Streptococcus equisimilis Pneumonia in a Compromised Host

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A fatal case of *Streptococcus equisimilis* pneumonia and septicemia is described in a young man with Hodgkin's disease. The disease course consisted of exudative pharyngitis, macular rash, septic shock, disseminated intravascular coagulation, deep vein thrombosis, and pulmonary embolization. *S. equisimilis* was isolated from blood, throat, and sputum cultures antemortem and from lung cultures at autopsy.

Lancefield group C streptococci can sometimes be cultured from the normal human pharynx and are occasionally a cause of childhood or adult pharyngitis (4). Pneumonia caused by group C streptococci is rare in humans, with only a few previously published cases (11, 14, 16, 17). To our knowledge this is the first documented report of pneumonia and septicemia caused by *Streptococcus equisimilis* in a compromised host.

Case report. A 29-year-old male with mixed cellularity Hodgkin's disease was admitted to the hospital with a 1-day history of increasing dyspnea, pleuritic chest pain, and swelling of his left leg. He also complained of 3 days of fever, nonproductive cough, and a new erythematous rash. He had been treated with cyclophosphamide, vincristine, procarbazine, and prednisone for 11 months after the original diagnosis of Hodgkin's disease. This treatment had continued until he developed symptoms of a sixth thoracic vertebral spinal cord compression. He then received 3,200 rads to his thoracic spine and was started on dexamethasone, 6 mg every 6 h. He denied recent exposure to animals.

He was admitted 1 month after the initiation of radiation therapy in moderate respiratory distress. His temperature was 101°F (38.3°C), the pulse rate was 110/min, the respiratory rate was 40/min, and the blood pressure was 64/44 mmHg. Numerous petechiae were present over the lower extremities, and well-circumscribed, blanching, annular macules were seen over his extremities, trunk, palms, and soles. There was a thick white exudate in the oral cavity and nasopharynx. Diffuse coarse rales were present bilaterally, but no local consolidations were found. The left lower extremity was grossly enlarged, warm, and edematous. There was no lymphadenopathy.

The patient's laboratory data revealed a leukocyte count of 3,300, with 19% segmented

neutrophils and 65% band neutrophils, and a platelet count of 40,000. A peripheral smear showed numerous schistocytes. Coagulation test results suggested severe disseminated intravascular coagulation. Arterial blood gases were severely hypoxemic. The chest radiograph revealed alveolar infiltrates in the upper and lower lobes of the left lung.

A ventilation-perfusion scan with ⁹⁹Tc-labeled microspheres and ¹³³Xe revealed a high probability of multiple pulmonary emboli. Impedance plethysmography suggested venous obstruction in the left leg. The patient received intravenous heparin, penicillin, tobramycin, and ticarcillin. He developed progressive pulmonary alveolar infiltrates, severe hypoxemia, and hypercarbia and required mechanical ventilation. He died less than 12 h after hospitalization.

Laboratory evaluation. Four blood cultures and sputum, throat, and lung tissue (obtained at autopsy) cultures all grew a beta-hemolytic streptococcus which was found to belong to group C. Immunological identification to group the streptococcus was done by the capillary precipitin test. Extraction of the group antigen was done with an enzyme mixture of lysozyme and *Streptomyces albus* enzyme. The antiserum used was supplied by Difco Laboratories, Detroit, Mich. The organism fermented glucose, maltose, sucrose, lactose, and trehalose. It did not ferment arabinose, sorbitol, mannitol, raffinose, or inulin. Arginine hydrolysis was positive; esculin hydrolysis was weakly positive, and hippurate hydrolysis was negative. The isolate from blood was fibrinolytic and caused partial lysis of clots formed by the addition of CaCl₂ to normal human plasma. The biochemical test results were consistent with those for *S. equisimilis*. The minimal inhibitory concentration and minimal lethal concentration of ticarcillin were <0.5 µg/ml and <8 µg/ml, respectively, and the minimal inhibitory concentration and

minimal lethal concentration of penicillin were <0.06 and $0.5 \mu\text{g/ml}$, respectively.

The autopsy revealed a massive pulmonary embolus in the right pulmonary artery and thrombophlebitis of the left femoral vein. Hemorrhagic bronchopneumonia and diffuse parenchymal pulmonary edema were evident, as were bilateral pleural effusions. Evidence of disseminated intravascular coagulation was found in many organs. Enlarged lymph nodes were found throughout the abdomen and groin, but no microscopic evidence of Hodgkin's lymphoma was found.

Discussion. Previous cases of group C streptococcal pneumonia have all occurred in presumably normal hosts. Two cases of bacteremia caused by group C streptococci have been reported for patients with acute myelomonocytic leukemia and leukocyte counts of 1,000 or less (13). A case of a child with lymphoblastic leukemia complicated by *S. equisimilis* septicemia has been reported (1). Group C streptococci have been cultured from skin abscesses and wounds in cancer patients with solid tumors (2). Although our patient had over 2,500 leukocytes, he was compromised and at risk for opportunistic infections because of his underlying Hodgkin's lymphoma, his recently completed radiation therapy, and his high doses of suppressive corticosteroids.

Our patient had several features in common with the previously reported cases of group C streptococcal pneumonia. Those all had pleural effusions, and three of the four were bacteremic. They either responded slowly to therapy or died.

Wound infections, skin ulcers, abscesses, and cellulitis, have been recognized as being caused by group C streptococci (2, 10, 11). The multiple erythematous macular lesions seen in our patient had not previously been associated with group C streptococci. No organisms grew in lesion cultures, and the rash may represent the release of a streptococcal product like that responsible for scarlet fever rash.

The four species of group C streptococci, *S. equisimilis*, *S. zooepidemicus*, *S. equi*, and *S. dysgalactiae*, can be differentiated by their biochemical properties. *S. equisimilis*, isolated from our patient, is the only species that produces streptolysin O and streptokinase (8). It is interesting that our patient had chemical and pathological evidence of disseminated intravascular coagulation. The streptokinase of *S. equisimilis* can complex with plasminogen activator to convert plasminogen to plasmin and result in fibrin degradation (12). The commercially available streptokinase used to treat thromboembolic disease is derived from the very same organism found in our patient, yet our patient clearly died from a fatal massive pulmonary embolism.

Besides pharyngitis and pneumonia, *S. equisimilis* has also been reported as being responsible for brain abscesses (9), osteomyelitis (3), puerperal sepsis (11, 15), endocarditis (7), and cellulitis (10, 11). Other group C streptococci cause a myriad of infectious diseases in animals, such as the following: *S. equi*, strangles in horses (5, 6); *S. zooepidemicus*, septicemia in cattle, horses, sheep, foxes, and guinea pigs (5, 13); and *S. dysgalactiae*, mastitis in cows (6). Most recognized human infections are caused by *S. equisimilis*.

It appears that pneumonia caused by this group C streptococcus is a serious illness despite appropriate therapy. Our patient presented several challenging problems, including disseminated intravascular coagulation (DIC) and massive pulmonary embolism. The presence of the severe pneumonia in this compromised host certainly contributed to his rapid death.

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