Severe *Bordetella holmesii* Infection in a Previously Healthy Adolescent Confirmed by Gene Sequence Analysis

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We describe an immunocompetent adolescent who presented with exceptionally severe *Bordetella holmesii* infection, including previously undescribed manifestations. Sequelae included a severe restrictive lung defect due to pulmonary fibrosis.

Only 20 cases of disease caused by *Bordetella holmesii*, a recently described gram-negative bacillus [1], have been reported to date [1–5]. We describe an immunocompetent adolescent who presented with exceptionally severe *B. holmesii* infection, including previously undescribed manifestations.

A previously healthy 14-year-old girl presented with a 6-month history of weight loss and exertional dyspnoea, and a 3-day history of worsening breathlessness without cough. There was no significant history of contact with ill individuals, travel, drug use, or sexual activity. The patient was thin and afebrile with hepatosplenomagaly, marked respiratory distress, and a large left pleural effusion confirmed by use of a chest radiograph. Neutrophil count was $1.9 \times 10^9$ cells/L, lymphocyte count, $0.4 \times 10^9$ cells/L, hemoglobin level was 12.6 g/L, and platelet count was $81 \times 10^9$ cells/L. Results of liver function tests were normal, with the exception of low levels of albumin (19 g/L) and total protein (46 g/L). An elevated lipase level (peak, 1034 U/L) suggestive of subclinical pancreatitis persisted (figure 1, top). Echocardiogram showed mitral valve prolapse and moderate mitral regurgitation but no vegetations or pericardial fluid. Histological examination of specimens from open-lung and mediastinal biopsies revealed empyema only.

On day 7 of hospitalization, a gram-negative bacillus, subsequently identified as *B. holmesii* [6], was isolated from cultures of pleural fluid, blood, and lung biopsy specimens. Results of investigations for malignancies and other causes of infection were negative. *Bordetella pertussis* IgA was initially detected by use of EIA at a low level (ratio to standard serum, 1.39), which subsequently became fully positive (ratio, 1.75). This was ascribed to cross-reaction, because *B. holmesii* is closely related to *B. pertussis* [7]. HIV testing was declined, but tests, including a CD4 count, revealed no significant immunodeficiency.

On day 16 of hospitalization, following further deterioration, a second thoracotomy was performed. This revealed a small amount of hemoserous fluid and a "solid" left lung. Spiking fevers continued for 2 weeks, accompanied by persistent respiratory symptoms and splenomegaly. A CT scan of the chest on day 19 showed persistent mediastinal and pericardial fluid. Echocardiography showed a pericardial effusion 8–9 mm in diameter and a thickened pericardium and anterior mitral valve: a diagnosis of endocarditis could not be excluded.

The patient was treated with fluoroaxillin (for 13 days), erythromycin (for 11 days), gentamicin (for 20 days) and cefotaxime (for 6 weeks, for possible endocarditis). Her symptoms resolved 1 month after admission and she started to gain weight, reporting that she felt less breathless than she had for the previous 6 months. Six months after discharge, pulmonary function testing continued to indicate that she had a severe restrictive defect. Findings of a CT scan of the chest were consistent with pulmonary fibrosis (figure 1, bottom). Echocardiography continued to show a pericardial effusion with pericardial thickening.

We determined the 16S rRNA gene sequence (1427 nucleotide positions) of the *B. holmesii* strain (99312960) that was isolated from the patient. We found 3 nucleotide differences between this sequence (deposited in the European Molecular Biology Laboratory Nucleotide Sequence Database [EMBL]; ac-
Figure 1. CT scans of the chest of an adolescent infected with *Bordetella holmesii*. Top, CT scan (with contrast) performed on day 19 of hospitalization shows consolidation of the lung and pericardial effusion (diameter, 1.5 cm). This fluid was in continuation with mediastinal fluid (not shown). Loculated fluid is visible in the left subpulmonic space, and a smaller loculated collection is visible medially, at the left base and surrounding the aorta. Bottom, CT scan of the chest performed 6 months after hospital discharge reveals increased linear and interstitial opacities consistent with pulmonary fibrosis.

Previously reported cases of *B. holmesii* infection have mostly had a relatively acute and uncomplicated course [2–4], and most have been associated with underlying disorders [1–3]. Interstitial and lobar pneumonia with progression to pulmonary fibrosis, pleural effusions, mediastinal collections, pericarditis, hepatosplenomegaly, pancreatitis, lymphopenia, thrombocytopenia, and coagulopathy have not been previously described. This is also the first report of the isolation of this organism from cultures of pleural fluid and lung biopsy specimens. This report documents the most severe and chronic manifestations of *B. holmesii* infection described to date and broadens the clinical spectrum of disease caused by this emerging pathogen.

References