

Mycobacteriology Laboratory
Capabilities in Asian Countries:
How This Impacts TB in
Immigrants to North America

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Tuberculosis in the foreign born

- 2007, USA
 - U.S. born 2.1/100,000
 - Foreign-born 20.7/100,000
- Canada: 63% of tuberculosis was in the foreign-born (in 2005)

Worldwide prevalence of MDRTB

from WHO Anti-TB Drug Resistance in the World, #4 2008

- An estimated 489,000 cases of MDRTB emerged in 2006
- The worldwide prevalence of MDRTB is between 1 and 1.5 million cases
- China and India together have about 50% of MDRTB cases with Russia a further 7%
- Worldwide, about 7% of MDR cases are also XDR

Treatment of MDR cases

By the end of 2007, 67 projects in 51 countries had been provided with second-line anti-TB drugs through Green Light Committee

Over 30,000 MDRTB patients had been treated

Average treatment success rate within GLC projects was 62%

Blower and Supervie, The lancet Infectious Diseases vol 7 July 2007, p 443

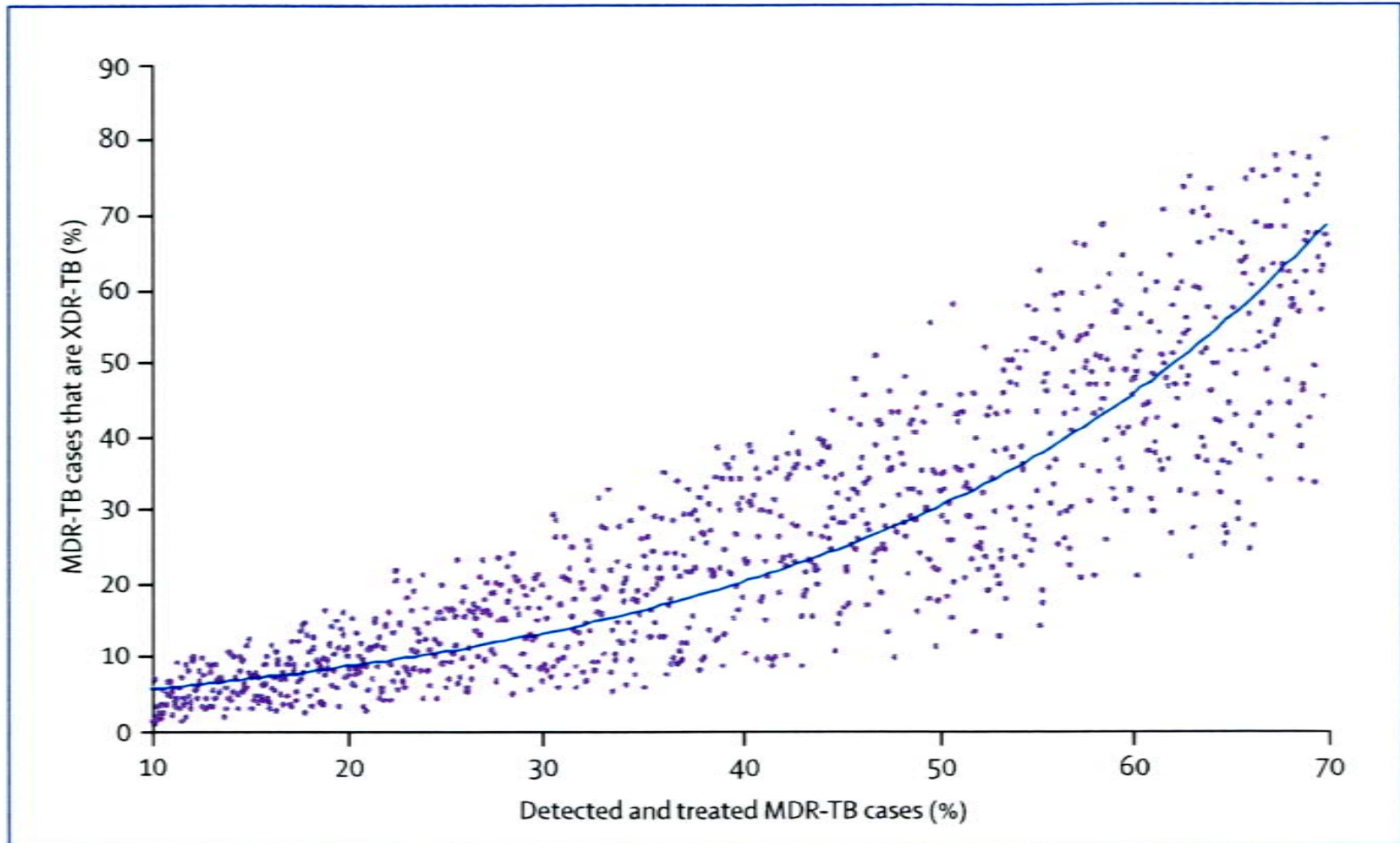


Figure: Dynamics of the emergence and transmission of multiple strains of tuberculosis resistant to a variety of first-line and second-line drugs

Drug-resistant TB in Calif., 1993-95

All cases tested, % resistant

| | INH | RIF | EMB | PZA | STREP |
|-------------|-------------|-------------|-------------|-------------|--------------|
| 1993 | 11.5 | 2.37 | 3.05 | 5.55 | 8.10 |
| 1994 | 10.3 | 2.5 | 1.56 | 4.21 | 8.57 |
| 1995 | 9.3 | 1.88 | 1.6 | 3.67 | 9.63 |

For 1993, data from L.A. excluded. 1995 date first 3 quarters only

Controlling TB in immigrants to North America

- New Technical Instructions for U.S. immigration

<http://www.cdc.gov/ncidod/dq/civil.htm>

Changed med screen reqmnts for immigrants & refugees from sole focus on CXRs & sputum smears to more comprehensive syst with sput cult, DST & treatment according to DOT.

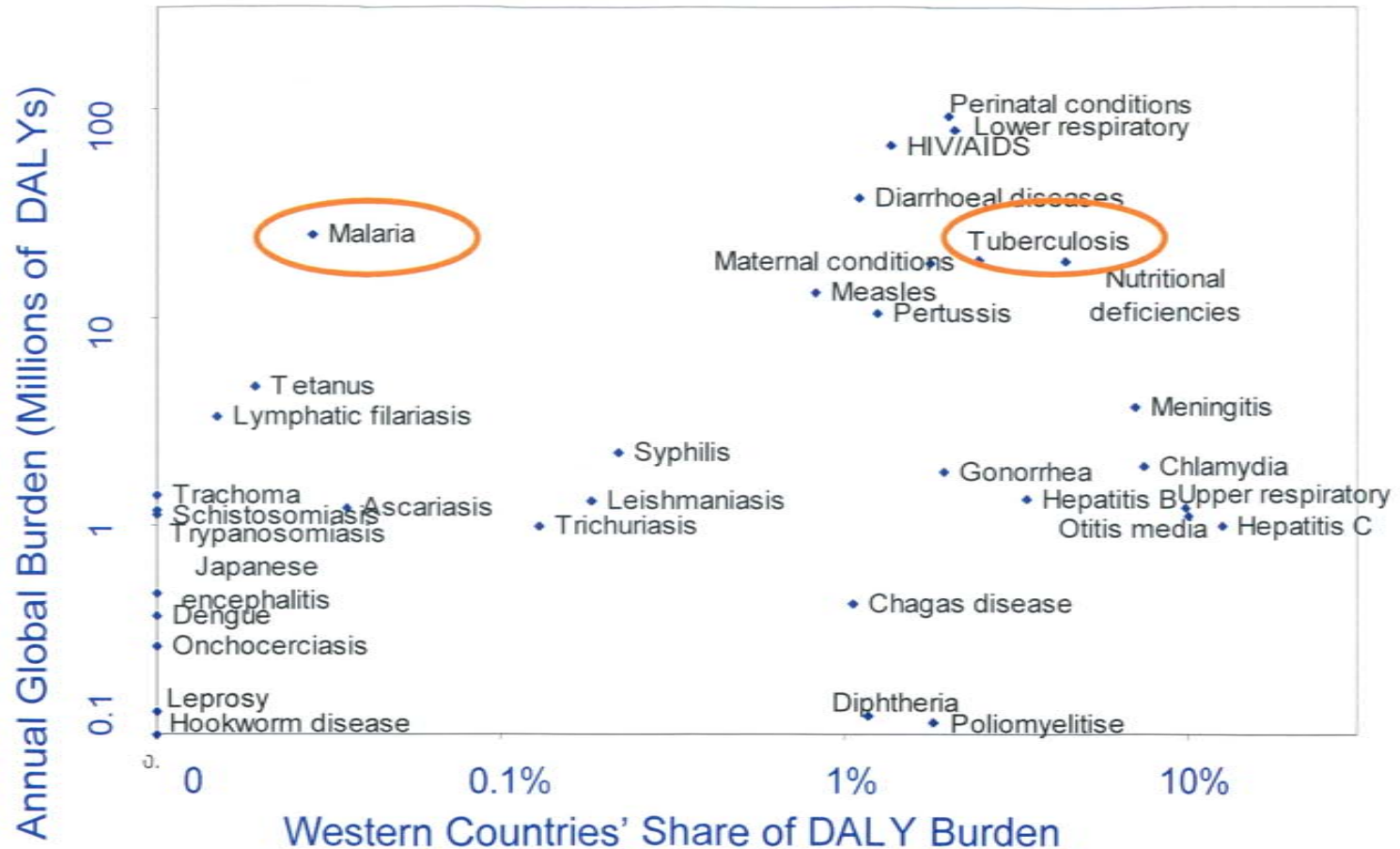
Majority of immigrants to U.S. are never screened overseas

Technical Instructions don't apply to students, business people, undocumented, etc.

- TB in immigrants will always be a major public health problem in North America
- Screening of immigrants for TB will have limited effect
- Collaboration with international efforts to control TB in countries which are the source of our immigrant stream should be part of our TB control strategies

Ridley, Grabowski and Moe, "Developing Drugs for Developing Countries", Health Affairs, Mar/Apr 2006

↑ Harm



DALY=Disability-adjusted life years

← Disparity

Source: Ridley, Grabowski, Moe

WHO plans for TB control

- Element 2: Case detection through quality-assured bacteriology
 - “Culture and DST [drug sus testing] services should be introduced, in a phased manner...”
 - Millennium Development Goals
 - Expand culture capacity from 10 to 60 million patients
 - Establish 2,000 new culture and DST laboratories
 - Train 23,000 new technicians in culture and DST
 - Funding required will be 1 billion USD

WHO's Global Laboratory Initiative

- “....an effective response to the diagnostic challenges of TB-HIV and MDR-TB requires urgent and massive scale-up of laboratory services.”
- “...the critical lack of TB laboratory capacity constitutes a global crisis...”
- Global Laboratory Initiative created October 2007, hosted in the Stop TB Department at WHO

| Country (2006 WHO data) | Culture labs per 5 million popul. | DST labs per 10 million pop. |
|-------------------------|-----------------------------------|------------------------------|
| India | 0.03 | 0.07 |
| China | 1.4 | 2.7 |
| Indonesia | 0.9 | 1.8 |
| Pakistan | 0.1 | 0.2 |
| Phillipines | 0.2 | 0.3 |
| Russian Feder. | 34 | 68 |
| Viet Nam | 1.0 | 2.1 |

Shanghai CDC TB laboratory



One specimen from every patient is cultured.
Cultures positive for *M. tb* have drug suscept.
testing

Beijing National TB Reference Laboratory, May 2008

90% of specimens have acid-fast microscopy only

10% of specimens are cultured

Laboratory staff is sophisticated and committed, but resources are limited



Li Liang, WHO Collab Ctr Res. & Training

TB cultures from Tibet

| Date | No. of specimens | No. culture + for <i>M. tb</i> | No. MDR | No. XDR |
|-------------|------------------|--------------------------------|---------|---------|
| May 2006* | 25 | 7 | 4 | 0 |
| May 2007* | 17 | 7 | 7 | 1 |
| Sept. 2007† | 16 | 5 | 5 | 1 |

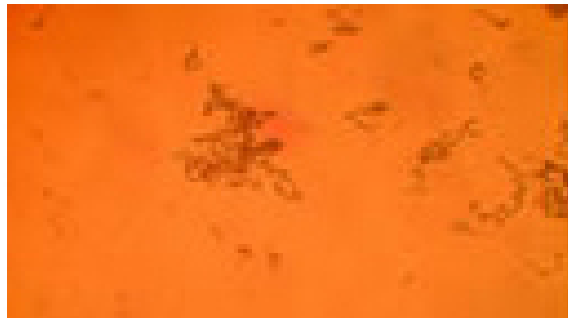
Specimens collected by Terma Foundation

*Tested at California Microbial Diseases Laboratory

†Tested at Hong Kong Supranational Reference Laboratory

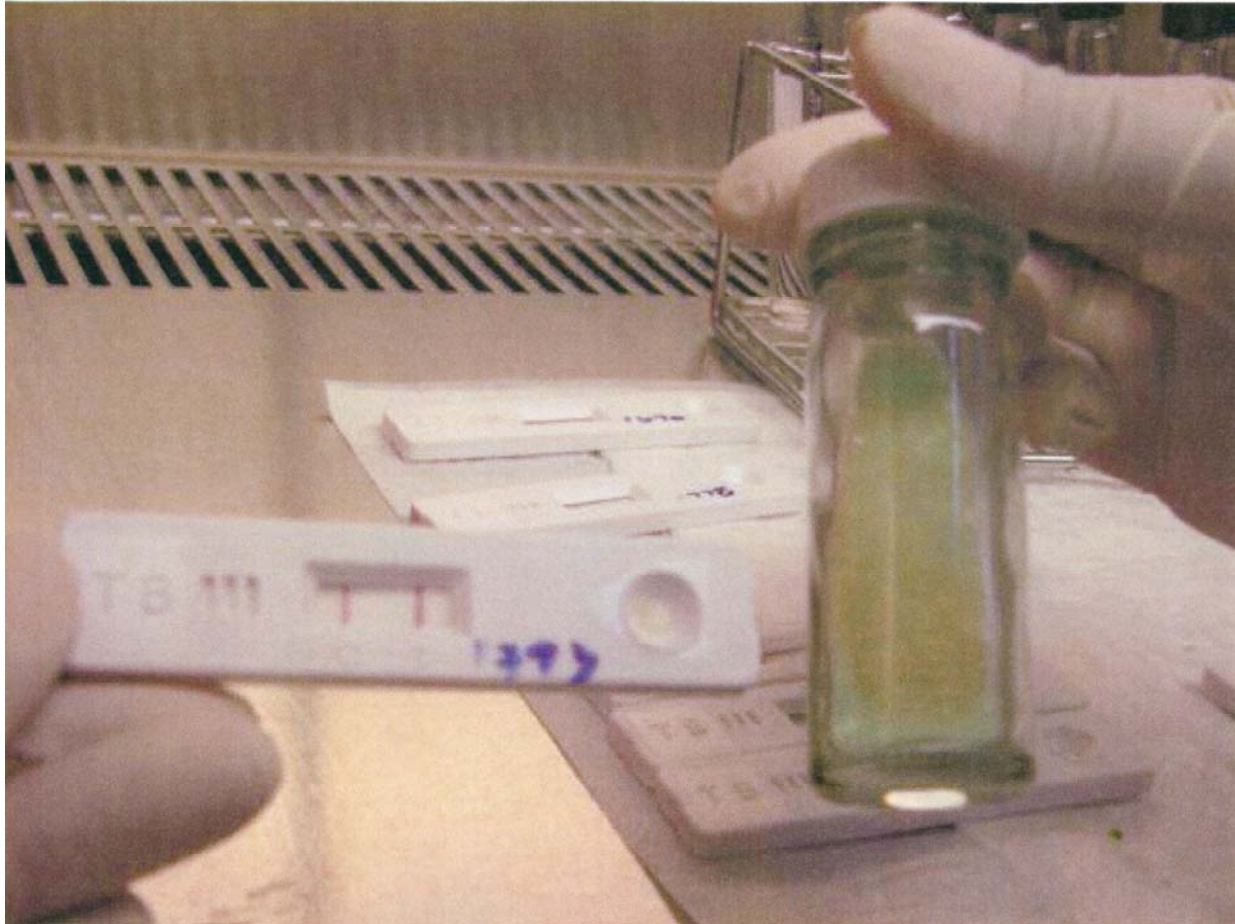
Newer methods suitable for developing countries

- MODS (microscopic observation drug susceptibility)
- See <http://www.jove.com/index/details.stp?ID=845>



Capilia for culture ID

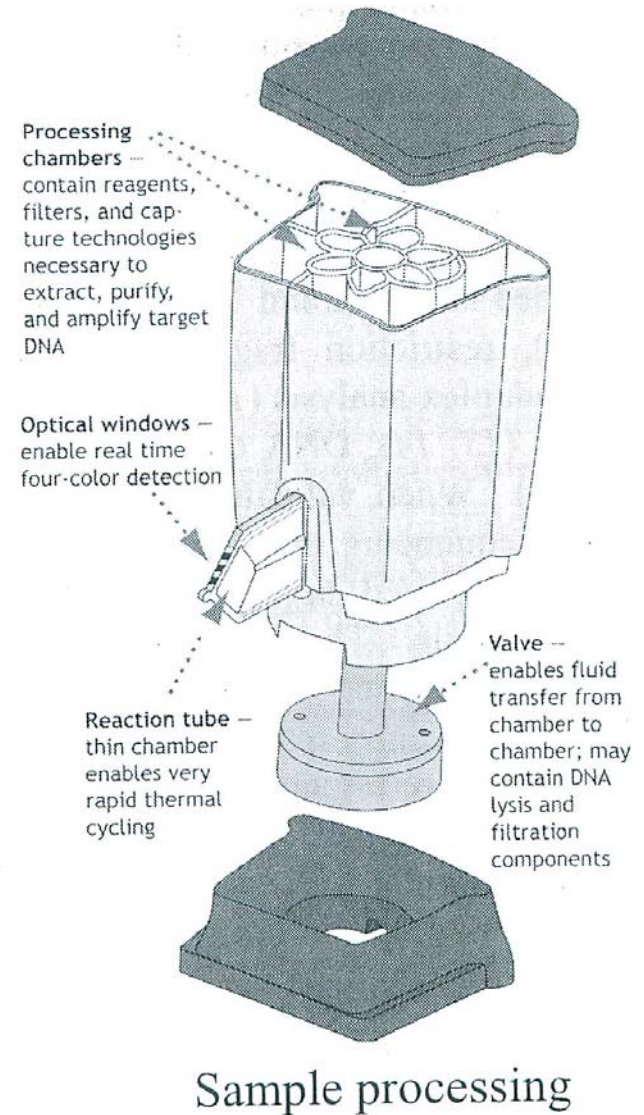
Detects TB-specific MPB 64 antigen in cultures



Cepheid

GeneXpert

- Grants for development from NIH and FIND
- Combines sample preparation (using microfluidics) with real-time PCR
- Detects *M. tb* and predicts drug resistance (to rifampin as now configured)



New Stop TB website with
resources for retooling for control
of tuberculosis, including new
diagnostic methods

- <http://www.stoptb.org/retooling/publications.asp>

Obstacles to training in developing countries

- 1998-2007 Training in U.S.-affiliated Pacific islands (WHO collab)
- Little improvements noted for several years
- Vasiti Uluiviti hired by Pacific Island Health Officers Assoc.
- Rapid improvements ensued



Conclusion

- Improvements to TB laboratory infrastructure are critically needed, but will require long-term effort and at least \$1 billion in resources
- Want to help? In U.S. contact globalvolunteer@aphl.org
(Association of Public Health Laboratories)
Efforts will be coordinated with Global Laboratory Initiative