Tuberculosis: Out with the Old, in with the New

Diagnostic Challenges and Possibilities

Public Health Laboratories, October 8th, 2009
Source: www.cdc.gov/tb/publications

www.oahpp.ca
Tuberculosis and the Laboratory in Ontario

Frances Jamieson, MD, FRCPC
October 8th, 2009
Tuberculosis incidence rate and counts Canada: 1980-2007

Source: Dr. Ed Ellis, Public Health Agency of Canada
Percentage of tuberculosis cases by origin - Canada: 1980 - 2007

Source: Dr. Ed Ellis, Public Health Agency of Canada
Origin of Tuberculosis Cases and Overall Incidence Rate – Provinces/Territories: 2007

- **Foreign-born**
  - Ottawa: 84
  - B.C.: 197
  - Man.: 28
  - N.B.: 3
  - N.L.: 1
  - N.S.: 3
  - Ont.: 579
  - P.E.I.: 0
  - Que.: 142
  - Sask.: 4
  - North*: 1

- **Canadian-born Aboriginal**
  - Ottawa: 15
  - B.C.: 41
  - Man.: 68
  - N.B.: 0
  - N.L.: 1
  - N.S.: 0
  - Ont.: 13
  - P.E.I.: 22
  - Que.: 99
  - Sask.: 46

- **Canadian-born non-Aboriginal**
  - Ottawa: 13
  - B.C.: 32
  - Man.: 7
  - N.B.: 2
  - N.L.: 5
  - N.S.: 4
  - Ont.: 49
  - P.E.I.: 0
  - Que.: 55
  - Sask.: 3
  - North*: 0

- **Rate per 100,000**
  - Ottawa: 3.2
  - B.C.: 6.4
  - Man.: 8.6
  - N.B.: 0.7
  - N.L.: 1.4
  - N.S.: 0.7
  - Ont.: 5.1
  - P.E.I.: 0
  - Que.: 3
  - Sask.: 10.6
  - North*: 45.6

*Includes Northwest Territories, Nunavut and Yukon

Source: Public Health Agency of Canada
Figure 4.16: Incidence of tuberculosis by year.
Toronto, the rest of Ontario and Canada, 1997 - 2007

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Toronto Public Health, 2008
Tuberculosis Rate, by Health Unit
2007

Legend
Incidence Rate: n/100,000
- 0
- < 3.0
- 3.1 - 6.0
- 6.1 - 9.0
- > 9.0

* Rates are derived using data from the Ontario Ministry of Health and Long-Term Care, integrated Public Health Information System (PHIS) database, extracted January 26, 2009

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Overall pattern of reported TB drug resistance in Canada – 2007

Source: *Tuberculosis drug resistance in Canada 2007*, Public Health Agency of Canada
Canadian Tuberculosis Strategy

- To achieve a sustained decline in incidence rate to 3.6/100,000 or less by 2015
- In 2007, the national incidence rate was 4.7/100,000, the first time below 5.0

*How can we reach this goal?*

A major component of success will be enhanced capability and capacity of the laboratory!
The TB Laboratory

• Quality laboratory services: pre-analytic, testing and post-analytic

• Safe work environment

• Expert consultative services and knowledge transfer

• Collaboration with health-care partners in research, knowledge exchange, service improvement, and surveillance
Systems Approach for TB Laboratory Services

- Prompt delivery of specimens to the laboratory
- Rapid, state-of-the-art methods (fluorescence microscopy, liquid media, rapid id’n methods)
- Report smear results within 24 hours of receipt
- Report culture identification of MtbC within 21 days
- Report drug susceptibility results within 30 days
- Report all positive test results to submitter within 1 working day from date of report

...can these services be provided more rapidly, with improved sensitivity and specificity, and greater accessibility?
TB Laboratory: Molecular technologies

1. Rapid diagnosis of Mtb directly from specimens
2. Rapid identification of Mtb complex and non-tuberculous isolates to species from culture
3. Detection of molecular determinants of drug resistance
4. Rapid DNA fingerprinting for case investigation and detection of transmission
5. Genomic analysis for population studies
Mycobacteriology and TB Laboratories in Ontario:

- Public Health Lab Network:
  - Central Lab (CPHL Toronto)
  - and 5 regional PHLs
- Ottawa Hospital
- Dynacare (community lab), Ottawa

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Ontario PHL Laboratory Services

- Smear microscopy (fluorescent) and culture (MGIT 960 liquid media and LJ solid media)
- Direct detection (from specimen) for MtbC: respiratory (AMTD) and non-respiratory (PCR)
- Isolate identification – DNA probe for MtbC (Accuprobe) and line-probe assay (GenoType) or 16S sequencing for NTM
- Susceptibility testing, phenotypic – MtbC and NTM (M. avium and M. kansasii)
- Molecular detection of drug resistance in MtbC (coming soon!)
- Molecular typing – MtbC (MIRU-VNTR, spoligotyping, RFLP)
- Web-based GIS TB genotyping query and reporting system (OUT-TB) (coming soon!)
- Detection of MtbC in formalin-fixed paraffin embedded tissues by PCR
- Detection of M. leprae in tissue by PCR
The World comes to Ontario…
TB in the underhoused – an endemic problem...

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New Technologies on the Horizon…

• Better
• Faster
• Accessible
• And cheaper?
Thank-you!

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