

## Tuberculosis: 2. History of the disease in Canada

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Tuberculosis is more than biology; it is a statement about society.  
Keith Wailoo, historian, *People's Plague*, PBS, 1995

Tuberculosis is a social disease with a medical aspect.  
Sir William Osler

Il bacillo non é ancora tutta la tubercolosi  
[translation: The bacillus is not yet all there is to tuberculosis].  
G. Bacelli, circa 1882, quoted in *Tuberculosis* (Barry R. Bloom, editor), 1994

In the pre-chemotherapy era, tuberculosis (TB) was almost universal, affected young and old, presented a wide array of morbid effects and carried a high mortality rate. In the post-chemotherapy era, the epidemiology has changed, and the strategies for controlling TB have had to be refocused.<sup>1</sup> The abrupt switch from sanatorium to outpatient care taught important lessons about compliance with drug treatment.<sup>2</sup>

This short history of TB will describe how the disease came to Canada, its effect on various population groups and what measures have been taken to control, prevent and treat it. For those who want to explore this subject more fully, several valuable publications are available.<sup>3-8</sup>

### The tuberculosis epidemic in Canada

#### *European immigrants*

There is evidence that mycobacterial diseases closely resembling TB existed in the pre-Columbian Americas,<sup>9</sup> but precise identification of the mycobacteria involved awaits application of recent refinements in molecular techniques.<sup>10,11</sup> The modern global TB epidemic began in western Europe in the 17th century and reached its peak some 100 years later.<sup>12</sup> The Canadian TB epidemic of the last several centuries was brought by the Europeans who settled here, bringing their infection with them; the epidemiologic pattern in the country of origin of each group has been mirrored in Canada.<sup>13</sup>

Currently, the largest proportion of the population (i.e., Canadian-born non-aboriginal people) exhibits a very low prevalence, probably approaching 1 or 2 per 100 000 in many provinces. In contrast, the overall mortality rate for TB in Canada in 1908 was reported to be 165 per 100 000 by the Canadian Tuberculosis Association.

#### *Aboriginal Canadians*

It is probably significant that recent incidence rates for TB among geographically defined aboriginal groups (which include Status Indians, non-Status Indians, Métis and Inuit people) have reflected the time of contact with the European settlers.<sup>14</sup> The aboriginal people of eastern Canada were probably first



#### *Education*

#### *Éducation*

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Dr. Stefan Grzybowski died before publication of this paper, although he was able to complete the first draft. Dr. Edward A. Allen, his friend and colleague for 40 years, mourns Dr. Grzybowski's passing and pays tribute to his enormously productive career and his compassion for the underdogs and the marginalized, wherever they exist in the world. His contribution to the understanding and control of tuberculosis was considerable. He will be sorely missed by many.

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exposed to TB some 300 years ago. Those on the west coast were exposed about 200 years ago with the arrival of Cook, Vancouver and a host of merchant adventurers from Europe and the Far East. The aboriginal people of the Prairies were exposed much later — about 100 or 120 years ago — when the Canadian Pacific Railway was built and the reserve system established.<sup>13</sup> In the North, the Déné nations and the Inuit were exposed relatively recently, in the late 19th and early 20th centuries.<sup>13</sup> The high mortality rates that afflicted aboriginal people from the Prairies toward the end of the 19th century reflected their lack of ancestral exposure to TB combined with the opportunity for transmission within the reserve system.<sup>13</sup>

### ***Immigrants from high-prevalence areas***

TB in epidemic form came to India and China in the 19th century.<sup>12</sup> Although prevalence rates have been steadily declining in both countries,<sup>15</sup> they remain relatively high, similar to those seen in Canada and Europe 50 or 60 years ago. In the last quarter of the 20th century Canada has admitted a much larger proportion of immigrants from areas other than Europe, especially Asia. As was the case for Europeans, their contribution to the epidemiology of TB in Canada reflects the state of TB in their countries of origin.<sup>15</sup>

### ***Natural history of a tuberculosis epidemic***

TB is believed to be a biological entity with a lifespan within a community of several hundred years in the absence of effective interventions. Even without intervention, after a relatively early peak the incidence rates start to gradually fall. The factors commonly assumed to influence the spread and severity of TB, such as housing, degree of crowding at home and work, nutrition, physical and mental stress, other diseases, and the level and availability of medical care, continue to be studied.<sup>16,17</sup> However, there remains a justifiable reluctance to generalize about the impact that socioeconomic issues may have had on TB in the past.<sup>16</sup> Furthermore, there is growing support for the role of Darwinian genetics in shaping a TB epidemic.<sup>12,16</sup>

## **Measures to combat tuberculosis**

### ***Sanatoria, dispensaries and health nurses***

Sanatorium treatment isolated infected patients and provided rest, nutritious food, fresh air (at one time, the ice-cold air of winter), education and rehabilitation.<sup>6</sup> The first Canadian sanatorium, the Muskoka Cottage Sanatorium in Gravenhurst, Ont., opened in 1897 and was run by the Toronto-based National Sanatorium Association under the leadership of Sir William Gage. In 1902 the Muskoka Free Hospital for Consumption opened; it was believed to be the first free sanatorium for the treatment of TB in the world.<sup>6</sup> The Toronto Free Hospital for Consumptives in Weston, Ont., opened in 1904, and the Gage Institute in

Toronto, which supervised tuberculous patients on an out-patient basis, opened in 1914.

In 1909 the first Canadian TB health nurse, whose salary was paid by the National Sanatorium Association, began to visit the homes of tuberculous patients in Toronto, to provide post-sanatorium follow-up, to educate, to provide sputum boxes and disposable cheese-cloth handkerchiefs, and to conduct disinfections. In 1911 a free dispensary opened in Toronto, which provided soup, eggs, milk, clothing, sputum boxes and free medicines and paid the rent of deserving patients with TB. The Samaritan Club made an important contribution in that era in Toronto, as did the Homemakers Clubs in rural Saskatchewan and the Imperial Order of the Daughters of the Empire in Saskatchewan and elsewhere.<sup>7</sup>

In 1929 Saskatchewan became the first jurisdiction in North America to provide free diagnosis and treatment on a universal basis.<sup>7</sup> Eventually, sanatoria and TB dispensaries were built in every province. In 1938 Canada had 61 sanatoria with close to 9000 beds. By 1953 there were 101 sanatoria and TB units in general hospitals with a total of 19 000 beds. By the early 1960s, with the success of drug therapy, only a few beds devoted to patients requiring hospital care or isolation were left.

Because of the misguided parsimony of the government with respect to the suffering of aboriginal people, aboriginal patients were rarely offered sanatorium treatment in the 1930s.<sup>3</sup> However, after protests and investigation, care for aboriginal people improved, and by the end of 1953, 2627 aboriginal people and 348 Inuit were in sanatoria.

### ***Collapse therapy and surgery***

By the late 1920s collapse therapy became common in Canada. Approximately one-third of TB patients received some form of this treatment. The most common procedure was artificial pneumothorax (the injection of air into the pleural space). By the early 1940s thousands of refills (re-injections of air) were being done each year to maintain collapse. Pneumoperitoneum followed in the late 1940s. These techniques were often combined with phrenicocolysis (crushing or surgical division of the phrenic nerve) to cause ipsilateral, reversible or permanent paralysis of the diaphragm. Sometimes scalenotomy (division of the scalene muscle) was added to reduce expansion of the lung apex. Pneumolysis under thoracoscopy, to free the lung from adhesions preventing its collapse, was first used in the 1930s.

Thoracoplasty was introduced in Canada by Professor Edward Archibald, head of surgery at McGill University.<sup>8</sup> It was a more permanent and focused form of collapse therapy, in which several ribs were removed, commonly from the upper part of one side of the chest. Techniques such as plombage (extrapleural insertion of fat or a “plombe” of solid paraffin wax and, later, lucite spheres or sponges of inert plastic material) and oleothorax (the introduction of oil into the pleural cavity) were occasionally used as less deforming and potentially reversible forms of collapse. Col-



lapse therapy ended when chemotherapy became an established treatment.

Lung resection was a major step in surgical intervention; the diseased lung was removed in the hope that there would be no recurrence in the other lung or elsewhere. A technique of lobectomy was developed by Drs. N.S. Shensstone and R.M. Janes, of Toronto, and in 1941 Dr. Janes performed what was probably the first pneumonectomy for TB in Canada.<sup>6</sup>

Surgical procedures for extrapulmonary TB became common in the 1930s and 1940s.<sup>6</sup> In 1931 Dr. R.I. Harris successfully applied a bone graft to a tuberculous spine. In 1933 Dr. J.G. McClelland performed the first nephrectomy for TB. After 1948, with the advantage of chemotherapy, it became common to do wedge resections and lobectomies. When effective anti-tuberculosis drugs were introduced, surgery became largely unnecessary and after 1960 was uncommon.

Rest, good nutrition and collapse therapy helped patients with TB, and care and compassion were provided for those who were terminally ill (in the first 25 years of the sanatorium era, 45% of patients with TB died<sup>6</sup>). But undoubtedly the main benefit of sanatorium treatment before chemotherapy was the isolation of chronically infectious patients. The efficacy of surgery alone between 1930 and 1948 may have been considerable. It seemed to hasten recovery, it produced some cures, and it relieved pain and various anatomic obstructions.

### **BCG vaccination**

Drs. Albert Calmette and Camille Guérin launched the BCG (bacille Calmette-Guérin) vaccine in 1924 in France, but its use was always restricted in Canada. Only Quebec and Newfoundland used this vaccine in mass vaccination programs. Other provinces reserved its use for special groups. Reluctance to use BCG vaccine was influenced by attitudes in the United States, where it has always been controversial.<sup>18</sup>

Dr. J.A. Baudouin began clinical trials of BCG vaccine in 1925 and continued to supervise them until 1948. Armand Frappier pioneered national and international research into BCG vaccine and, from 1933, oversaw the production of the vaccine.<sup>19</sup> Between 1933 and 1943 Dr. R.G. Ferguson, director of the Saskatchewan Anti-Tuberculosis League, conducted a trial of BCG vaccine involving aboriginal infants and initiated a program of BCG prophylaxis for student nurses.<sup>7</sup>

### **Mass radiography and tuberculin surveys**

The first formal mass community survey in Canada was conducted in Melville, Sask., in 1941. In Saskatoon in 1948, 96% of the population underwent radiography. Initial surveys found more than 1 new active case of TB per 1000 tested, but this number fell to about 0.6 per 1000 by the end of 1945. In BC, community screening with radiographs

and tuberculin tests was conducted by mobile van between 1923 and 1975; between 1959 and 1969, 75% of the population was screened, with 219 085 tested in Vancouver alone.<sup>8</sup> Every province participated, but by the 1960s the incidence rate of TB had become too low to justify mass surveys.

In the early years of these surveys, skin tests were rarely conducted on adults because the great majority were expected to be positive. In the 1950s large-scale tuberculin surveys in Ontario revealed that the tuberculin-positive rates were actually much lower than had been believed, and this opened up the possibility of tuberculin testing in adults to detect those infected. In Ontario in the late 1950s less than 50% of the Canadian-born, nonaboriginal population reacted to tuberculin tests in every age group.<sup>1</sup> Subsequently, tuberculin testing became the preferred screening test for TB; radiography was reserved for positive reactors. By the early 1960s the instability of the reaction and the level of interference from cross-reactions with environmental mycobacteria were recognized.<sup>1</sup>

Chest radiography was useful when the yield was still rewarding, and it contributed to the early diagnosis of TB. However, radiography cannot be used to distinguish active from inactive TB, nor can it confirm the diagnosis or identify infectious cases without bacteriology.

### **Anti-tuberculosis drugs**

Anti-tuberculosis drugs ushered in a new era of treatment and control. Although discovered by Selman Waksman and colleagues in 1944, streptomycin did not become widely available until 1948. Even then, supplies were limited, indications for its use were restricted, and courses of treatment were often too short. The striking improvement that it produced in many was soon offset by the emergence of resistance to the drug.

Para-aminosalicylic acid salts, introduced in 1948, and isoniazid, introduced in 1952, reduced resistance and, when used in combination with streptomycin, were close to 100% effective.<sup>20</sup> Other drugs and various regimens followed. The effectiveness of drug therapy opened the door to the prevention of tuberculous disease, and from the earliest days these drugs were available without cost to all patients.

### **The Canadian Lung Association**

In 1900 the Canadian Association for Prevention of Consumption and Other Forms of Tuberculosis was established; it evolved into the Canadian Tuberculosis Association and, ultimately, the Canadian Lung Association. Early emphasis was placed on education and the definition of responsibility. The association initiated many activities, such as mass surveys, and was the impetus for much of the action that government, somewhat reluctantly, undertook.

The Canadian Lung Association, acting in concert with its provincial representatives, has initiated programs, guided standards, made recommendations for change and



supported research. Its independence from government has assured the primacy of the patient and the priority of TB control in the face of bureaucratic whimsy, shortsightedness and delays. The official provincial TB control programs have always been and still are essential to national success.

## Record-keeping and statistics

By 1921 deaths from TB in Canada were being uniformly reported.<sup>4</sup> The first report of morbidity was published in 1937 by the Dominion Bureau of Statistics. Since 1996 the Laboratory Centre for Disease Control in Ottawa has assumed this function.

## Conclusion

At the end of the 19th century, the bacteriology and pathology of TB were well understood, and the conquest of TB seemed possible with the tools at hand. These tools included, first, isolation of infectious cases — concerns about heredity and constitution were being replaced by concerns about infection. Next, provision of rest, good nutrition, fresh air and education. The prevailing optimism and the groundswell of voluntary enthusiasm and effort led King Edward VII to utter, “If preventable — why not prevented?” Why not, indeed! The advances in drug therapy have produced spectacular results, and scientific advances at the most basic level have broadened our understanding of this disease. But the elimination of TB requires much more: it requires above all official and voluntary action, it requires that patients comply with all elements of control, and it requires the betterment of those marginalized in society.

In Canada the tools to manage TB are now largely available and adequate, although funding is not guaranteed. To eliminate TB, essential components of control must be maintained for a long time despite a declining incidence rate and the inevitable increase in cost per case. Eradication must be the goal, or the need for control will be unending.

Canada is far from eradicating TB, even within the Canadian-born nonaboriginal population. Eradication cannot be achieved in isolation; worldwide TB remains the largest cause of death from a single agent among those aged 15 to 49.<sup>21</sup> And the full impact of drug resistance, AIDS<sup>22</sup> and perhaps other biological, societal and environmental surprises have yet to be felt. It should never be forgotten that Canada's borders are a sieve, not a seal. The many facets of TB remind us forcibly that this disease exists within a broad context from which it cannot be separated.

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