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Lactobacillus Empyema in a Patient With Schizophrenia

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Abstract

Lactobacillus species are anaerobic gram-positive rods that are part of the normal human flora as well as commercially available probiotic formulations. Although their pathogenicity in the normal host has been the subject of debate, lactobacilli have been associated with serious infections in immunosuppressed patients and those with predisposing risk factors. We report a case of a patient with a history of schizophrenia who presented with an empyema, cultures of which identified *Lactobacillus acidophilus* and *Lactobacillus rhamnosus* as the causative organisms. To our knowledge, this is the first case of *Lactobacillus* parapneumonic pleural space infection reported from the Western Hemisphere.

Keywords

empyema, infection, pleural bacterial infection

Introduction

Lactobacillus spp. are non-spore-forming, gram-positive rods that can be strictly or facultatively anaerobic. They are part of the normal human flora, residing in the mouth, gastrointestinal tract, and female genital tract. Some species of *Lactobacillus* are commonly used in commercially available probiotic formulations and food fermentation. The pathogenicity of lactobacilli is controversial, although reports of bacteremia, endocarditis, and localized infections can be found in the literature. The majority of *Lactobacillus*-associated infections occur in individuals with an immunodeficiency, a compromised mucosal barrier, poor oral hygiene, or predisposition to aspiration.[1] Herein, we describe a case of *Lactobacillus* parapneumonic pleural space infection in an immunocompetent host, the first such case reported from the Western Hemisphere.

Case Report

A 58-year-old man with a history of hypertension, diabetes mellitus, and schizophrenia was brought to the emergency department (ED) from his group home with several days of cough and weakness. On arrival, he was unable to provide further history due to lethargy. His medication list included metformin, lisinopril, clozapine, and citalopram. According to the accompanying records, he had a cigarette smoking history. In the ED, his temperature was 39.3°C, blood pressure 83/57 mHg, pulse 101 beats/min, respirations 20 breaths/min, and an oxygen saturation of 93% while breathing room air. On physical examination, the patient was an obese African American male responsive only to vigorous sternal rub. He was wearing dentures. He had decreased breath sounds over the right chest posteriorly with dullness to percussion. The remainder of the physical examination was unremarkable.

Initial laboratory evaluation revealed a blood leukocyte count of 32.3 K/μL (normal range 4.5-11 K/μL), serum glucose of 290 mg/dL (normal range 74-126 mg/dL), serum lactate dehydrogenase (LDH) of 208 U/L (normal range 90-225 U/L), and serum total protein of 7.7 gm/dL (normal range 6.5-8.5 gm/dL). His arterial lactic acid level was 4.0 mmol/L (normal range 0.5-2.2 mmol/L). Testing for the HIV had been negative on a prior admission 7 years previously and could not be repeated due to lack of capacity to consent. There were no hemoglobin A1c values available. His portable chest radiograph showed extensive pleuroparenchymal opacity in the right hemithorax (Figure 1). Computed tomography (CT) of the chest with administration of intravenous contrast demonstrated a complicated right

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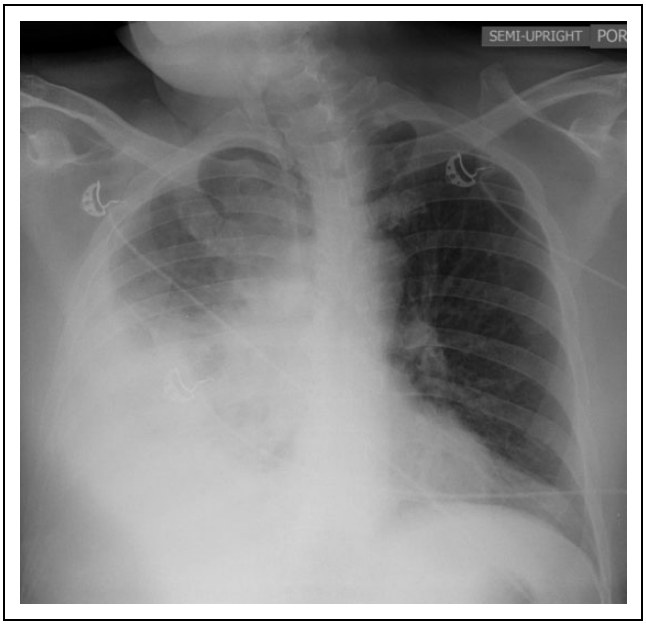

Figure 1. Plain chest radiograph showing a large pleuroparenchymal opacity in the right hemithorax.

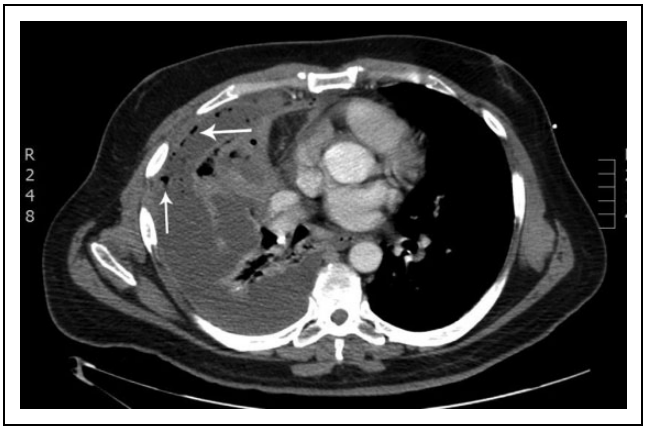

Figure 2. Chest computed tomography (CT) with intravenous contrast showing a loculated pleural effusion with internal pockets of gas (arrows).

pleural effusion with multiple gas locules and associated consolidation (Figure 2). No emphysematous changes were present in the visualized lung parenchyma.

In the ED, the patient received cefepime, vancomycin, and azithromycin. His blood pressure did not improve adequately after the infusion of 4 L of intravenous crystalloid solution, so a central venous catheter was inserted for infusion of norepinephrine. Upon admission to the medical intensive care unit (MICU), a 14F pigtail chest drain was inserted into the pleural effusion, yielding turbid fluid with 89% neutrophils and the following biochemical characteristics: pH 6.62, glucose <10 mg/dL, LDH 1942 U/L, and total protein 5.4 U/L. The Gram stain was negative. Fluid for bacterial culture was sent in both a sterile container and in Bactec

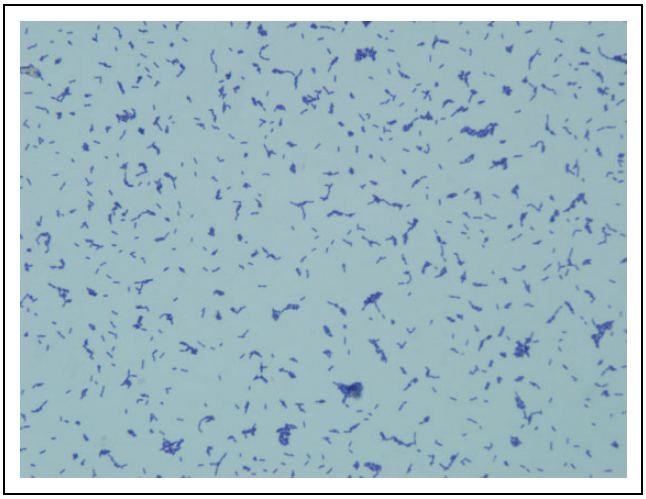

Figure 3. Gram stain of the pleural fluid culture colonies showing innumerable gram-positive bacilli (original ×400 magnification).

(Becton, Dickinson & Co., Sparks, MD) blood culture bottles. Antibiotics were changed to piperacillin/tazobactam and vancomycin. The norepinephrine infusion was titrated off within 24 hours. Over the course of 3 days, a total of 5 doses each of 10 mg of tissue plasminogen activator and 5 mg of dornase alpha were administered intrapleurally via the chest drain. On MICU day #4, pleural fluid bacterial cultures grew gram-positive bacilli in the sterile container and in the anaerobic Bactec bottle (Figure 3). On MICU day #5, the organism was identified as *Lactobacillus* species, eventually confirmed to be *L acidophilus* and *L rhamnosus*, with assistance from the New York State Department of Health bacteriology laboratory. Antibiotics were narrowed to ampicillin/sulbactam. Blood cultures ultimately returned negative. The patient defervesced, and his leukocytosis steadily improved. Nevertheless, repeat chest CT, though showing a decrease in the amount of fluid, revealed a large loculated pleural gas collection (Figure 4). The patient was referred to thoracic surgery for fluid/gas evacuation and lysis of adhesions as well as possible decortication. Upon entry into the pleural space via the video-assisted thoracoscopic approach, the large number of encountered adhesions required conversion to open thoracotomy. A thick, fibrinous pleural peel was found to be coating almost the entire surface of the right lung. This was removed to the extent possible and sent for bacterial culture, which ultimately came back negative. The patient's right lung reexpanded successfully in the operating room. He had an uneventful postoperative course and completed a month of antibiotic therapy.

Discussion

The *Lactobacillus* species are rod-shaped, gram-positive anaerobes routinely found in the human mouth, gastrointestinal tract, and female genital tract. Through fermentation of lactic acid, they are capable of lowering the pH, thereby

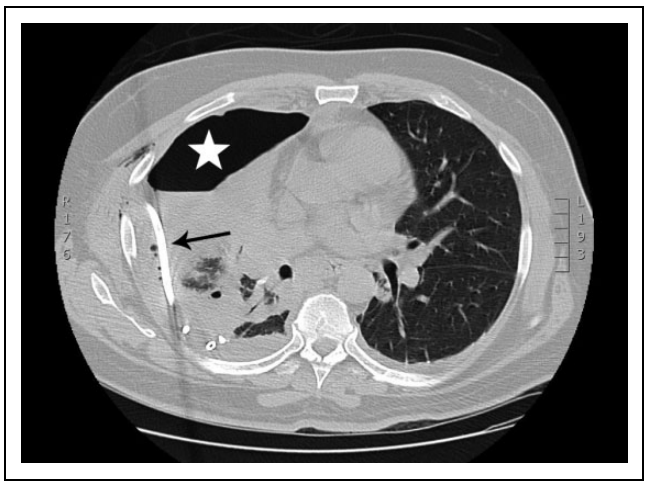

Figure 4. Chest computed tomography (CT) obtained after completion of intrapleural tissue plasminogen activator and dornase alpha administration showing a large pleural gas collection (star). A pigtail drainage catheter is in place (arrow).

preventing colonization by other bacteria. Due to this property, lactobacilli are often part of commercially available probiotic formulations and have a role in the treatment and prophylaxis of certain types of diarrhea. Although their pathogenicity is controversial, lactobacilli have been associated with serious infections in the setting of immunosuppression or predisposing factors, including cancer, diabetes, poor oral hygiene, fistulas, and aspiration.[1,2] On initial Gram staining, lactobacilli are easily confused with *Corynebacterium* species, which can lead to their dismissal as contaminants in the immunocompetent host.[1]

In a retrospective series of 241 cases of *Lactobacillus*-associated infections collected over a 53-year period, 84% manifested as bacteremia or endocarditis.[1] Localized infections were much less common, with pulmonary involvement comprising only 15 (6%) cases of the 241 reviewed. More than 40% of all the localized infections were polymicrobial. The overall mortality rate in this series was 28%, which may simply reflect the severe comorbid illness that generally underlies *Lactobacillus*-associated infections.[1] In another study, Civen et al reviewed 46 patients with an empyema for which complete anaerobic bacteriology had been determined by a research laboratory. Of the 161 isolates obtained from pleural fluid specimens, only 7 (4%) were a *Lactobacillus* species.[3]

Nearly all of the previously published cases of pleural *Lactobacillus* have involved either malignant or iatrogenic fistulization between the gastrointestinal tract and the pleural space.[4] In fact, Shoji et al from Japan have reported the only prior case of parapneumonic pleural space infection attributable to Lactobacilli.[2] In our patient, there was no evidence of interruption of the mucosal barrier, malignancy, or significant immunosuppression. Although a hemoglobin A1c percentage was not available, his elevated serum glucose level on presentation likely represented a stress response, and he was not known to require insulin. There was also no history or radiographic evidence of emphysema, which would have suggested locally compromised immunity in the lung. Our patient was taking antipsychotic medications, however, which have been associated with an increased risk of aspiration by a variety of mechanisms.[5] We hypothesized that his pleural space infection was related to antecedent aspiration pneumonia, to which he was predisposed because of antipsychotic therapy.

Our case adds to mounting evidence that lactobacilli can indeed be pathogenic, particularly in the susceptible host, and ought not to be disregarded as mere contaminants. It reminds the clinician to include this organism on the list of bacterial causes of parapneumonic effusions, especially when confronted with patients who are at increased risk of aspiration such as the mentally ill. It also underscores the importance of effective anaerobic coverage in cases of pleural infection complicating aspiration pneumonia.

Declaration of Conflicting Interests

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