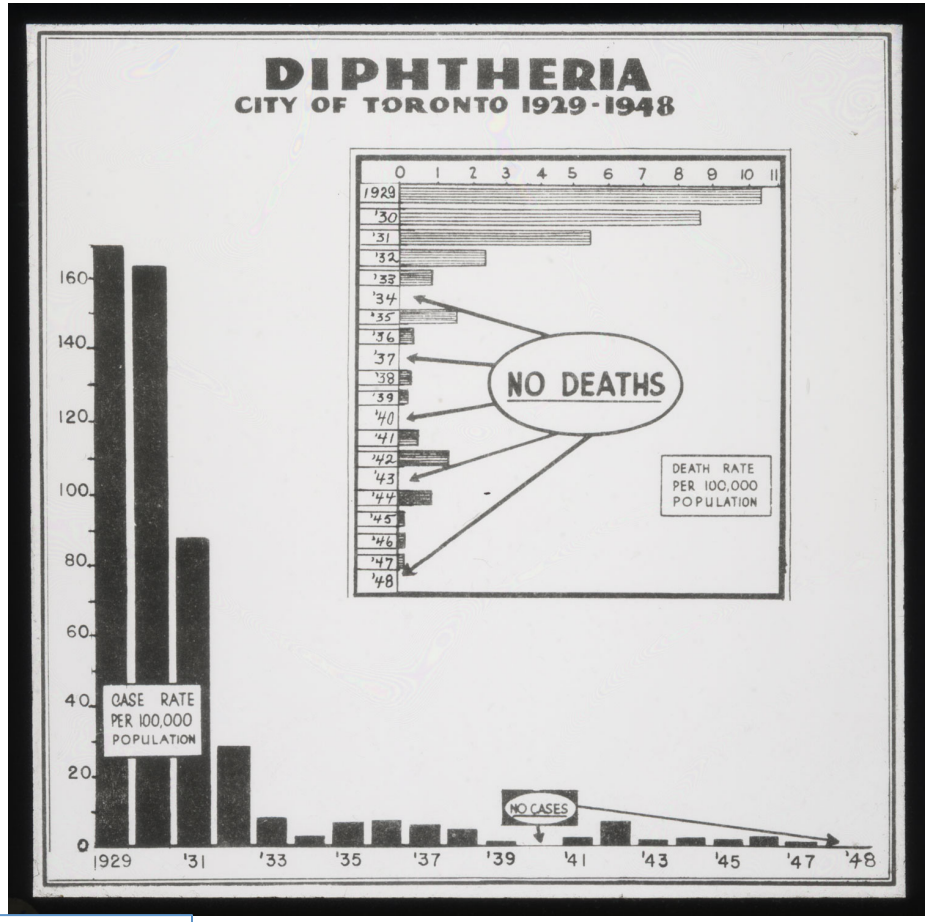
For a number of years, successful toxoid campaigns have been conducted in Toronto, which last year did not have a single death from diphtheria as a consequence of widespread immunization. This success has encouraged the extension of this organized drive to combat diphtheria to the whole Province. At a meeting yesterday presided over by John P. Patterson, those present included Dr. J. T. Phair of the Ontario Department of Health, Inspector Greer of the Ontario Department of Education, Dr. H. A. Ross, Dr. E. A. Hardy and Dr. C. C. Goldring of the Toronto Board of Education, M. Duggan and D. A. Balfour of the Separate School Board, Dr. Gordon Bates, General Director, and Miss M. Ferris and C. Sanagan of the Health League of Canada.

Globe & Mail, Jan 27, 1938, p. 8

Diphtheria Toxoid & Vaccine Promotion

- **1920-39** – While diphtheria toxoid certainly played a central biotechnological role in bringing a once deadly disease under control during this period, there was another similarly significant biotechnological product that did something similar at about the same time, although the disease was not infectious

Sanofi Pasteur Canada Archives



Diphtheria Toxoid & Vaccine Promotion

- The disease was Diabetes and the product was Insulin, and its Canadian discovery and development story during the 1920s and 1930s will be central to Class #4…

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