New York State FAST TRACK program

Vincent Escuyer, Ph.D.
Wadsworth Center, NYSDOH
Albany, NY
FAST TRACK program history

- Implemented in the late 1993

- Survey had shown that rapid tuberculosis-testing methodologies were applied to only 15% of the more than 450,000 specimens that were processed statewide.

- **Goal:** To provide the most rapid detection of *M. tuberculosis* complex in specimens from the priority group - highly infectious New Yorker patients with newly diagnosed acid-fast bacilli, smear-positive sputum.

- This program is available to all health care providers and clinical laboratories in New York State that care for New York State patients.

- Free
First time smear AFB positive patients. Submission overnight required.
(Mailers are provided to the different submitters)

- Included a nucleic amplification assay (MTD) and microscopy; were generally completed and reported within 24 hours of receipt.
- All Fast-track specimens were then cultured.
- Following growth, all Fast-track specimens were subject to further microscopy.
- If positive for AFB, subject to a molecular PCR test to determine the *Mycobacterium* species.
- If a member of the *M. tuberculosis* complex, scheduled for drug susceptibility assays.
Results were transmitted by FAX (within 24 hours) to the submitter, with copies to the local health unit and to the Bureau of Tuberculosis Control for New York City or New York State, as appropriate. Laboratory results generated by Wadsworth Center's Clinical Laboratory Information Management System (CLIMS) were posted twice daily on the Health Information Network (HIN) and transferred via Electronic Clinical Laboratory Reporting System (ECLRS) to the New York State Bureau of Tuberculosis Control.
<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008*</th>
</tr>
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<tbody>
<tr>
<td>Total specimens and isolates</td>
<td>3,361</td>
<td>1,135</td>
</tr>
<tr>
<td>Fast-track specimens</td>
<td>617</td>
<td>256</td>
</tr>
<tr>
<td>Positive for TB complex</td>
<td>167 (27%)</td>
<td>66 (26%)</td>
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</table>

* From 1/1/2008 to 6/1/2008
FAST TRACK Today i.e. “Universal FAST TRACK”

WHAT HAS CHANGED?

1) Real-time PCR assay has been implemented
Detection of \textit{M. tuberculosis} complex by Real-time PCR

Primer/Probe set taken from literature

\textbf{Target: IS6110}
Multi copy target ranging from 1 to 25 copies

\textbf{Detects all the members of the Mtb complex:}

\textit{M. tuberculosis , M. bovis BCG, M. africanum, M. canetti, M. bovis, M. microti, M. caprae}
Detection of *M. tuberculosis* complex by real-time PCR

<table>
<thead>
<tr>
<th></th>
<th>Real-time PCR</th>
<th>Previous assay</th>
</tr>
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<tbody>
<tr>
<td><strong>Sensitivity</strong></td>
<td>1 CFU</td>
<td>1 CFU</td>
</tr>
<tr>
<td><strong>Specificity</strong></td>
<td>100%</td>
<td>Cross reactive with <em>M. terrae</em> and <em>M. celatum</em></td>
</tr>
<tr>
<td><strong>Cost (per test)</strong></td>
<td>$8.00</td>
<td>$28.00</td>
</tr>
<tr>
<td><strong>Ease of Use</strong></td>
<td>Easy</td>
<td>Intensive hands-on time</td>
</tr>
<tr>
<td><strong>Specimens</strong></td>
<td>Can be validated for all types</td>
<td>Sputum, bronchial specimens, tracheal aspirates</td>
</tr>
<tr>
<td><strong>Contamination</strong></td>
<td>Closed system</td>
<td>Open system</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>~2 hours</td>
<td>4-6 hours Often requiring repeat testing</td>
</tr>
</tbody>
</table>
From November 1, 2007 to May 31, 2008

184 regular specimens

- 20 smear negative and positive for TB after culture
- 25 smear positive and positive for TB after culture

24 % of the regular specimens were positive for TB
Fast-Track Today: “Universal Fast-Track”

WHAT HAS CHANGED?

1) Real-time PCR assay has been implemented

2) Real time-PCR is now performed on all the original specimens.

3) Reporting process streamlined
Electronic reporting implemented for all results using the Wadsworth Center’s electronic management system (CLIMS). Reports are sent electronically via either the Electronic Clinical Laboratory Reporting System (ECLRS) or Health Provider Network (HPN).

Results available in real time and accessible seven days a week.

Dramatically reduced paperwork, avoids mistakes and put submitters directly in touch with the relevant results from any location.
Turnaround Time for Universal FAST TRACK

Report of PCR results:

90% within 24 hours after receipt
98% within 48 hours after receipt

Report of susceptibility to 1st line drugs:

94% within four weeks after receipt

From 6/1/2008 to 8/1/2008
What is next?

Incorporate early detection of genetic markers for drug resistance

Special emphasis on rifampin ($rpoB$) and INH($katG$, $inhA$)
Two main approaches under investigation:

PCR & pyrosequencing
PCR + sequencing performed the same day (~ 5 hours)

Advantage: provides a sequence; Every mutation present in the DNA fragment analyzed will be detected and identified.
Two main approaches under investigation:

- PCR & pyrosequencing
- DNA microarray
TruArray™ MDR-TB Test

- Test for diagnosing multi-drug resistant strains of TB in **under 2 hours**.

- Screens for **88 genetic markers on 6 genes**

- Includes specific probes for *M. tuberculosis* complex and *M. avium*

- Diagnose resistance to the drugs rifampin, isoniazid, streptomycin, ethambutol.
Sample preparation  Multiplex PCR  Microarray analysis
Detection of Wild Type vs Mutation in RpoB

Rifampin-susceptible strain

Point mutation was identified at position 531
Tested strain is considered resistant

Ser531 ⇒ Leu
Tomorrow is around the corner

Thank you!