TUBERCULOSIS IN OREGON: GOING BUT NOT GONE

During the winter of 2007-08, a call center employee with cavitary pulmonary tuberculosis (TB) coughed among >1000 co-workers for more than four months, sparking one of the state’s largest TB contact investigations. TB is a rare and declining disease in Oregon, with 94 cases in 2007 (incidence = 2.5/100,000 population); however, several recent outbreaks resulting from infectious cases with delayed diagnoses show that TB can still be a major public health issue in our state. In this issue of the CD Summary, we review pathogenesis, clinical characteristics, and diagnosis of TB, and identify factors contributing to delayed diagnosis.

THE PROBLEM

Anyone with active pulmonary TB sitting for >4 months in close contact with co-workers is likely to spread TB effectively. This contact investigation blossomed as increasingly distant concentric rings of co-workers around the index case continued to have high rates of TB skin test conversion. In the year since diagnosis, this investigation has reached across multiple counties and states in search of the relatively mobile workers. More than 900 contacts have been tested, of whom 91 (10.1%) have been diagnosed with latent TB infection (LTBI). Currently, four subsequent cases of active TB disease have been linked by strain genotyping, and another two cases share epidemiologic links. This outbreak has several important characteristics:

- Highly infectious index case, with cough for more than four months
- Coughing among >1000 co-workers for more than four months
- Spread of disease despite seeking medical care
- Long delay to diagnosis
- Important characteristics: highly infectious index case, co-workers sitting for >4 months in close contact

The outbreak has several important characteristics: highly infectious index case, with cough for more than four months, coughing among >1000 co-workers for more than four months, spread of disease despite seeking medical care, and long delay to diagnosis. The index case continued to have high rates of TB skin test conversion, leading to the investigation of contacts.

MAKING THE DIAGNOSIS

Clearly, very few people with prolonged cough in Oregon have TB. Clinical suspicion and a thorough history are key to placing TB in the right place on the differential diagnosis list.

Start by asking about TB risk factors. Between 2003 and 2007, two-thirds of Oregon’s TB cases were born outside the US (table). While people born in Latin America account for the largest number of Oregon cases, those born in Africa and SE Asia have the highest rates of disease.

Table: Risk factors for TB disease in Oregon, 2003–2007

<table>
<thead>
<tr>
<th>Risk Factor*</th>
<th>% Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign-born</td>
<td>66.7</td>
</tr>
<tr>
<td>Alcohol Use</td>
<td>13.3</td>
</tr>
<tr>
<td>Homeless</td>
<td>8.8</td>
</tr>
<tr>
<td>Drug Use</td>
<td>8.0</td>
</tr>
<tr>
<td>Previous Diagnosis of TB</td>
<td>5.5</td>
</tr>
<tr>
<td>HIV</td>
<td>4.7</td>
</tr>
<tr>
<td>Health Care Worker</td>
<td>3.7</td>
</tr>
<tr>
<td>Corrections (inmates and employees)</td>
<td>1.6</td>
</tr>
</tbody>
</table>

* Multiple risk factors can be present in a single individual

Other risk factors include a history of alcohol or drug use, homelessness, or incarceration; the call center case had several of these risks. Medical risk factors for developing disease among persons with LTBI include: HIV infection, diabetes, chronic renal failure, silicosis, solid organ transplant, gastrectomy, and use of immunsuppres-
sive medications such chemotherapy, steroids, and TNF-alpha inhibitors.

MTB can be seen by light microscopy in sputum smears stained for acid fast bacteria (AFB). However, this method is both insensitive (40–60% of culture-positive cases will be smear negative) and non-specific (also detects non-tuberculous mycobacterium.) We recommend collecting three sputum specimens 8–24 hours apart, with at least one being an early morning sample. Definitive diagnosis of TB disease is made by laboratory isolation of MTB in culture, or more rapidly by detection of MTB DNA using a nucleic acid amplification test (NAAT). Neither test provides immediate results, so clinicians should consider presumptive treatment of highly suspect cases while awaiting definitive diagnosis.

Because laboratory samples are not always available and culture methods are not always successful (18% of US cases are culture negative), the diagnosis can also be made clinically. The following clinical criteria suggest the possibility of culture-negative TB: 1) evidence of TB infection by either a positive tuberculin skin test or QuantiFERON-gold blood test (immunocompromised patients may be an exception); 2) clinical presentation consistent with TB; 3) clinical or radiographic response to anti-TB therapy; and 4) a complete diagnostic work-up ruling out alternate explanations.

**DELAYED DIAGNOSIS**

Prolonged illness before diagnosis can lead to large numbers of contacts being exposed. Delayed diagnosis of TB can involve both patient and provider factors; patients may wait to seek medical consultation while providers may not initially suspect TB or may wait for cultures to start treatment. The onset of symptoms to the start of antibiotic treatment is one way to estimate time to diagnosis. Examining Oregon case data, we found that patients who delayed seeking care for ≥1 month after symptom onset were more likely to be older than >65 years (OR = 10.5) or homeless (OR = 3.5). Foreign-born people tended to seek care early (OR = 0.6; 95% CI: 0.32, 1.03) possibly reflecting greater knowledge of TB.

To examine provider factors in diagnosis delay, we analyzed the time from initial patient contact to the start of TB treatment. Time to diagnosis greater than the median (16 days) was considered provider delay. Female patient gender (OR = 3.2) was the only factor that significantly predicted provider delay in diagnosis. Although we are unsure of the reasons for this finding, it has been noted in other studies.1,2

**Clinical Pearl**

20% of active TB cases are skin test negative. A negative TST or QuantiFERON does not exclude the possibility of TB disease.

**THE ROLE OF PUBLIC HEALTH**

As a reminder, suspected and confirmed TB disease is reportable to your local public health department within one working day. Timely reporting facilitates contact investigations to identify and treat new infections and cases of disease. The local health department also serves as a valuable resource for patient management by assisting with diagnosis (collection and forwarding of sputum smears to the Oregon State Public Health Laboratory (OSPHL), chest X-ray reimbursement for uninsured patients to rule out active disease); treatment (medications and Directly Observed Therapy); and case management (patient agreements to treatment and isolation, assistance with social, cultural and financial barriers to care). The OSPHL processes sputum smears, cultures and sensitivities, and forwards samples to the CDC for genotyping and cluster analysis. In addition, the Oregon TB Control Program can provide timely clinical advice via our expert TB physician consultant.

**THE BOTTOM LINE**

TB exists in Oregon and delayed diagnosis is costly. While most patients with chronic cough will not have TB, think TB in patients who are foreign-born, have a history of homelessness or incarceration, or medical risk factors such as immunosuppression. As always, we are happy to discuss TB diagnosis and treatment with you. Call your local health department, or the state TB Control Program at 971-673-0174.

**REFERENCES**