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Lacticaseibacillus rhamnosus Infection in a Liver Transplant Patient: A Case Report

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Abstract

Lacticaseibacillus spp., are Gram-positive bacteria found in human mucosa and various fermented foods. *L. rhamnosus*, has been recognized for its beneficial effects on gut and vaginal microflora, though it can act as an opportunistic pathogen in immunocompromised individuals. We present the first case of *L. rhamnosus* pleural empyema and intraabdominal infection in a post liver transplant patient and review of literature. The isolate from peritoneal and pleural fluids was fully resistant to commonly used antibiotics in post-transplant setting. It was only susceptible to metronidazole. Most infections in literature are reported in patients with chronic illnesses and are associated with high mortality. In conclusion although *L. rhamnosus* is an opportunistic pathogen, but this and other reported cases emphasizes the necessity for increased awareness of it as a potential pathogen and its resistance in immunocompromised patients. For better outcome it is important to start customized early antimicrobial therapy with effective source control.

Keywords: *Lacticaseibacillus rhamnosus* • Liver transplant • Liver • Immunocompromised

Introduction

Historically, *Lactobacillus* was first described in 1901; however, advancements in genetic sequencing methods have since uncovered new species. This prompted the International Journal of Systematic and Evolutionary Microbiology (IJSEM) to release new classifications and novel genera in April 2020. *L. rhamnosus* was renamed from *L. rhamnosus*, with lacti and casei meaning derived from milk and cheese Zheng J, et al. [1]. *Lacticaseibacillus* spp. have shown very low pathogenicity and beneficial effects on gut and vaginal microflora, such as preventing diarrhoea of varying etiology and vaginal candidiasis Mikucka A, et al. [2]. However, there have been an increasing number of reports on the isolation of *Lacticaseibacillus* spp., commonly *Lacticaseibacillus casei* and *L. rhamnosus*, in patients with bacteraemia and endocarditis. Some reported cases show organ or space infections due to *Lacticaseibacillus* spp, such as pneumonia, intra-abdominal infections, peritonitis, chorioamnionitis, and abscesses Mikucka A, et al. [2]; Salminen MK, et al. [3]. Less frequently, these bacteria have also been isolated in cases of pyelonephritis, endophthalmitis, liver disease, infected wounds, leukemia, transplantation, and vascular grafts Mikucka A, et al. [2]. Here, we describe the first case of *L. rhamnosus* infection in a Liver Transplant Recipient (LTR) and review of the literature.

Case Presentation

A 65-year-old man was electively admitted in January 2024 for are-do Liver Transplant (LTX) due to portal vein thrombosis and graft failure. His first transplant was performed in 2021 for hepatocellular carcinoma secondary to non-alcoholic steatohepatitis. Post re-do LTX, he experienced primary non-function graft and was super urgently re-listed, undergoing LTX surgery after 24 hours of anhepatic period. Following the transplant, he received broad-spectrum antibiotics piperacillin-tazobactam, vancomycin, and the antifungal anidulafungin, according to local protocol. On day 7, his antibiotic regimen was escalated to meropenem due to worsening inflammatory markers (Figure 1). His White Blood Cells (WBC) were rising, and he had elevated Procalcitonin (PCT) levels. His abdominal drains were removed 15 days post-op. On day 17 post-op, CT scan of the abdomen and pelvis was done because of abdominal distension and tenderness. There was significant collection in the right subhepatic and pelvic regions (Figure 2A), suggesting a possible colonic perforation. The patient underwent an emergency laparotomy with washout, primary repair of the colonic perforation, and defunctioning loop ileostomy. Cultures from abdominal wall tissue and peritoneal fluid grew *L. rhamnosus despite being on meropenem*. This isolate was only susceptible to metronidazole and resistant to other antibiotics tested. Metronidazole was added to the regimen on day 20. As his condition did not improve, a CT thorax, abdomen, and pelvis was repeated on day 44, showing less peritoneal collection than previous imaging but had large bilateral pleural effusions (Figures 2B and 2C). Pleural drainage was performed twice, on day 82 and day 99, with turbid and caramel-colored fluid drained both times.

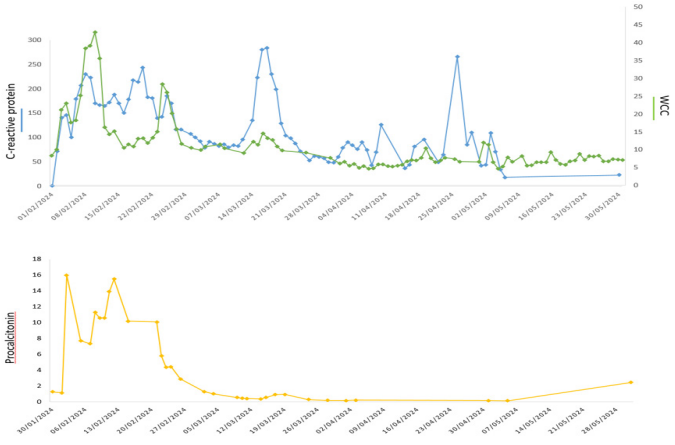

Figure 1. Rising inflammatory markers post-transplant period.

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These pleural fluid cultures were positive for *L. rhamnosus* despite 60 days of metronidazole and meropenem treatment. On day 119 patient underwent right thoracotomy and decortication for the empyema. He received a total of 4 months of meropenem and metronidazole. The patient recovered from the described infection postoperatively but remained an inpatient for further management of his post LTX associated complications. The time line of infections and treatment are shown in in Figure 3.

Results and Discussion

The pathogenesis of *Lacticaseibacillus* infection could be attributed to systemic dissemination or translocation sequealae following disturbances of the mucosa Sendil S, et al. [4]. In our patient infection was precipitated by colonic perforation post multiple abdominal surgeries. *L. rhamnosus* intarabdominal infection in our patient continued to progress to pleural empyema while on antibiotic for >3 months. The empyema was likely due to continuity with the intra-abdominal fluid. However after drainage of the empyema, repeat intra-abdominal wash out and continuation of long term antibiotics the infection resolved. Although this organism is of low pathogenicity, *L. rhamnosus* has been reported in most case series, as a significant cause of bacteraemia in both immunocompetent and immunocompromised patients (Table 1) suggesting that this bacteria has greater pathogenic potential than initially thought [5]. Likely Due to its resistance pattern to commonly used antibiotics Falci DR, et al. [6]. Interestingly, Albarillo FS, et al. [5] reported a case series of 47 patients that isolated *L. rhamnosus* from different samples, including blood cultures, wounds, urine, abdominal abscesses, and respiratory samples. Out of these, 35 patients were treated for the infection [5]. In most reported cases, patients had underlying chronic illnesses or were immunocompromised and the mortality as high as >55% Albarillo FS, et al. [5]. The likely mortality was due to infection in critically ill patients with significant comorbidities, polymicrobial infections, and use of antibiotic therapies to which *L. rhamnosus* is intrinsically resistant [5].

Microbiologically, it is challenging isolating and performing antimicrobial susceptibility for *L. rhamnosus* because of their low significance and special growth requirements [7]. Standardized antimicrobial panels may not always be available or interpreted. The Clinical Laboratory Standards

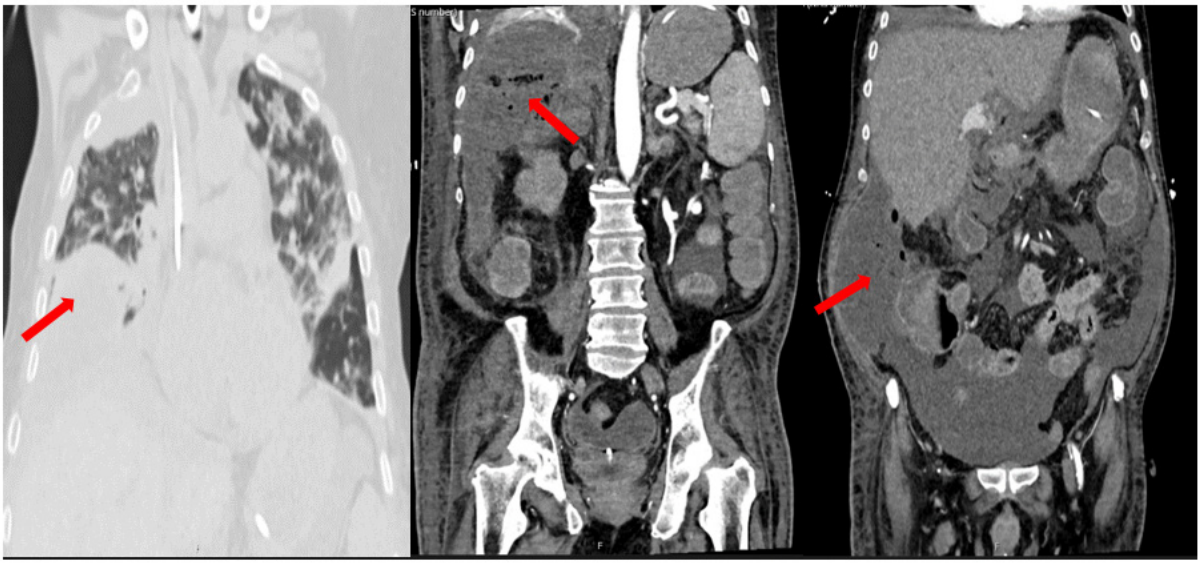

Figure 2. A) Large bilateral pleural effusions, worse on the right where there are also gas locules and pleural enhancement, **B and C)** There is a large gas-containing right subphrenic collection extending to the hepatorenal space, subhepatic space and anterior abdomen.

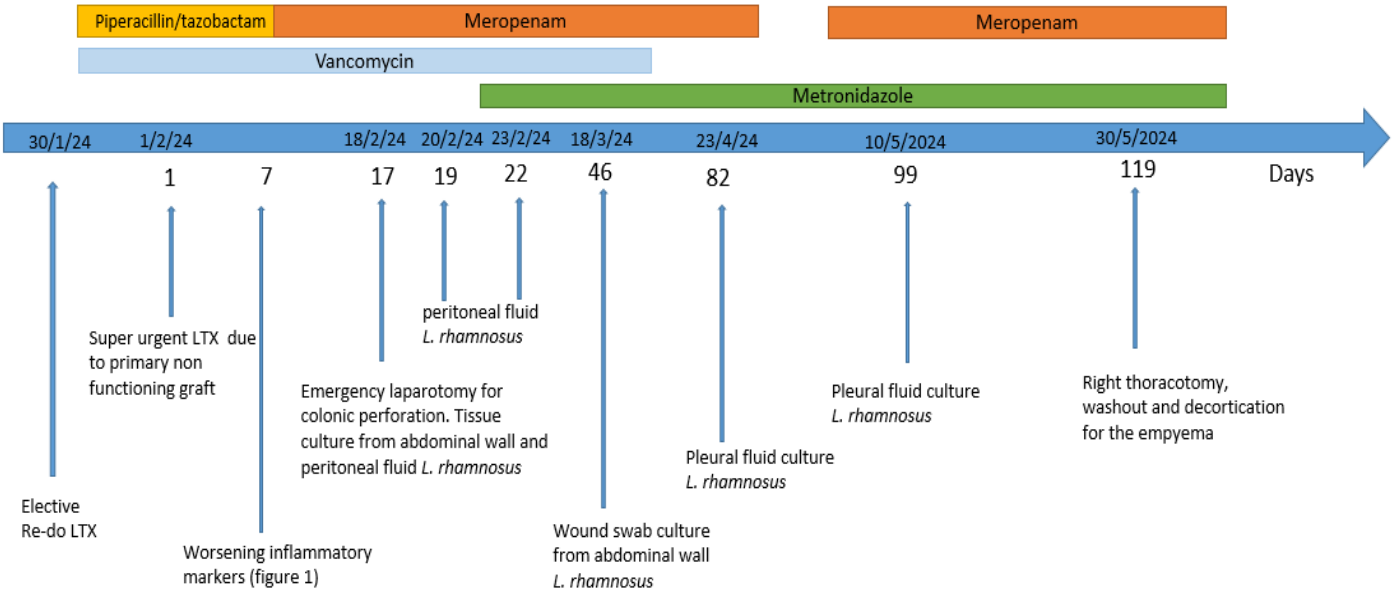

Figure 3. Timeline of infections and treatment.

Table 1. Findings of reviewed source.

Author (Year)	Gender	Age	Site of Infection	Underlying Condition	Treatment & Duration	Outcome
Eze UJ, et al. [8]	Male	79	Bacteraemia	Parkinson's disease, stage III chronic kidney disease, Type II Diabetes Mellitus, hypertension, chronic anaemia, atrial fibrillation, pacemaker placement and bioprosthetic aortic valve replacement	Ampicillin-sulbactam and Vancomycin	Death
Kell, et al.	Male	76	Bacteraemia, perisplenic fluid	Coronary artery disease, intracerebral haemorrhage, peripheral vascular disease, hypertension, type II diabetes mellitus, congestive heart failure and pacemaker.	Piperacillin/tazobactam 1-2 months	Successfully treated
Rubin IMC, et al. [9]	Male	56	Bacteraemia	Immunocompetent, consumed commercial probiotic presented with multi-trauma	No treatment, probiotic discontinued	Successfully treated
Karime C, et al. [10]	Male	60	Bacteraemia	Bio prosthetic aortic valve replacement, ulcerative colitis treated with balsalazide and probiotics containing six *Lactabacilli* strains including *L. rhamnosus)*	Ampicillin 14 days	Successfully treated
Mikucka A, et al. [2]	Male	83	Bacteraemia	Acute respiratory failure and haemorrhagic shock due to polytrauma	Amoxicillin-clavulanate 10 days	Death
Mikucka A, et al. [2]	Female	74	Bacteraemia	Acute respiratory failure after mitral valve replacement, tricuspid valve annuloplasty and coronary artery bypass grafting	Ampicillin , not stated	Successfully treated
Aydogan S, et al. [11]	NA	Infant	Bacteraemia	Aortic coarctation	Ampicillin	Successfully treated
Lilitwat W, et al. [12]	Male	14	Lung abscess	Cerebral palsy, epilepsy, asthma	IV Ampicilin-sulbactam then oral amoxicillin-clavulanic acid 4 weeks	Successfully treated
Falci DR, et al. [6]	Female	43	Bacteraemia	Kidney transplant recipient	Ampicillin 21 days	Successfully treated
Albarillo FS, et al. [5]	47 patients		Intrabdominal infection, bacteraemia, mediastinitis, others (empyema, septic arthritis, pneumonia, vascular graft and mandibular abscess)	GI disruptions/GI related procedures, Malignancy, Cardiovascular disease, immunosuppression, biliary disease, diabetes mellitus, renal disease, prior antibiotic exposure	Vancomycin, Metronidazole, carbapenems, piperacillin/ tazobactam, cephalosporins, Others (daptomycin, linezolid, clindamycin, trimethoprim-sulfamethoxazole, amoxicillin-clavulanate, aztreonam, fluoroquinolones, and ampicillin-sulbactam) Mean duration of antibiotics: 3.7 ± 2.2 weeks)	57.1% Clinical improvement; 56.2% mortality

Institute (CLSI) M45 Ed3 guidelines for *Lactobacillus* spp. suggest testing for ampicillin, penicillin, imipenem, meropenem, vancomycin, daptomycin, erythromycin, Clindamycin, And Linezolid, whilst, the European Committee on Antimicrobial Susceptibility Testing (EUCAST) recommends testing for ampicillin, gentamicin, streptomycin, and tetracycline. When it comes to the susceptibility pattern of *Lactocaseibacillus* species it can vary. For instance, penicillin and ampicillin are typically effective against *L. rhamnosus*, although resistance has been documented [3]. *L. rhamnosus* is intrinsically resistant to vancomycin, and resistance to ciprofloxacin, tetracycline, meropenem, metronidazole, and sulfonamides has been observed in some strains [4]. Despite known metronidazole resistance in some cases, in our case the organism was susceptible to metronidazole, and the patient responded positively when metronidazole was included in the treatment regimen. Treatment duration for *Lactocaseibacillus* infections is highly variable and depends on the patient's response and any underlying conditions. A study of 85 cases found that treatment durations can range from several days to weeks [3]. In our case, the infection disseminated despite the use of appropriate antibiotics, underscoring the critical need for source control in managing anaerobic infections. This case highlights several key considerations for treating invasive or severe *Lactocaseibacillus* infections, particularly in immunocompromised patients:

Tailored antimicrobial therapy

Due to the variability in resistance patterns, it is essential to base antimicrobial therapy on the specific susceptibility profile of the isolated strain.

Source control

Addressing the source of the infection is crucial, as antibiotics alone may not be sufficient to control the infection without effective source management.

Treatment duration

The duration of treatment should be individualized based on the patient's response and underlying conditions, which can range from several days to weeks.

Despite *L. rhamnosus* being generally of low virulence and pathogenicity, our case demonstrates that infections can disseminate and become severe, particularly in immunocompromised or transplant patients. Therefore, when *Lactocaseibacillus* is isolated in a clinical sample, it is important for clinical microbiologists and treating physicians to maintain a high index of suspicion for potential infection and to carefully consider appropriate treatment and source control measures [8-14].

Conclusion

In conclusion although *L. rhamnosus* is an opportunistic pathogen, but this and other reported cases emphasizes the necessity for increased awareness of it as a potential pathogen and its resistance in immunocompromised patients. For better outcome it is important to start customized early antimicrobial therapy with effective source control.

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Author Contributions

AAH, AV: drafting the initial manuscript and revising it critically for important intellectual content; AAH,AV,BM, FT: Reviewed and edited the draft. All authors approved the final manuscript.

Ethical Consideration

Not applicable.

Conflict of Interest Statement

The authors declare no conflict of interest.

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