Stopping TB in Canada: Will We Meet the Canadian Target for 2015?

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“Tuberculosis: the People’s Plague”
The TB situation in Canada

- Forgotten by most
- But not gone: A new TB case in Canada every 6 hours
Outline

- The Canadian TB incidence target
- TB in Canada in general
- TB among the foreign born in Canada
- TB among Aboriginal Peoples in Canada
- Role of molecular genotyping
- Role of social network analysis
- Role of interferon-gamma release assays for latent TB infection
- Canadian Tuberculosis Prevention and Control Strategy
- Top short-term priorities for TB prevention and control in Canada
The Canadian Target

- Reduce the 1990 incidence rate of 7.2 per 100,000 population to 3.6 by 2015 in keeping with the spirit of the Global Plan to Stop TB, 2006-2015
Reaching the 2015 Canadian Target (Eh!)

• To reach the new Canadian target, we need to reduce the incidence rate from 5.1 (1,651 cases in 2006) to 3.6 (1,252 cases) by 2015
• Average 3.5% annual rate decrease is needed
Conquering TB is not as simple as this picture
Tuberculosis incidence and mortality rates - Canada: 1924-2007
Tuberculosis incidence rate and counts
Canada: 1980-2007
Canadian Tuberculosis Incidence Rates by Province/Territory, 2007

- ≤ 4.7 (national rate)
- 4.8-9
- 10-29
- ≥ 30

Tuberculosis in Canada 2007 pre-release
Rates per 100,000 population (2008.10)
### Proportion of TB cases by age group and origin – Canada: 2007

<table>
<thead>
<tr>
<th>Age group</th>
<th>Proportion</th>
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<tbody>
<tr>
<td>0-1</td>
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<tr>
<td>1-4</td>
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<td>5-14</td>
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<td>45-54</td>
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<td>55-64</td>
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<td>65-74</td>
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<td>75+</td>
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- **Canadian-born Aboriginal**
- **Foreign-Born**
- **Non-Aboriginal**
Overall pattern of reported TB drug resistance in Canada – 2007

Source: Tuberculosis drug resistance in Canada 2007
Percentage of TB cases for which HIV status is known, Canada: 1997-2006
HIV among immigration applicants
Canada, 2002-2007

<table>
<thead>
<tr>
<th></th>
<th>Number of HIV infected applicants</th>
<th>Identified in Canada (%)</th>
<th>Identified outside Canada (%)</th>
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<tbody>
<tr>
<td>2007</td>
<td>536</td>
<td>59%</td>
<td>41%</td>
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<td>Jan. 2002 to Dec. 2007</td>
<td>3,103</td>
<td>60%</td>
<td>40%</td>
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Percentage of tuberculosis cases by origin - Canada: 1980 - 2007

- **Foreign-born**
- **Canadian-born non-Aboriginal**
- **Canadian-born Aboriginal**

Year

Percentage of cases
Tuberculosis incidence rate by origin
Canada: 1992 - 2007

- Canadian born Aboriginal
- Foreign-born
- Canadian born non-Aboriginal

Rate per 100,000 population

Year
TB among the foreign born in Canada by year of arrival

Years since arrival

Number of cases

- Arrival year 1951
- Arrival year 1962
- Arrival year 1970
- Arrival year 1980
- Arrival year 1985
- Arrival year 1990
Diagnosis within 2 years of arrival in Canada by country of birth: 2000 - 2004

- India: 16%
- China: 10%
- Philippines: 10%
- Pakistan: 6%
- Afghanistan: 3%
- Viet Nam: 3%
- Korea, South: 3%
- Congo: 2%
- Former Ethiopia: 2%
- Haiti: 2%
- Others: 43%
TB control among the foreign-born

1. Immigration Medical Exam

- **500,000** exams in 2007 among all immigrants, refugees and refugee claimants plus temporary residents from high TB incidence countries coming for at least 6 months or to work in health care, education, personal care, etc.
- History, physical exam, chest x-ray, 3 smears and cultures if any symptoms/signs
- **135 pulmonary TB cases** (52/100,000 medicals) found and treated during the Immigration Medical Process, Jan-June, 2008
- If they entered Canada and were then diagnosed and treated, our TB rate would go up 17%
TB control among the foreign-born

2. Medical surveillance after arrival

• 2.1% of 2007 applicants were diagnosed with inactive pulmonary TB
• Highest rates from China, India, Philippines and among refugee claimants
• About 7,000 referred for medical surveillance in 2007
• Guidelines for surveillance in *Canadian TB Standards, 6th edition*
• Confirmation from province/territory that 50-60% keep their first appointment
• But how many are treated to completion for LTBI?
• Citizenship and Immigration Canada is reviewing the Medical Surveillance Program
TB control among the foreign-born

3. Screening and treatment for latent TB infection after arrival

- Usual co-morbidity risk factors for progression of LTBI to disease, or

- Lived in a high TB incidence country (smear positive TB rate of ≥ 15/100,000) and immigrated within the past 2 years:
  - Under age 15: all
  - Age 15 and older: have lived with or in known contact with a TB case in the past or at high risk for development of active TB
High TB Incidence Countries

- Canada uses WHO estimated sputum smear positive rate ≥ 15/100,000 (3 year average of latest published data)
- Correlates well with Canadian rates of persons born in larger immigrant source countries
- Provides a uniform “third party” method for determining current infectious TB rates by country
- <www.publichealth.gc.ca/tuberculosis> for list of high TB incidence countries
TB incidence rate by Aboriginal origin, Canada, 1994-2007

- Inuit
- Status Indian
- Metis
TB among Aboriginal Peoples in Canada
Some reasons the rate is high

- Historically high exposure to the bacteria leading to 20-30% of adults being TB skin test positive vs. ~11% for all Canadians in general
- Some may have less natural resistance to TB disease due to genetic factors (e.g., Larcombe, *Journal of Infectious Diseases*, 2008)
- Co-morbidities such as diabetes mellitus type 2 increase the risk of latent TB infection progressing to disease
- Decreased nutritional status
- Substance abuse in some cases
- Crowded, inadequately ventilated housing—especially in remote areas—increases household transmission Delayed diagnosis of infectious cases leading to prolonged exposure time for contacts
- Delayed diagnosis of infectious cases leading to prolonged exposure time for contacts
- Lack of continuity of health care providers in remote communities
“Housing conditions that serve as risk factors for TB infection and disease”
Canadian Tuberculosis Committee, 2007
www.publichealth.gc.ca/tuberculosis

- 50% of First Nations housing on reserve are below Canada Mortgage and Housing Corporation suitable housing standards
- 10% of on-reserve households have too few bedrooms compared to 1.4% for Canadian-born non-Aboriginal households, (2001)
- Inadequate ventilation; mould; no plumbing in some cases
- Housing needs to meet national standards
So what is being done?

- Health Canada’s First Nations and Inuit Health Branch, provincial TB programs and First Nations public health authorities operate TB prevention and control programs south of the territories.
- The Branch is revising its TB control plan for First Nations persons on reserve.
- Demonstration PAL type project for early diagnosis of lung disease being considered.
- TB program review is underway in Nunavut.
- TB program was reviewed and program changes were made in the Northwest Territories.
- Canadian Tuberculosis Committee created an Aboriginal Scientific TB Subcommittee which will be providing scientific and evidence-based advice regarding TB control in Aboriginal populations in Canada.
- Some housing initiatives by Indian and Northern Affairs Canada.
Genotyping (finger printing) TB Bacteria

- TB-GRID--TB Genotyping Reference Interactive Database is in development as a national pilot project
- MIRU and spoligotyping all isolates in Canada; RFLP only when MIRU and spoligotypes match and RFLP data will guide the contact investigation etc.
- Matches will be reported to respective provinces/territories for follow-up
- MIRU pattern will be part of the national TB case reporting form
Social Network Analysis
(Courtesy of Dr. Ann Jolly, PHAC)

- A social network is a set of relationships linking a defined set of persons, objects or events.
- Network analysis added to regular contact tracing provides systematic visualization and mathematical analysis.
Role of Interferon-Gamma Release Assays (IGRA)

- Two products registered in Canada
  - QuantiFERON-TB Gold In-Tube (Cellestis Limited, Australia)
  - T-SPOT. TB (Oxford Immunotec, U.K.)
- T-cells previously sensitized to TB antigens produce high levels of interferon-gamma when re-exposed to the same mycobacterial antigens
- Negative result with BCG and non-tuberculous Mycobacteria
- The Canadian Tuberculosis Committee (CTC) recommends that all provincial and territorial governments fund the use of IGRAs for use according to the current CTC recommendations.
Canadian TB Committee Updated Statement on IGRAs, October, 2008
www.publichealth.gc.ca/tuberculosis

• **Diagnosis of active TB disease:** Supplementary diagnostic test in children under 18 with suspected TB disease

• **Contacts of a case of active infectious TB:** May use as confirmatory test for a positive TST if there is a low pretest probability of recent infection and there are no risk factors for progression to active disease if infected

• **Immunocompetent person with a positive TST, low risk of being infected and low risk of progressing to disease if infected:** Use
Canadian TB Committee
Updated Statement on IGRAs (2)

• **Immunocompromised:** Use if TST result is suspected to be false negative

• **Immigrant screening:** Not recommended for the Immigration Medical Exam but may be used after immigration if the person has been in a high TB incidence country and immigrated within the past 2 years:
  - Under age 15: all
  - Age 15 and older: have lived with or in known contact with a TB case in the past or at high risk for development of active TB

• **Serial testing and prevalence surveys:** Use TST
Canadian TB Prevention and Control Strategy (Canadian TB Committee)

- **GOAL**: Reduce the incidence rate of TB in Canada to 3.6/100,000 by 2015 in the spirit of the Global Plan to Stop TB
- **PURPOSE**: Provide a framework for coordination and program linkages
- **CONTENT**: Elaborate essential activities and gaps for TB prevention and control programs and in at risk populations
Top short-term priorities for TB prevention and control in Canada (Ellis’ view)

- Training and funding to implement the *Canadian Tuberculosis Standards*
- Increase our efforts to control TB among First Nations and Inuit populations—especially in remote communities
- Completion of medical surveillance for all immigrants with inactive pulmonary TB
- More LTBI screening and treatment among immigrants in Canada for less than 2 years; delivered in primary care settings
- HIV testing of all TB cases in order to monitor co-infection trends more precisely
Can Canada and the World Reach the Global Target?

- Reduce the 1990 incidence rate and death rate 50% by 2015
Don’t Forget Some of the Basics

• Sir William Osler (1849-1919) Canadian born and trained physician

• "Tuberculosis is a social disease with a medical aspect."

• Unfortunately, this remains largely true today
Never, never give up!

• Eleanor Wilson, wife of President Roosevelt, died in New York City, 1962 with TB resistant to INH and streptomycin
• “You must do the thing you think you cannot do.”
• So, what am and my colleagues doing to stop TB?
Acknowledgements

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www.publichealth.gc.ca/tuberculosis
www.santepublique.gc.ca/tuberculose