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Probable Transmission of Multidrug-Resistant Tuberculosis in a Correctional Facility -- California

During 1990-1991, an inmate in a California prison spent a total of 6 months in the prison infirmary with multidrug-resistant tuberculosis (MDR-TB). As a result, from November 1990 through March 1991, 11 of the 21 prison infirmary physicians and nurses underwent tuberculin skin testing; two persons could be documented as newly positive. In addition, two correctional officers (from an unknown number tested) also had newly positive tuberculin skin tests. State and local departments of health, industrial relations, and corrections investigated the possibility of nosocomial TB transmission from inmates to staff. This report presents the findings from their investigation. Case-Patient

In September 1986, on incarceration, an inmate underwent a chest radiograph that was normal and received a multiple-puncture tuberculin skin test that was recorded as "ok." In August 1987, he presented with fever, weight loss, and night sweats. Although a chest radiograph indicated a left upper-lobe infiltrate at that time, records do not indicate that TB treatment was given. In September 1987, he developed hemoptysis, and a sputum culture was positive for *Mycobacterium tuberculosis* susceptible to all drugs. He was returned to his two-man cell and was treated with (but not directly observed to take) isoniazid (INH) and rifampin (RIF).

In May 1988, *M. tuberculosis* resistant to INH and RIF was isolated from the first follow-up sputum specimen; the inmate was admitted to the infirmary and treated with INH, RIF, and ethambutol (EMB). In July 1988, pyrazinamide (PZA) and ethionamide (ETA) were added to his treatment regimen. In August 1988, two sputum smears were negative for acid-fast bacilli (AFB); he was discharged from the infirmary and was to continue unobserved anti-TB therapy.

His next recurrence of TB was detected in March 1990 when a chest radiograph, obtained to evaluate a stab wound, showed a new left upper-lobe cavity. A sputum smear was positive for AFB, and he was treated in the infirmary with INH, RIF, PZA, EMB, ETA, and streptomycin (SM) after *M. tuberculosis* resistant to INH and ETA was isolated. In July 1990, INH was discontinued because of elevated liver function test results. In 1990, while being treated for TB, he was housed in the prison infirmary near patients with human immunodeficiency virus (HIV) infection; the case-patient's evaluation for underlying causes of immunosuppression was negative.

From July 1990 through August 1991, the inmate was transferred between three different state prisons, and sputum specimens obtained during that time were predominately smear- and/or culture-positive. In February 1991, a specimen isolate from the inmate showed resistance to INH, RIF, SM, EMB, ETA, and amikacin. The patient improved clinically on PZA, EMB, amikacin, capreomycin, and ciprofloxacin. By February 1992, three sputum specimens were smear- and culture-negative. TB Exposure Among Selected Employees

From March 1990 through February 1991, during the care of the case-patient, the prison infirmary did not contain a respiratory isolation cell; employees recalled air blowing out of TB patients' cells when food slots were opened. Infirmary air was recirculated after passing through high-efficiency particulate air filters. In January 1991, the infirmary ventilation was changed to 100% fresh air; however, in March 1991, two cells tested were documented to still be under positive pressure. Employees reported occasionally wearing surgical masks when entering the rooms of TB patients.

During the period March 1987-March 1991, 10 of the 21 currently employed infirmary physicians and nurses were tested twice (31.3 person years of observation); two were newly positive, and the risk of acquiring TB infection was 6.4 per 100 person years. Of the 11 other infirmary employees, six were known to be tuberculin skin-test positive in 1987, and five had not been tested twice. The number of additional infirmary physicians and nurses employed during this period was unknown. One health-care provider had a documented 0 mm Mantoux tuberculin skin test in April 1990 that increased to 10 mm in March 1991. For 5 months in the intervening year, this health-care provider had provided care for the case-patient in the infirmary. Another health-care provider and a correctional officer (who worked in the infirmary) who both had newly positive tuberculin skin tests had not had yearly screenings; therefore, their tuberculin skin-test conversions could have occurred any time after their last tests in 1987 through March 1991, a period in which pulmonary TB was diagnosed in 13 other inmates in this prison.

In May 1991, an additional employee (a correctional officer who did not work in the infirmary) also had a newly positive tuberculin skin test. His reported TB exposure consisted of one 8-hour shift in December 1990 in a community hospital where he was assigned without respiratory protection to the bedside of an inmate with sputum- culture positive (AFB-negative) TB who was coughing. Identification and testing of other correctional officers assigned to the community hospital or the prison infirmary have not been completed.

The California Department of Corrections (CDC), with consultation from the California Department of Health Services, is planning and implementing TB-control procedures in its facilities. CDC staff members are participating on the California Tuberculosis Elimination Task Force and the Interagency Working Group on Tuberculosis.

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Editorial Note

Editorial Note: The findings from this investigation indicate several situations that increased the risk for possible transmission of TB among inmates and employees and emphasize the need to improve infection-control practices in correctional settings. Specifically, the MDR-TB case-patient's initial infection appears to have occurred while he was incarcerated, and had his treatment included directly observed therapy, the emergence of his MDR-TB might have been prevented. The documented airflow from the infirmary cells into the hall (rather than the negative pressure recommended for AFB isolation) provided the potential for release of *M. tuberculosis*. The full extent of transmission from this patient is unknown in the absence of contact tracing or routine annual screening of staff or inmates. However, findings in this investigation suggest that delays in the diagnosis of the inmate's initial drug-susceptible TB and his two recurrences with MDR organisms, as well as delayed and inadequate respiratory isolation,

made possible transmission to his cell mates, other inmates, and staff.

This investigation did not evaluate for transmission of MDR-TB to HIV-infected persons collocated in the infirmary with the case-patient. However, recent MDR-TB outbreaks in hospital settings have demonstrated rapid progression to clinical TB after infection with *M. tuberculosis* in HIV-infected persons, and high mortality and the potential for rapid spread of TB when immunocompromised persons are exposed to persons with infectious TB (1). Prison inmates have a higher prevalence of HIV infection than the general population (2,3), and in some correctional facilities HIV-infected inmates are housed together. Delayed TB diagnosis, delayed and inadequate isolation precautions, and frequent transfers of inmates among prison facilities and community hospitals have resulted in outbreaks of MDR-TB in correctional settings and in communities (4).

The findings in this report underscore the need for 1) regular and systematic TB screening of inmates and staff; 2) TB preventive therapy for those who test positive for TB and are eligible for preventive therapy; 3) rapid diagnosis of TB and isolation and treatment (including directly observed therapy) of persons with suspected TB; and 4) follow-up to assure continuity of care both inside and outside correctional facilities. In addition, education of correctional staff is necessary so that appropriate anti-TB regimens are prescribed and guidelines are followed for TB surveillance, containment and infection control, and program evaluation in correctional institutions (5,6).

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