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Limited Utility of Name-Based Tuberculosis Contact Investigations among Persons Using Illicit Drugs: Results of an Outbreak Investigation

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ABSTRACT *Persons named by a patient with tuberculosis (TB) are the focus of traditional TB contact investigations. However, patients who use illicit drugs are often reluctant to name contacts. Between January 2004 and May 2005, 18 isoniazid-resistant TB cases with matching Mycobacterium tuberculosis genotypes (spoligotypes) were reported in Miami; most patients frequented crack houses and did not name potentially infected contacts. We reviewed medical records and reinterviewed patients about contacts and locations frequented to describe transmission patterns and make recommendations to control TB in this population. Observed contacts were not named but were encountered at the same crack houses as the patients. Contacts were evaluated for latent TB infection with a tuberculosis skin test (TST). All 18 patients had pulmonary TB. Twelve (67%) reported crack use and 14 (78%) any illicit drug use. Of the 187 contacts evaluated, 91 (49%) were named, 16 (8%) attended a church reported by a patient, 61 (33%) used a dialysis center reported by a patient, and 19 (10%) were observed contacts at local crack houses. Compared to named contacts, observed contacts were eight times as likely to have positive TST results (relative risk=7.8; 95% confidence interval=3.8–16.1). Dialysis center and church contacts had no elevated risk of a positive TST result. Testing observed contacts may provide a higher yield than traditional name-based contact investigations for tuberculosis patients who use illicit drugs or frequent venues characterized by illicit drug use.*

KEYWORDS *Tuberculosis, Drug resistance, Outbreak, Substance abuse, Contact investigations*

BACKGROUND

Although tuberculosis (TB) rates continue to decline in the USA, rates remain higher in urban settings,[1] particularly among high-risk groups such as those who use illicit drugs.[2] Contact investigations, a key component of TB control, find persons exposed to patients with infectious TB so they can be screened and treated if necessary. In the USA, persons named by patients with TB are the focus of contact

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investigations, despite known limitations.[3] One such limitation is the inability or reluctance of persons engaged in illicit activities to name their contacts.[4–6]

In the spring of 2005, TB control staff in Miami-Dade County detected a cluster of cases with *Mycobacterium tuberculosis* isolates resistant to isoniazid and with matching spacer oligonucleotide (spoligotype) polymerase chain reaction results. Many of these patients were HIV-infected, and nearly all used rock cocaine (crack) and lived in low-income neighborhoods in Miami. We investigated to determine transmission patterns and devise appropriate strategies for the control of TB in this special population.

METHODS

Patients with TB were included in the investigation if they were diagnosed in Miami-Dade County during January 2004–May 2005 and their *M. tuberculosis* isolates were resistant to isoniazid and had matching spoligotypes. To further characterize isolates and increase specificity, isolates were also typed by mycobacterial interspersed repetitive units (MIRU) and IS*6110*-based restriction fragment length polymorphism (RFLP). Patients were interviewed about contacts, locations frequented, illicit drug use, and other behaviors relevant to transmission of *M. tuberculosis*, TB symptom onset, and TB treatment history. Medical record reviews yielded further information about patient demographics and comorbidities. A tuberculin skin test (TST) was administered to contacts. A TST result of at least 5 mm induration was considered positive.

RESULTS

Patient Characteristics

Eighteen patients met the inclusion criteria. Their median age was 49 years (range, 21 to 70). Thirteen (72%) were male, 17 (94%) were US-born, and 16 (89%) were black non-Hispanic. Fourteen (78%) reported alcohol abuse and illicit drug use, including 12 (67%) who also reported crack cocaine use. Eight (44%) were HIV-infected and all had pulmonary disease. Twelve patients (67%) had sputum smears positive for acid-fast bacilli and ten (56%) had cavitary disease, suggesting increased contagiousness.

Links among Patients

Five patients (patients 1–5, Table 1) frequented a house in south Miami associated with crack cocaine use, gambling, and prostitution (i.e., the south crack house). Twelve other patients resided in northern Miami in neighborhoods associated with poverty. These patients also mentioned visiting nearby houses associated with crack cocaine use and prostitution. The remaining patient (patient 6, Table 1) lived in north Miami but had family members who lived only a block away from the south crack house.

Genotyping Results

Isolates were characterized by MIRU and RFLP to help determine whether patients were part of a single chain of transmission. All 16 isolates with RFLP results were similar (Table 1) but displayed three different MIRU patterns. Isolates from the 12 patients who lived in northern Miami matched strain A ($n=12$). Of the five patients linked through the south crack house, four had matching MIRU results (strain B),

TABLE 1 Tuberculosis genotyping results and patient links

Patient	RFLP cluster	MIRU cluster	Patient links
1	Outbreak strain	B	South crack house
2	Outbreak strain	B	South crack house
3	Specimen unavailable for RFLP	Specimen unavailable for MIRU	South crack house
4	Untypeable DNA degraded	B	South crack house
5	Outbreak strain	B	South crack house
6	Outbreak strain	Unique	Family resided near south crack house
7	Outbreak strain	A	North Miami
8	Outbreak strain	A	North Miami
9	Outbreak strain	A	North Miami
10	Outbreak strain	A	North Miami
11	Outbreak strain	A	North Miami
12	Outbreak strain	A	North Miami
13	Outbreak strain	A	North Miami
14	Outbreak strain	A	North Miami
15	Outbreak strain	A	North Miami
16	Outbreak strain	A	North Miami
17	Outbreak strain	A	North Miami
18	Outbreak strain	A	North Miami

and one (patient 3) had no MIRU results. Patient 6, who resided in north Miami, with family who lived a block from the south crack house had a unique MIRU result.

Contact Investigations

Patients were reluctant to reveal the names of contacts. Repeated interviews, however, ultimately yielded 91 names, an average of five named contacts per patient. In addition, one patient reported that he was a patient at a dialysis center while potentially contagious, and another mentioned regular attendance at a local church. TB and latent tuberculosis infection screenings were conducted at both locations. Because of the difficulty of eliciting names, investigators talked with and offered skin testing to persons they encountered during repeated visits to the crack houses (i.e., observed rather than named contacts).

Of 187 contacts tested, 91 (49%) were named, 16 (8%) attended the church, 61 (33%) used the dialysis center, and 19 (10%) were observed at a crack house. Of the 19 observed contacts, 13 (68%) had positive TST results, while only eight (9%) of 91 named contacts had positive TST results (Table 2). Compared to named contacts, observed contacts were 7.8 (95% confidence interval=3.8–16.1) times as likely to have positive TST results. Compared to named contacts, individuals at the dialysis center and church had no elevated risk of a positive TST result (Table 2).

DISCUSSION

Eighteen patients were included in this investigation based on isolates with matching spoligotype results and isoniazid resistance. Because of similar patient demograph-

TABLE 2 Relative risk of a positive tuberculin skin test among contact categories

Contact category	Total screened	Number positive (%)	Relative risk (95% confidence interval)
Named	91	8 (8.8)	Referent
Dialysis center	61	6 (9.8)	1.1 (0.4–3.0)
Church	16	2 (12.5)	1.4 (0.3–6.1)
Identified at a crack house	19	13 (68.4)	7.8 (3.8–16.1)

ics, spoligotype results, RFLP results, and drug resistance patterns, we initially assumed that all 18 patients were involved in the same chain of transmission. However, with additional TB genotyping information, the connectedness between these patients became less clear. Although the matching RFLP results supported a common transmission chain, the three distinct MIRU patterns suggested that we may have investigated more than one chain of transmission. Regardless of whether these patients were infected through one or more transmission chains, this group of inner-city black non-Hispanics represents a subpopulation whose behaviors and residence in high poverty areas both increase their risk of TB and reduce the effectiveness of traditional interventions.

Despite the multiple interviews with each patient, on average, patients only named five contacts each. This number of contacts per patient is approximately half as many contacts identified per patient in reports that focus on the general population.[7,8] Further highlighting the limitations associated with the traditional named-based approach in this investigation, named contacts appeared, in fact, to be the least at risk of a positive TST result. The highest yield of positive TST results (68%) was among the 19 persons who frequented a crack house but were not named by any of the patients: the observed contacts. The results suggest that transmission occurred in venues associated with illicit drug use, places where traditional methods of contact investigation do not work very well.

Persons who use illicit drugs present a complex set of challenges for TB control.[9] First, TB patients who use crack cocaine are more likely to be sputum-smear positive at diagnosis,[10] suggesting increased contagiousness. Second, persons involved in the sale and use of illegal drugs are unlikely to volunteer names of contacts and may also be less likely to know or remember contacts' names. Therefore, a sizable group of recently infected contacts may remain unknown to public health officials. To complement interviewing, The National Tuberculosis Controllers Association and Centers for Disease Control and Prevention recommend site visits to locations associated with transmission. Site visits can add contacts that would otherwise remain unknown.[11] For high-risk urban populations, such as the one mentioned in this report, alternative methods such as on-site screening and identification of observed contacts is especially important and likely to produce a higher yield of contacts at risk of future TB disease.

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