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Acute *Bordetella pertussis* Infection in an Adult

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***Bordetella pertussis* was transmitted from an immunized boy to his father and possibly to other family members. This case report demonstrates that although unusual, acute adult *B. pertussis* infection can occur. *B. pertussis* immunization may not prevent infection but can reduce the severity. *B. pertussis* was detected in sputum from the adult by direct-fluorescent antibody staining and was grown on Regan-Lowe medium. Serology tests confirmed the infection in the adult.**

Pertussis is a common and potentially serious disease affecting infants and young children but rarely healthy adults (3, 8). The frequency of *Bordetella pertussis* infections may have been underestimated in recent years, as immunized children and adults may have only catarrhal symptoms or mild bronchitis. During 1993, a total of 6,586 pertussis cases were reported in the United States, including 675 (10%) cases among persons aged less than 19 years (1). The total number of cases may be substantially higher, as only an estimated 10% of all pertussis cases are reported. This case report focuses on the transmission of *B. pertussis* from an immunized boy to his father and possibly to other family members.

Case report. A 53-year-old male physician developed symptoms of malaise, fatigue, and mild cough while on vacation in Canada with his family. Six days after the onset of symptoms, the patient returned home to Bermuda still ill and complaining of a headache, low-grade fever, chest pains, and a cough. At day 10, the patient had a cough with the production of purulent sputum. A sputum specimen was collected and sent to the laboratory for culture. The patient's symptoms persisted despite treatment with ampicillin-clavulanic acid [Augmentin (R)]. At day 14 of his illness, the patient developed paroxysmal coughing with occasional vomiting. The paroxysms of coughing persisted for 2 weeks before they decreased in frequency. The cough finally resolved after 6 weeks. Previously, the patient had been healthy, with no history of pneumonia, immune deficiency, acute bronchitis, or asthma.

As mentioned, the patient had been on vacation in Canada, traveling in close contact with his 11-year-old son, his mother-in-law, his 21-year-old daughter, and his wife. The son had returned from Canadian Boy Scout camp with malaise, fatigue, and a nonproductive paroxysmal cough with vomiting. He was afebrile. His symptoms persisted for 1 week and resolved without treatment. Two weeks later, the father developed malaise and a cough. The wife and daughter, however, showed no signs or symptoms suggestive of *B. pertussis* infection. The daughter had had clinical whooping cough in her early teens.

A purulent sputum specimen from the adult male patient was sent to the laboratory on day 10 of the illness. A Gram stain of the sputum specimen showed large numbers of polymorphonuclear leukocytes and small gram-negative coccobacilli. The initial culture of the sputum specimen on 5% horse blood agar and chocolate agar grew normal respiratory flora. Additional tests on the sputum specimen revealed *B. pertussis* by direct fluorescent-antibody (DFA) staining. The DFA stain used fluoroscein isothiocyanate conjugate produced by Difco (Detroit, Mich.) for *B. pertussis* and *B. parapertussis* diluted 1:900 prior to use. It was counterstained with Evans blue stain. The positive controls were *B. pertussis* and *B. parapertussis*, and the negative control was *Escherichia coli*. The sputum specimen was also cultured on Regan-Lowe medium and incubated in room air at 35°C. After 72 h small shiny colonies were observed. Gram staining showed small gram-negative coccobacilli which were confirmed as *B. pertussis* by DFA staining.

Immunoglobulin G (IgG) and IgA antibody titers to filamentous hemagglutinin (FHA) and pertussis toxin (PT), performed by Viromed Laboratories (Minneapolis, Minn.), were markedly elevated (Table 1). The positive and negative controls for FHA and PT were within the normal limits. The adult patient's serological results suggest primary infection with *B. pertussis*. The patient's immune status prior to *B. pertussis* infection was unknown but was assumed to be negative, as pertussis vaccination was not available in Canada until the 1950s. The patient moved to Bermuda in 1949 at the age of 7. Routine *B. pertussis* immunization was commenced in Bermuda in the 1960s. Therefore the patient would have missed both immunization programs.

Discussion. *B. pertussis* infection in adults usually presents as a mild infection, sometimes only a cough. Documented cases of adult pertussis are rare for healthy, immunocompetent adults. During the past 10 years, there have been several reports of adult *B. pertussis* infection in human immunodeficiency virus patients and one report in which university students were studied (2–4, 6, 8). The study involving university students reported adult *B. pertussis* as a mild infection with only a persistent cough. The pattern of infection was endemic rather than epidemic for the adult population. The conclusion suggested that a booster shot may be required for immunized adults. A mild infection, as described for the university students, was seen with the mother-in-law. This case study has shown that a severe acute case of adult pertussis can occur in a person who has not been vaccinated or whose vaccination status is unknown.

The epidemiology of this case is atypical. The father had an acute case of *B. pertussis*. The son, who had evidence of vaccination, had a mild case of whooping cough and was untreated. However, *B. pertussis* was transmitted from a relatively mild case of the disease in an immunized child to an adult. The evidence suggests a vaccination breakthrough in the child. There have been documented cases of pertussis being transmitted from an adult to an unimmunized child, but not the

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TABLE 1. Results of *B. pertussis* antibody tests for two patients

Patient	Level of antibody[a]			
	PT		FHA	
	IgG	IgA	IgG	IgA
Adult male	525.1 (1—40, 9)	14.2 (1—10, 3)	241.7 (1—60, 18)	326.9 (1—15, 10)
Child (11 yr old)	13 (1—40, 14)	1.2 (1—3, 1)	229 (1—50, 15)	48 (1—6, 2)

[a] Results are expressed as units per milliliter of serum; results in parentheses are reference interval units and mean units per milliliter of serum.

reverse (1). The adult had a severe case of the disease and may have transmitted it to another adult, the mother-in-law.

Several interesting bacteriological observations can be made. The Gram stain of the purulent sputum specimen and the patient's symptoms suggested a preliminary diagnosis of *Haemophilus influenzae* pneumonia, but the initial culture grew normal flora. On further investigation, *B. pertussis* was noted on a DFA stain and the organism grew in culture. The sputum specimen was collected during the catarrhal stage of the disease, which facilitated isolation of the organism. After the start of the paroxysmal stage, the number of organisms present decreases and isolation of *B. pertussis* organisms becomes increasingly difficult (7). The recommended specimen for optimal isolation of the organism is obtained from nasopharyngeal secretions.

Serological methods have been used to aid in the diagnosis of *B. pertussis* disease and may be helpful when the DFA stain and culture are negative. Unfortunately, there is no "gold standard" for antibody testing, and interpreting a single set of antibody test results is difficult. It is recommended that IgG and IgA titers to PT and FHA be performed in combination (5). The adult patient's IgG and IgA antibodies to PT and FHA were elevated, as expected in an unvaccinated individual with a primary infection. The child's antibody tests, drawn 3 months postdisease, are more difficult to interpret. There were elevated IgG and IgA antibody titers to FHA but not to PT. Marcon (5) indicated that IgA antibody to FHA appears promising as a diagnostic test for immunized patients who have had a mild infection.

B. pertussis can occur in adults showing classical symptoms of acute pertussis. The apparent vaccination breakthrough in the child indicates that immunization may not prevent infection with *B. pertussis* but can reduce the severity of the infection. Transmission of the organism to close contacts may occur if the patient is not treated.

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