

CDC guidelines recommend that HIV-positive persons be offered PCRS to identify potentially exposed partners on an ongoing basis, rather than limit such efforts to the time of initial diagnosis (7,8). In this project, most HIV-positive recruiters were not newly diagnosed; nevertheless, they were able to recruit a substantial number of NAs with a high rate of newly diagnosed HIV infection, and to do so efficiently. This finding supports the potential efficacy of working with HIV-positive persons on an ongoing basis to identify and offer CTR to others at high risk for HIV infection. However, the finding further suggests that a broader approach, which targets not only sex partners but also others in the HIV-positive person's social, sexual, or drug-using network, might be more cost-effective for identifying persons with HIV infection. Although results are preliminary, further assessment of the social network strategy is warranted.

References

1. Glynn M, Rhodes P. Estimated HIV prevalence in the United States at the end of 2003 [Abstract T1-B1101]. Presented at the National HIV Prevention Conference, Atlanta, GA; June 2005.
2. CDC. Advancing HIV prevention: new strategies for a changing epidemic—United States, 2003. *MMWR* 2003;52:329–32.
3. Rothenberg R, Kimbrough L, Lewis-Hardy R, et al. Social network methods for endemic foci of syphilis: a pilot project. *Sex Transm Dis* 2000;27:12–8.
4. Jordan WC, Tolbert L, Smith R. Partner notification and focused intervention as a means of identifying HIV-positive patients. *J Natl Med Assoc* 1998;90:542–6.
5. CDC. HIV counseling and testing in publicly funded sites: annual report, 1997 and 1998. Atlanta, GA: US Department of Health and Human Services, CDC; 2001.
6. Golden MR, Hogben M, Potterat JJ, et al. HIV partner notification in the United States: a national survey of program coverage and outcomes. *Sex Transm Dis* 2004;31:709–12.
7. CDC. HIV partner counseling and referral services: guidance. Atlanta, GA: US Department of Health and Human Services, CDC; 1998. Available at <http://www.cdc.gov/hiv/pubs/pcrs/pcrs-cov.htm>.
8. CDC. Incorporating HIV prevention into the medical care of persons living with HIV: recommendations of CDC, the Health Resources and Services Administration, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. *MMWR* 2003;52(No. RR-12).

Human Tuberculosis Caused by *Mycobacterium bovis* — New York City, 2001–2004

In March 2004, a U.S.-born boy aged 15 months in New York City (NYC) died of peritoneal tuberculosis (TB) caused by *Mycobacterium bovis* infection. *M. bovis*, a bacterial species of the *M. tuberculosis* complex, is a pathogen that primarily infects cattle. However, humans also can become infected, most

commonly through consumption of unpasteurized milk products from infected cows. In industrialized nations, human TB caused by *M. bovis* is rare because of milk pasteurization and culling of infected cattle herds (1). This report summarizes an ongoing, multiagency* investigation that has identified 35 cases of human *M. bovis* infection in NYC. Preliminary findings indicate that fresh cheese (e.g., queso fresco) brought to NYC from Mexico was a likely source of infection. No evidence of human-to-human transmission has been found. Products from unpasteurized cow's milk have been associated with certain infectious diseases and carry the risk of transmitting *M. bovis* if imported from countries where the bacterium is common in cattle. All persons should avoid consuming products from unpasteurized cow's milk†.

TB Surveillance

Since January 1, 2001, spoligotyping of *M. tuberculosis*-complex isolates from patients with newly diagnosed TB has been conducted routinely in NYC. This rapid genotyping method is primarily used for epidemiologic monitoring; however, spoligotyping also differentiates *M. bovis* from *M. tuberculosis*. Of 4,524 TB cases reported in NYC during 2001–2004, a total of 3,417 (76%) were culture-confirmed; 3,123 (91%) of these had spoligotype results, of which 35 (1%) were *M. bovis*. Twelve (34%) of the *M. bovis* cases were in children aged <15 years (median age: 5 years), and five of the 35 cases (14%) were in children aged <5 years (range: 1–4 years). Of the 35 patients, 20 (57%) were born in Mexico, 11 (31%) in the United States, two (6%) in the Dominican Republic, and one (3%) each in Guatemala and Guyana. Of 23 adult patients (median age: 27 years; range: 16–76 years), 22 (96%) were born abroad; of the 12 patients aged <15 years, 10 (83%) were born in the United States, all of Mexican-born parents. Of the five patients aged <5 years, all had extrapulmonary disease (i.e., three lymphatic and two peritoneal). All five were born in the United States of Mexican-born parents. None had traveled outside of the United States, and no epidemiologic link to other TB cases was discovered.

Twenty-six of the 35 patients received inpatient hospital care. The anatomical site of disease was extrapulmonary in 21 (60%) patients, pulmonary in nine (26%), and both pulmonary and

*The investigation is led by the NYC Department of Health and Mental Hygiene, in collaboration with the New York State Department of Agriculture and Markets, CDC, the U.S. Department of Agriculture, and the Food and Drug Administration.

†The Food and Drug Administration permits sale of imported or domestic, aged cheeses from unpasteurized milk under certain conditions. (Cheeses and related cheese products, 21 C.F.R. Part 133 [2005]).

extrapulmonary in five (14%) patients. The sputum-smear microscopy results were positive for acid-fast bacilli, indicating potential contagiousness, for eight (57%) of the 14 patients with pulmonary disease. Twenty-five (seven children and 18 adults) of the 35 patients were tested for antibodies to human immunodeficiency virus (HIV). Seven (28%) of those tested had positive HIV results; all were adults, aged 23–51 years (median: 35 years).

The only fatal *M. bovis* case was in the boy aged 15 months. He was treated for diarrhea and fever and received inpatient and outpatient care for 4 weeks, until abdominal distension and tenderness led to laparotomy for presumed ruptured appendicitis. Tuberculous peritonitis was diagnosed on the basis of surgical and microbiologic findings, and treatment for TB was begun. However, the boy died after 4 days of treatment.

During 1995–2004, the number of TB cases reported annually in NYC among Mexican-born persons ranged from 28 to 64. During 2001–2004, a total of 20 (13%) of 155 culture-confirmed TB cases in Mexican-born patients were caused by *M. bovis* infection, compared with 15 (<1%) of 2,925 TB cases (with spoligotype results) in all others. During 2001–2004, a total of 101 TB cases in children aged <5 years were reported; 32 (32%) of the cases were culture-confirmed, and five (16%) of the 32 culture isolates were *M. bovis*.

The standard four-drug regimen for TB consists of isoniazid, rifampin, pyrazinamide, and ethambutol. Since 2003, a fifth drug, streptomycin, is no longer recommended as a first-line alternative to ethambutol (2). Whereas isolates of other species belonging to the *M. tuberculosis* complex usually are susceptible to pyrazinamide, *M. bovis* isolates typically are resistant. In this investigation, of the 35 isolates, 17 (49%) were resistant to pyrazinamide only; 14 (40%) were resistant to pyrazinamide and streptomycin; two (6%) were resistant to pyrazinamide, isoniazid, and streptomycin; one (3%) was resistant to pyrazinamide and isoniazid; and one (3%) had no resistance.

Laboratory Investigation

Identification of the 35 *M. bovis* isolates was confirmed by genetic deletion analysis. Genotyping determined nine different patterns by spoligotype, three patterns (1–7 bands) by IS6110-based restriction fragment length polymorphism (RFLP), and six patterns by mycobacterial interspersed repetitive units (MIRU). A cluster of 13 cases had identical RFLP (BE4), spoligotype (octal designation 26407377777600) (3), and MIRU (232224253322)

(Figure). Genotyping with polymorphic guanine- and cytosine-rich repeat sequences (PGRS) did not reveal additional clusters. The interpretation of *M. bovis* genotypes for investigating paths of transmission has not been determined.

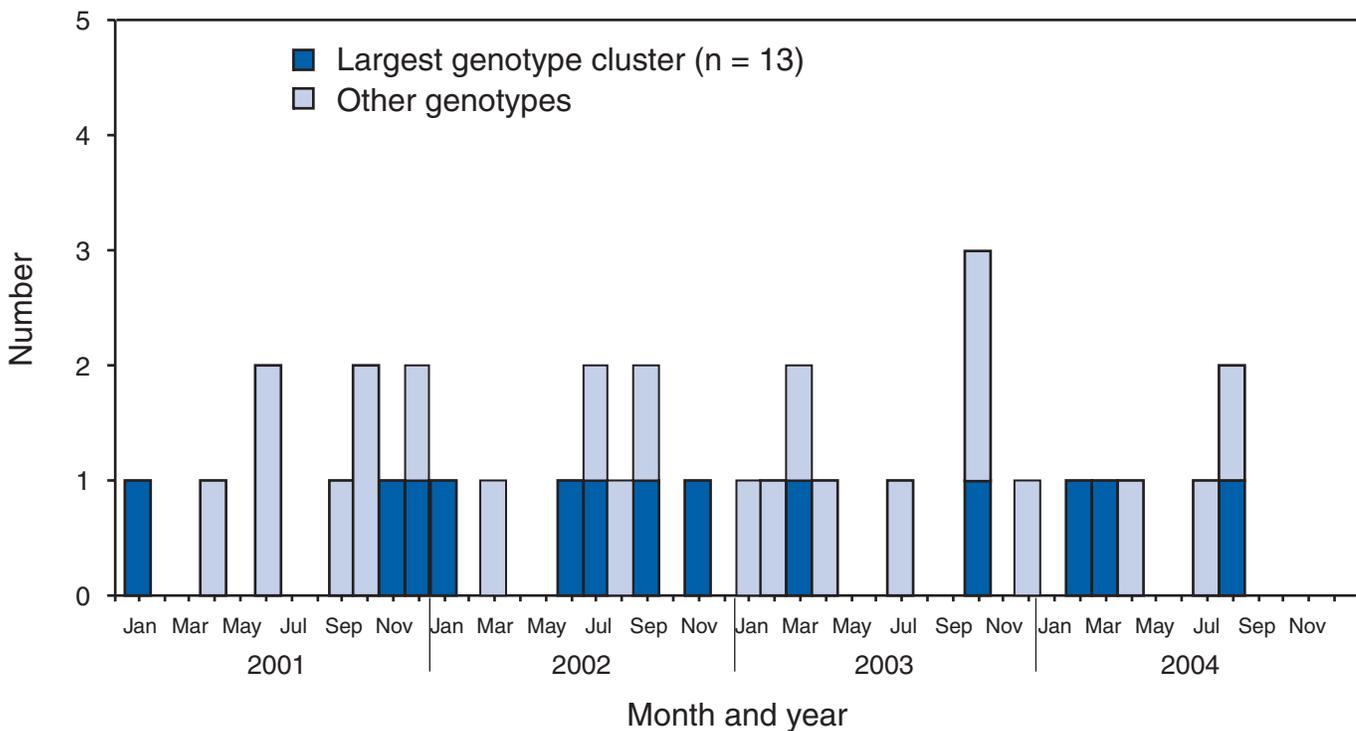
Epidemiologic Investigation

Of the 35 patients, 23 (66%) patients (or parents of patients) were interviewed regarding exposures associated with *M. bovis* infection. Among the 12 not interviewed, two had died, three had moved back to Mexico, five had their telephones disconnected and attempts to visit them at home were unsuccessful, and two lacked usable locating information. Parents of the 10 U.S.-born children and one of the two children born abroad were interviewed, as were 12 of 22 adults. No linkages that might allow airborne, person-to-person transmission of *M. bovis* were discovered among any of the patients.

Nineteen (83%) of the 23 interviewed reported eating cheeses produced in Mexico while they were living in the United States, including parents of four (80%) of the five children aged <5 years. The cheeses were believed obtained from one or more of the following sources: a courier agency delivering Mexican products, a visitor carrying food in luggage, a Mexican-specialty grocery, or a door-to-door vendor in NYC. Eighteen (78%) of the 23 interviewed did not know whether milk products they consumed were pasteurized. Samples of cheeses produced in Mexico and acquired in NYC are being tested for presence of *M. bovis*.

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Editorial Note: *M. bovis* transmission from cattle to humans was once common in the United States, but human infections were virtually eliminated by decades of disease control in cattle herds and by routine pasteurization of cow's milk (1). Now the majority of persons who have *M. bovis* TB come from countries where the infection is prevalent in cattle and where they presumably acquired infection. However, in San Diego, California, during 1980–1997, 34% of culture-confirmed TB cases in children aged <15 years were caused by *M. bovis*; approximately 90% of these children were U.S. born and of Hispanic ethnicity (4). Fresh cheese brought from Mexico is suspected to be one source of infections in these

FIGURE. Number* of reported *Mycobacterium bovis* cases, by month and largest genotype cluster† — New York City, 2001–2004§

* N = 35.

† Cases had identical restriction fragment length polymorphism (BE4), spoligotype (octal designation 26407377777600), and mycobacterial interspersed repetitive units (232224253322).

§ Data as of October 2004.

children. The investigation in NYC, where the Mexican population tripled to 186,872 during 1990–2000, suggests that fresh cheese from Mexico might account for a high percentage of the 35 cases described in this report; however, further epidemiologic investigations and laboratory results are needed for confirmation.

M. bovis causes disease in cattle, deer, and other mammals. In humans, consumption of unpasteurized infected cow's milk products can cause infection. Although human disease caused by *M. bovis* and other species of *M. tuberculosis* complex are similar, the anatomic site of *M. bovis* disease is more often extrapulmonary. Epidemiologic evidence supports the likelihood of human-to-human, airborne *M. bovis* transmission from patients who have pulmonary disease, but its relative contribution to new infections in humans is unknown (5).

The frequency of isoniazid resistance in the cases described in this report was comparable to that previously reported for *M. bovis* in San Diego. Streptomycin resistance, which had not been examined previously for *M. bovis* in the United States, was approximately six times more frequent among the cases

in NYC (16 of 35 isolates) than that reported for *M. tuberculosis* complex previously (6). Continued surveillance for drug resistance is needed to ensure effective treatment.

TB disease is a reportable condition in all U.S. jurisdictions; however, speciation of *M. tuberculosis* complex is not reported nationally. Approximately 80% of cases in the United States are culture confirmed. Systematic speciation was not feasible until the advent of comprehensive genotyping. *M. bovis* also can be distinguished from other species of *M. tuberculosis* complex by its pyrazinamide resistance and by biochemical tests available in reference laboratories; genetic deletion analysis identifies *M. bovis* definitively. The CDC national genotyping program for TB isolates incorporates spoligotype and MIRU, with IS6110 RFLP upon special request. However, RFLP is poorly discriminatory for *M. bovis* because isolates usually have a low number of IS6110 copies. Spoligotype variability among *M. bovis* isolates from the same cattle herd and similar spoligotype patterns from cattle in different regions have been observed (7). MIRU can yield more patterns than RFLP (8). PGRS has been recommended as the method of choice for strain typing of isolates with low copy numbers of IS6110

(9); however, in the NYC investigation, PGRS did not further differentiate clusters among the cases. The matching genotypes that defined the cluster of 13 cases might imply a transmission linkage; however, the significance of genotype clustering among *M. bovis* isolates is undetermined. The ongoing investigation in NYC has determined that human-to-human transmission was an unlikely explanation.

New York and surrounding states are accredited as TB free for *M. bovis* in cattle[§]. Cow's milk products approved for sale in New York state are pasteurized with a few regulated exceptions[¶]. In contrast, a previous study determined that 17% of cattle sampled at meat-processing plants in Mexico were infected with *M. bovis* (10). An estimated 20% of cow's milk in Mexico destined for production of fresh cheese and similar products is not pasteurized. Other pathogens potentially acquired by consuming unpasteurized cow's milk products include *Listeria monocytogenes*, *Salmonella* spp., *Brucella* spp., *Staphylococcus aureus*, and *Escherichia coli*. To prevent infections with these bacteria, consumption of unpasteurized cow's milk products should be avoided^{**}.

References

- O'Reilly LM, Daborn CJ. The epidemiology of *Mycobacterium bovis* infections in animals and man: a review. *Tuber Lung Dis* 1995;76(Suppl 1):1–46.
- CDC. Treatment of tuberculosis: American Thoracic Society, CDC, and Infectious Diseases Society of America. *MMWR* 2003;52(No. RR-11).
- Dale JW, Brittain D, Cataldi AA, et al. Spacer oligonucleotide typing of bacteria of the *Mycobacterium tuberculosis* complex: recommendations for standardized nomenclature. *Int J Tuberc Lung Dis* 2001;5:216–9.
- Dankner WM, Waecker NJ, Essey MA, Moser K, Thompson M, Davis CE. *Mycobacterium bovis* infections in San Diego: a clinicoepidemiologic study of 73 patients and a historical review of a forgotten pathogen. *Medicine (Baltimore)* 1993;72:11–37.
- LoBue PA, LeClair JJ, Moser KS. Contact investigation for cases of pulmonary *Mycobacterium bovis*. *Int J Tuberc Lung Dis* 2004;8:868–72.
- Moore M, Onorato IM, McCray E, Castro KG. Trends in drug-resistant tuberculosis in the United States, 1993–1996. *JAMA* 1997;278:833–7.
- Milian-Suazo F, Banda-Ruiz V, Ramirez-Casillas C, Arriaga-Diaz C. Genotyping of *Mycobacterium bovis* by geographic location within Mexico. *Prev Vet Med* 2002;55:255–64.
- Cowan LS, Mosher L, Diem L, Massey JP, Crawford JT. Variable-number tandem repeat typing of *Mycobacterium tuberculosis* isolates with low copy numbers of IS6110 by using mycobacterial interspersed repetitive units. *J Clin Microbiol* 2002;40:1592–602.
- Cousins DV, Skuce RA, Kazwala RR, van Embden JD. Towards a standardized approach to DNA fingerprinting of *Mycobacterium bovis*. *Int J Tuberc Lung Dis* 1998;2:471–8.
- Milian F, Sanchez LM, Toledo P, Ramirez C, Santillan MA. Descriptive study of human and bovine tuberculosis in Queretaro, Mexico. *Rev Latinoam Microbiol* 2000;42:13–9.

Erratum: Vol. 54, No. 23

In the report, “Seroprevalence of Poliovirus Antibodies Among Children in a Dominican Community — Puerto Rico, 2002,” an error occurred in the second sentence of the final paragraph of the Editorial Note on page 581. The sentence should read, “The study described in this report included children who were vaccinated with OPV and children who were vaccinated after the all-IPV schedule was implemented in Puerto Rico on January 1, 2001.”

Errata: Vol. 53, No. SS-2

In the *MMWR Surveillance Summary*, “Youth Risk Behavior Surveillance — United States, 2003,” the following errors occurred in the overweight and at risk for overweight data.

On page 1, the last sentence of the abstract under “Results and Interpretation” should read, “In 2003, a total of 21.9% of high school students had smoked cigarettes during the 30 days preceding the survey; 78% had not eaten >5 servings/day of fruits and vegetables during the 7 days preceding the survey; 33.4% had participated in an insufficient amount of physical activity; and 12.1% were overweight.

On page 25, the text should read as follows:

Overweight and Weight Control

At Risk for Overweight

Nationwide, 14.8% of students were at risk for becoming overweight (Table 58). Overall, the prevalence of being at risk for overweight was higher among black (18.2%) and Hispanic (17.4%) than white (13.3%) students; higher among black female (21.2%) than white female (12.4%) and Hispanic female (15.7%) students; and higher among Hispanic male (19.1%) than white male (14.0%) students. Overall, the prevalence of being at risk for overweight was higher among 11th grade (16.5%) than 12th grade (13.7%) students and higher among 11th grade female (16.1%) than 12th grade female (12.0%) students. Prevalence of being at risk for overweight ranged from 11.0% to 16.7% across state surveys (median: 14.5%) and from 14.2% to 20.9% across local surveys (17.4%) (Table 59).

[§] Accredited-free states or zones, 9 C.F.R. Sect. 77.7 (2003).

[¶] New York Codes, Rules, and Regulations. Title 1, Department of Agriculture and Markets; chapter I, milk control; subchapter A, dairy products; part 2, requirement for the production, processing, manufacturing, and distribution of milk and milk products.

^{**} 21 C.F.R. Part 133 (2005).