2011

Contact Investigation of Bus Travelers Exposed to a Passenger with Contagious Tuberculosis

Parvathy Pillai  
*University of Michigan*

Andrea Saunders  
*Tuberculosis Prevention and Control Public Health Agency of Canada*

Tiffany Bateman  
*Infectious Diseases Branch Ontario Ministry of Health and Long-Term Care*

G. Allen Heimann  
*Windsor-Essex County Health Unit*

Paul J. Edelson  
*Centers for Disease Control and Prevention*

*See next page for additional authors*

Follow this and additional works at: [http://scholarworks.gvsu.edu/mjph](http://scholarworks.gvsu.edu/mjph)

Part of the [Public Health Commons](http://scholarworks.gvsu.edu/mjph)

**Recommended Citation**

Pillai, Parvathy; Saunders, Andrea; Bateman, Tiffany; Heimann, G. Allen; Edelson, Paul J.; and Kim, Curi (2011) "Contact Investigation of Bus Travelers Exposed to a Passenger with Contagious Tuberculosis," *Michigan Journal of Public Health*: Vol. 5 : Iss. 1 , Article 4.
Available at: [http://scholarworks.gvsu.edu/mjph/vol5/iss1/4](http://scholarworks.gvsu.edu/mjph/vol5/iss1/4)

This Article is brought to you for free and open access by ScholarWorks@GVSU. It has been accepted for inclusion in Michigan Journal of Public Health by an authorized editor of ScholarWorks@GVSU. For more information, please contact scholarworks@gvsu.edu.
Contact Investigation of Bus Travelers Exposed to a Passenger with Contagious Tuberculosis

Authors
Parvathy Pillai, Andrea Saunders, Tiffany Bateman, G. Allen Heimann, Paul J. Edelson, and Curi Kim
Research and Practice

Contact Investigation of Bus Travelers Exposed to a Passenger with Contagious Tuberculosis

Parvathy Pillai, MD
Office of Health Practice, University of Michigan School of Public Health
Ann Arbor, Michigan, USA

Andrea Saunders, MSc
Tuberculosis Prevention and Control
Public Health Agency of Canada
Ottawa, Ontario, Canada

Tiffany Bateman, RN
TB/Respiratory Unit, Infectious Diseases Branch
Ontario Ministry of Health and Long-Term Care
Toronto, Ontario, Canada

G. Allen Heimann, MD
Windsor-Essex County Health Unit
Windsor, Ontario, Canada

Paul J. Edelson, MD
Division of Global Migration and Quarantine,
Centers for Disease Control and Prevention
Atlanta, Georgia, USA

Curi Kim, MD
Division of Global Migration and Quarantine,
Centers for Disease Control and Prevention
Atlanta, Georgia, USA
Abstract

Multiple barriers exist to conducting contact investigations for tuberculosis after bus travel, and the degree of transmission risk to bus contacts is uncertain. We describe a patient with active infectious tuberculosis and the contact investigation that took place following her 5 hour bus trip across the United States-Canadian border.
Introduction

Although exposure to persons with active tuberculosis on a bus likely carries the risk of transmission, it is not clear how great a risk is involved and what circumstances may affect that risk (Edelson & Phypers, 2011). While guidelines have been published for investigation of tuberculosis exposures on airplanes (World Health Organization [WHO], 2008), there are no generally recognized guidelines for investigating exposures on buses.

We present a case of a patient with active infectious TB who traveled by bus across an international border and the subsequent contact investigation among bus passengers. This case also highlights the coordinated efforts required among public health and border security authorities when responding to an infectious traveler. Because this investigation comprised a public health response based on regulatory authority, it was exempted from human subjects review.
Case Report

A woman living in the Chicago metropolitan area was hospitalized in 2008 with fever, cough, weight loss, and fatigue. Chest radiograph demonstrated extensive alveolar infiltrates bilaterally and at least one cavity. Sputum smears demonstrated 4+ (“many”) acid-fast bacilli (AFB) on microscopy and was positive for *Mycobacterium tuberculosis* by polymerase chain reaction (PCR). *M. tuberculosis* was culture confirmed, and the isolate was determined to be susceptible to all first-line anti-tuberculosis medications.

Upon hospital discharge, the patient began directly observed therapy (DOT) with the local health department. However, 12 days after initiating therapy, the patient defaulted from treatment. Over the next 6 days, multiple attempts were made to locate her, at which time a family member reported that she may have traveled out of the country.

The local health authorities notified the U.S. Centers for Disease Control and Prevention (CDC) Chicago Quarantine Station about the case, and the patient was added to the Do Not Board (DNB) list. The DNB list, managed by CDC and the U.S. Department of Homeland Security (DHS), is a public health tool which prevents individuals with infectious conditions that may constitute a serious public health threat from boarding commercial aircraft. A Lookout record was also placed for this patient. A Lookout record is a DHS tool that prompts a thorough review of an individual if he or she attempts to enter the United States through an international airport, seaport or land border port of entry. DHS Customs and Border Protection (CBP) would be alerted to her potential as a public health threat and notify CDC (CDC, 2008). Within DHS, CBP and Coast Guard
officers are required, pursuant to 42 U.S.C. § 268(b), to aid CDC “in the enforcement of quarantine rules and regulations.” CDC’s authority to detain individuals at ports of entry stem from the Public Service Act (42 U.S.C, §§ 264-272), Interstate Quarantine (42 CFR Part 70), and Foreign Quarantine (42 CFR Part 71), which authorize the Secretary of the Department of Health and Human Services to create and enforce regulations to prevent the introduction, transmission, and spread of communicable diseases from foreign countries into U.S. states and territories.

Approximately 2 weeks later, the Lookout record alerted CBP that the patient was entering Detroit, Michigan from Windsor, Ontario on a commercial bus that originated in Toronto, Ontario. CBP notified the CDC Detroit Quarantine Station whose staff advised CBP to detain the patient at the border, provide her with a face mask, isolate her, and collect contact information from other passengers. The patient was hospitalized under a local emergency isolation order. Multiple sputum smears were AFB positive (+1 to +3), which subsequently grew *M. tuberculosis* on culture.

The bus route from Toronto to Detroit lasted approximately 5 hours, and the patient was observed coughing during travel. She was one of 33 passengers to board the bus in Toronto. Two hours later, the bus stopped in London, Ontario for 30 minutes where nine additional passengers boarded the bus and no one disembarked. Approximately 2 hours later, the bus stopped in Windsor and 27 passengers exited. Aside from the patient and her three immediate family members, 13 travelers, including two bus drivers, were on board when the bus crossed the border from Windsor to Detroit. A contact investigation
was initiated for the travelers still aboard the bus at the time of border crossing. As no locating information was available for the passengers who had exited the bus prior to the border crossing, the Ontario public health authorities issued a press release encouraging any passengers on this bus trip to seek medical care.

Of the 40 non-family member bus contacts, 24 were identified, including 13 contacts who crossed the border with the patient and 11 who responded to the Canadian press release (Figure 1). Most of these contacts were either Canadian or US citizens, and local public health agencies were informed about the passengers who resided in their jurisdictions; however, three contacts were neither US nor Canadian citizens and had returned to their home countries before they could be evaluated. Both US and Canadian contact investigation guidelines use a 5-mm cut-off size for interpreting a single tuberculin skin test (TST) result; if a negative TST result is obtained less than 8 weeks after exposure ended, a second TST should be placed no earlier than 8 weeks post-exposure (CDC, 2005; Tannenbaum, Yuan, and Wallington, 2007). Of the 21 individuals who were evaluated, 15 had complete evaluations: 13 had negative TST results at least 8 weeks after exposure and two had positive TST results (both had normal chest radiographs); one individual with a history of military service abroad had a 14 mm TST result at 6 weeks post-exposure and the other individual, who was born in a high-TB prevalence country, had a 15 mm TST result at 9 weeks. It is not known where these individuals sat on the bus in relation to the index case. Six individuals had incomplete evaluations: one person had a TST placed but did not return to have the test read and five had negative TST results within 8 weeks of exposure. Six individuals who tested negative at least 8 weeks
post-exposure were known to have boarded in Toronto, including two passengers seated within three rows of the index patient; data regarding origination of boarding is unknown for the remainder of the passengers.
Figure 1
Investigation of travelers exposed to tuberculosis on a bus –
United States and Canada, 2008

40 bus contacts

- 16 (40%) not contacted
- 24 (60%) contacted
  - 3 (7.5%) lost to follow-up prior to initial TST placement
  - 13 (32.5%) with negative TST >8 weeks after exposure
  - 6 (15%) only had a TST ≤ 8 weeks after exposure
    - 1 failed to return for reading
    - 5 with negative TST
  - 2 (5%) with positive
    - 2 with normal

Note
a. Excludes 3 family members who also were on the bus and includes 2 bus drivers
b. Tuberculin Skin Test
c. One individual born in a high TB disease prevalence country (≥20 cases/100,000 persons); the other with history of military service abroad (locations unknown)
Discussion

Although likely transmission has been reported via a single bus or train trip exposure (Moore, Valway, Ihle, and Onorato, 1999), most published reports supporting the risk of TB transmission to other bus passengers have involved students who have had recurrent daily contact with the exposed individuals, often over a period of months (Neira-Munoz, Smith, Cockcroft, Basher, and Abubakar, 2008; Edelson & Phypers, 2011). In this case, exposure to an individual with infectious tuberculosis was for a single 5 ½-hour period on a commercial bus.

With fewer air exchanges per minute and no standard use of high-efficiency particulate air (HEPA) filters, the typical bus environment would likely be more conducive to transmission of respiratory pathogens than an airplane cabin (WHO, 2008; Huston, 2009). Unlike for airplanes, routine bus contact investigations are often not done. Bus travel typically does not involve assigned seating or retention of passenger manifests for more than 24 hours, which are both key tools in conducting airline contact investigations. With limited resources, bus investigations may be also regarded as a low priority compared to other TB control activities. Given these difficulties, the index patient should be determined to be highly infectious before a bus contact investigation is considered. This index patient had symptomatic, smear positive, cavitary TB, and two of her three immediate family members were found to have positive TST results in follow-up evaluation.
Utilizing the public health travel restriction tools facilitated this bus investigation by alerting CBP officials about the infectious traveler; CBP notified CDC quarantine staff of the situation before the passengers disembarked, which allowed CBP to obtain contact information at the port of entry. This underscores the value of the Lookout record and CDC-CBP cooperation in contact investigations.

Although 53% of the bus contacts began evaluation, the overall complete evaluation rate was only 38%, highlighting the difficulty in ensuring adequate follow-up, even with the collaboration of international, federal, state, and local health officials. This limited contact investigation did not identify probable transmission events. Only two bus contacts had positive TST results, which given other potential risk exposures could not be directly attributed to the recent bus travel.

Defining the risk of TB infection from bus exposures requires further study, especially considering the association of bus travel with low social economic status (SES) and the incidence of TB attributed to SES. Bus contact investigations under some circumstances appear feasible. Public health authorities should recognize the resources available to them to overcome some of the barriers to bus investigations while also emphasizing prevention. In general, travelers with communicable respiratory illness should be discouraged from boarding public conveyances.
Acknowledgements

The authors gratefully acknowledge the following individuals for their assistance with the contact investigation (affiliations at time of investigation): Melinda Dixon, Vernard Green, City of Detroit Department of Health and Wellness Promotion; Shane Bies, Nancy Benavides, Oakland County Health Division; Candice Jemison, Wayne County Department of Public Health; Pamela Hackert, Ruta Sharangpani, University of Michigan School of Public Health; Peter Davidson, Michigan Department of Community Health; Demian Christiansen, Susan Marantz, Michael O. Vernon, Cook County Department of Public Health; Michael Lawson, East Tennessee Region, Tennessee Department of Health; Rose Marie Sales, Georgia Department of Human Resources; Frank Romano, Ohio Department of Health; Ann Hulvey, Marilyn Michaud, Public Health - Dayton & Montgomery County; Gabriel Palumbo, Nicole Cohen, Miguel Escobedo, Division of Global Migration, Centers for Disease Control & Prevention; Melanie Elms, Middlesex-London Health Unit; Elizabeth Rea, Toronto Public Health; Line Lauzon, Windsor-Essex County Health Unit; George Samuel, Ontario Ministry of Health and Long-Term Care.

Declaration of Conflict of Interest

The authors report that they have no conflicts of interest.

Disclaimer

The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the U.S. Centers for Disease Control and Prevention.
References


