Liver Abscess Due to a *Lactobacillus rhamnosus* Strain Indistinguishable from *L. rhamnosus* Strain GG

Although generally innocuous, *Lactobacillus* species have been isolated infrequently in connection to serious infections such as endocarditis and sepsis [1–3]. We report, to our knowledge, the first case of severe infection due to a *Lactobacillus rhamnosus* strain indistinguishable from *L. rhamnosus* strain GG.

A 74-year-old woman with a several-year history of hypertension and non-insulin-dependent diabetes mellitus was admitted to the hospital because of a 2-week history of mild abdominal discomfort and a few-day history of fever. She had been treated for many years with enalapril maleate (20 mg, once a day), bisoprolol fumarate (10 mg, once a day), and glipizide (5 mg b.i.d.). Her glucose control was moderate; her fasting blood glucose values were from 6.4 mmol/L to 9.4 mmol/L. When admitted to the hospital, she had a fever (temperature, 38.3°C), as well as mild tenderness under the right costal margin and suppressed breath sounds over the lower right lung. The WBC count was 11,000/mm³ with 85% segmented neutrophils, the hemoglobin level was 101 g/L, the C-reactive protein level was 245 mg/L, and the erythrocyte sedimentation rate was elevated to 108 mm/h. A chest radiograph showed an infiltration and a cavity with a fluid level in the lower right lung.

Initially pneumonia with lung abscess was suspected. However, a CT scan of the abdomen showed a 9.6 cm × 6.9 cm abscess in the right hepatic lobe. In addition, right basal pneumonia with pleural fluid was noted. With use of ultrasound guidance, a 10-ML purulent viscous fluid specimen was aspirated from the hepatic abscess and a percutaneous catheter was inserted for drainage. Initially, the patient was treated iv with penicillin G (2,000,000 units q.6.h.) for 3 days, and, thereafter, with iv piperacillin/tazobactam (4.0 g/0.5 g t.i.d.). After initial improvement, the patient’s condition gradually deteriorated: dyspnea worsened, she had fever (temperature, between 37.0°C and 37.8°C), and the C-reactive protein level increased again to a peak value of 168 mg/L. A right-sided pleural empyema was noted. A chest radiograph and chest CT scan showed widespread infiltration of the right lung and an increased amount of pleural fluid. Successful drainage was not achieved by using a percutaneous catheter; therefore, 4 weeks after admission, a thoracotomy with surgical decortication was performed. Histopathologic evaluation of the pleural tissue specimen showed nonspecific pleuritis, and gram-staining and cultures remained negative for bacteria. Therapy with piperacillin/tazobactam was replaced by that with oral ciprofloxacin, 500 mg b.i.d., and oral clindamycin, 600 mg t.i.d. The patient recovered gradually and she was discharged to her home after a 6-week hospitalization. Ultrasonography at discharge was negative for a hepatic cavity and for pleural fluid. Antibiotic therapy was continued for an additional 2 months. About 2 months after discharge from the hospital, the patient’s condition was good and the erythrocyte sedimentation rate had decreased to 41 mm/h.

Direct gram-staining of a hepatic abscess aspirate demonstrated an abundance of polymorphonuclear leukocytes and gram-positive coccobacilli. Within 48 hours, cultures of the aspirate specimen revealed pure colonial growth of a gram-positive, non-spore-forming, non-branching rod-shaped bacterium on normal and sheep blood chocolate agar plates incubated aerobically (5% CO₂), but, in particular, on a fastidious anaerobic agar (FAA) plate incubated anaerobically at 35°C. With use of standard susceptibility testing on blood agar plates performed according to National Committee for Clinical Laboratory Standards (NCCLS) guidelines (disk-diffusion method [Oxoid, Basingstoke, UK] and Etest [AB BIODISK, Solna, Sweden]) the strain was found to be resistant to cephalosporins and vancomycin but susceptible to penicillin, piperacillin, erythromycin, clindamycin, imipenem, and rifampin.

The strain was identified to the species level by use of API 50 CHL (bioMérieux, Marcy l’Etoile, France). Profiles of preformed enzymes were determined by use of API ZYM system (bioMérieux) and Rosco diagnostic tablets (Rosco, Tästrup, Denmark). Finally, the strain was confirmed as *L. rhamnosus* species by use of a PCR assay with species-specific primers [4] and was further analyzed by pulsed-field gel electrophoresis (PFGE).

The fermentation pattern and enzymatic reactions of this isolate were compatible with a probiotic strain *L. rhamnosus* GG used in dairy products in Finland since 1990.

PFGE with three different restriction enzymes (*NotI*, *SfiI*, and *Ascl*) was used to further test the clonal relatedness between the patient isolate and *L. rhamnosus* GG (ATCC 53103). With use of these enzymes, the restriction profiles of the patient’s isolate and *L. rhamnosus* GG were identical and the strains were indistinguishable. Figure 1 shows the results with two enzymes. Other *L. rhamnosus* strains that were studied were distinguishable from the previous group.

All of the pleural-fluid specimens remained negative for bacteria, including *Mycobacterium* species.

The incidence of severe infections caused by lactobacilli is very low. Generally lactobacilli are isolated in connection with immunosuppression or severe underlying disease [2, 3]. In a few cases of liver abscess, lactobacilli including *Lactobacillus acidophilus* have been isolated [5–7]. In a recent review by Saxelin et al. [8], only eight bacteremic infections were recorded among 3,317 blood culture isolates, and none of the strains isolated were similar to strains used in dairy products in Finland. The present patient had had diabetes for several years, a condition which may have led to increased risk for infections. She reported a daily intake of about one-half liter of dairy drinks containing *L. rhamnosus* GG to relieve abdominal discomfort during the 4 months before her symptom onset.

The *L. rhamnosus* isolate from the patient was indistinguishable from the probiotic strain according to the phenotypic and genotypic methods used in typing. However, the heterogeneity of natural populations of intestinal *L. rhamnosus* has not been defined. In an earlier study in Finland [9], an identical strain (confirmed later by
Pneumococcal Pneumonia in Adults Treated at University of Kentucky Medical Center, 1995–1998: Implications of Pathogen Resistance

Kentucky is reported to have a relatively high prevalence of penicillin-resistant Streptococcus pneumoniae in its pediatric population. We reviewed these data and performed an analysis to determine how this prevalence affected the adult population in Kentucky. In this report, we review the demographics and risk factors for pneumonia of our adult patients to determine any associations for disease due to resistant S. pneumoniae.

In 1992, the prevalence of nasopharyngeal carriage of penicillin-resistant S. pneumoniae was 53% (65 of 123 isolates) in children attending a day care center or visiting a county health center in rural western Kentucky. For 41 (63%) of the 65 S. pneumoniae isolates, the MICs of penicillin were ɛ=2 μg/mL, and 61 (50%) of the 123 isolates were multiresistant [1]. From January 1992 to January 1994, S. pneumoniae with penicillin MICs of >0.06 μg/mL were detected in 48 (31%) of 157 pneumococcal middle ear isolates from 246 ambulatory patients living in rural Kentucky. For 23 (15%) of the 157 pneumococcal middle ear isolates, penicillin MICs were ɛ=2 μg/mL [2]. Recently, Mainous et al. [3] reported that 35 (34%) of 104 nasopharyngeal cultures from 104 healthy children who attended one of eight rural central Kentucky day care centers in the spring of 1997 yielded S. pneumoniae. Five (14%) of the 35 isolates were penicillin resistant and 14 (40%) were of indeterminate susceptibility to penicillin. In addition, 9 isolates (26%) were resistant to erythromycin, 14 (40%) were resistant to trimethoprim-sulfamethoxazole (TMP-SMZ), and 3 (9%) were resistant to cefotaxime [3].

To study our adult population, a case-controlled retrospective chart review study was completed. All cases of lung infection due to infections caused by lactobacilli in general and carefully type and compare the isolates on a molecular level to known probiotic strains of fermented foods.

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