Happy Cows Come from California?
M. bovis Epidemiology and Treatment

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Outline
• Epidemiology of M. bovis in California
• Treatment of M. bovis
• Recommendations for providers

EPIDEMIOLOGY OF M. BOVIS IN CALIFORNIA
Methods

- Retrospective review of California TB case registry, 2003-2011
- Culture confirmed TB cases with initial drug susceptibility testing to INH, RIF, and PZA
- Pediatric case was defined as <15 years of age
- *M. bovis* case definition: resistance to PZA and susceptibility to INH and RIF

RESULTS

**Flowchart of *M. bovis* and *M. tuberculosis* cases, California, 2003-2011**

- 24,424 verified TB cases
- 5672 excluded
- 18,752 eligible TB cases
- 18,010 (96%) *M. tuberculosis*
- 742 (4%) *M. bovis*
- Aged <15 years 82 (11%)
- Aged 15-64 years 519 (70%)
- Aged 65+ years 141 (19%)
~4% of all culture-positive TB cases compared to 1-2% nationally\(^1\)

\(^1\) Hlavsa, Clin Infect Disease, 2008
Percentage of TB Cases Attributable to *M. bovis* by County, California, 2003-2011

~4% of all culture-positive TB cases compared to 1-2% nationally\(^1\)

\(^1\) Hlavsa, Clin Infect Disease, 2008

### TB case rates of *M. bovis* and *M. tuberculosis*, California, 2003-2012

- Trend: \(p < 0.0001\)
- Trend: \(p = 0.16\)

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Proportion of TB cases that are *M. bovis*, California, 2003-2012

- Trend: \(p < 0.001\)
Epidemiologic analysis of *M. bovis* and *M. tuberculosis*, California, 2003-2011

<table>
<thead>
<tr>
<th>Characteristic</th>
<th><em>M. bovis</em></th>
<th><em>M. tuberculosis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, 0 – 14 years</td>
<td>82/742 (11%)</td>
<td>297/18,010 (2%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>599/742 (81%)</td>
<td>6,346/18,010 (35%)</td>
</tr>
<tr>
<td>Country of Origin - Mexico</td>
<td>437/560 a (78%)</td>
<td>4,016/14,336 a (28%)</td>
</tr>
<tr>
<td>Site of Disease - Extrapulmonary</td>
<td>319/742 (43%)</td>
<td>3,013/18,009 (17%)</td>
</tr>
</tbody>
</table>

Pediatric *M. bovis* in California

- 87% extrapulmonary
- Cervical lymph nodes (scrofula) TB most common
- 16 -20% of pediatric TB meningitis *M. Bovis*
  - These forms of TB have a high mortality rate and can have serious lifelong complications

Pediatric *M. bovis* in California

Compared to *M. tuberculosis* cases, *M. bovis* pediatric cases

- More likely to have a parent or guardian born in Mexico
  OR
- Had lived in Mexico for more than 2 months
Adults with *M. bovis* in California

- Compared to *M. tuberculosis*, adults with *M. bovis* were more likely to be
  - Hispanic, from Mexico
  - Diabetes
  - Kidney failure
  - Immune suppressive therapy
  - HIV

Treatment Outcomes of *M. bovis*, California

<table>
<thead>
<tr>
<th>Treatment Outcome</th>
<th><em>M. bovis</em></th>
<th><em>M. tuberculosis</em></th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Died before treatment completion</td>
<td>26/165 (15.8)</td>
<td>285/3299 (8.6)</td>
<td>0.006</td>
</tr>
<tr>
<td>Completed treatment</td>
<td>126/165 (76.3)</td>
<td>2786/3299 (84.4)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>13/165 (7.9)</td>
<td>228/3299 (6.9)</td>
<td></td>
</tr>
</tbody>
</table>

*M. bovis* cases that died before treatment completion were more likely to have had at least one concurrent immunosuppressive condition compared to *M. tuberculosis* case (73% vs 53% respectively, p = 0.05)

Summary of Results

- California has a higher *M. bovis* burden than the national average
- Proportion of TB cases attributable to *M. bovis* unchanged
- Children, individuals from Mexico and immunocompromised adults at risk for *M. bovis*
- *M. bovis* associated with extrapulmonary disease and higher rate of death
TREATMENT FOR M. BOVIS

Short-course treatment of pulmonary tuberculosis
- Limitation: not specifically M. bovis cases
- Fox 1975
  - 9 months of therapy with INH and RIF
  - 95% effective with 1 – 2% relapse rate
- Dutt 1984
  - Daily INH and RIF for one month followed by twice weekly INH and RIF for 8 months
  - 95% success rate, 2.8% failed to convert sputum and 2.1% relapsed

Treatment
- 2003 CDC TB treatment guidelines
  - If PZA cannot be included in the initial regimen, or isolate is resistant to PZA
  - INH, RIF, and EMB should be given for the initial 2 months followed by INH and RIF for 7 months given either daily or twice weekly.
Programmatic Experience

- **SF experience 1988**
  - INH and Rif daily for all TB patient for 9 months
  - 1.5% failure rate
  - Relapse rate
    - 6 months: 2.3%
    - 12 months: 0%

- **San Diego experience 2005**
  - *M. bovis* patients less likely to have EMB and PZA in initial regimen
  - Relapse rate 1%


WHAT SHOULD PROVIDERS DO?

Providers

- Assess if patient consumes unpasteurized dairy products
- How frequently are these products consumed?
 Providers

• Likely entire family consuming same products
• Educate your patient about eating unpasteurized cheese
• Instruct how to look for proper labeling on your queso

 TB Programs

• New \textit{M. bovis} surveillance variables launched 2015
• Upon detection of an \textit{M. bovis} case through genotyping results, local program will get a notification and a supplemental \textit{M. bovis} questionnaire
  – Did the patient ever eat or drink raw (unpasteurized) dairy products made outside the US?
  – If yes, where were the dairy products made?

 RESOURCES FOR PROVIDERS FOR PATIENT EDUCATION
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