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# *Rhodotorula mucilaginosa* Bloodstream Infection in a Case of Duodenal Perforation

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## Abstract

**Introduction:** *Rhodotorula* species are widespread in nature and can be isolated from a variety of sources, including air, soil, seawater, plants, and the household environment. They are also widely distributed in hospitals, and their presence could be considered a risk factor for hospitalized patients. These commensal yeasts have emerged as a cause of life-threatening fungemia in patients with depressed immune systems.

**Case Presentation:** We report a case of duodenal perforation with peritonitis in a 36-year-old female who was scheduled immediately for exploratory laparotomy followed by closure of perforation and omentopexy. The peritoneal fluid was sent to the microbiology laboratory for routine investigations. On the 4$^{th}$ postoperative day, the patient had a fever that did not subside with antipyretics; hence, blood cultures were sent the next day. The peritoneal fluid and blood culture reports both yielded *Rhodotorula mucilaginosa* after 3 days of incubation. The patient was started on IV amphotericin B therapy, which resulted in a favorable outcome.

**Conclusions:** In humans, *Rhodotorula* species have been recovered as commensal organisms from the nails, the skin, and the respiratory, gastrointestinal (GI), and urinary tracts. Due to their presence in the GI flora, broad-spectrum antibiotics could contribute to their overgrowth in the GI tract. Localized infections, such as peritonitis, due to *Rhodotorula* species following infected peritoneal dialysis catheters have been reported in the literature. However, in our case, it seems possible that the fungus might have entered the bloodstream through disruption of the GI mucosa, and to prove this, further study is mandatory. It should also be noted that both amphotericin B and flucytosine have good activity against *Rhodotorula* in vitro, whereas fluconazole is inactive.

*Keywords:* Fungemia, Duodenal Perforation, Peritonitis, *Rhodotorula mucilaginosa*

## 1. Introduction

In the last two decades, *Rhodotorula* species, which are ubiquitous yeasts, have been emerging as human pathogens in immunocompromised hosts. In recent studies, the incidence of reported *Rhodotorula* fungemia was between 0.5% and 2.3% in the United States and Europe (1). The risk factors associated with the development of disseminated *Rhodotorula* infections are prolonged use of central venous catheters, solid organ neoplasms in patients receiving corticosteroids and cytotoxic drugs, abdominal surgery, and the administration of broad-spectrum antibiotics (1, 2). Most cases have been associated with central venous catheters (1, 3). Localized infections caused by *Rhodotorula*, such as meningitis, keratomycosis, endophthalmitis, peritonitis, and prosthetic joint infections, are not necessarily linked to the use of central venous catheters or immunosuppression (1, 4, 5). Peritonitis caused by *Rhodotorula* species have been reported in patients undergoing continuous ambulatory peritoneal dialysis (1). Breakthrough fungemia have been reported in patients receiving fluconazole and caspofungin, because of the intrinsic resistance of *Rhodotorula* species to these antifungal drugs (6, 7).

Amphotericin B and flucytosine have good activity against *Rhodotorula* in vitro, whereas fluconazole is inactive (4). A few studies have reported that newer broad-spectrum azoles, particularly ravuconazole, show excellent in vitro activity, which might have a role in the treatment of life-threatening *Rhodotorula* infections (2, 8).

## 2. Case Presentation

A 36-year-old female with a chief complaint of pain in the lower abdomen for two days, mainly below and around the umbilicus, was admitted to Krishna hospital, Karad, Maharashtra. The pain was dull and diffuse in nature, with

three episodes of vomiting and retention of urine. There was no history of fever or altered bowel habits. The patient was not on any immunosuppressant drug therapy. There was no significant history of any medical illness in the past or of comorbidities, such as diabetes, hypertension, ischemic heart disease, or tuberculosis. The patient had a history of taking irregular doses of antibiotics for abdominal pain for the last month. On general examination, the patient had an average build and no pallor, with a pulse rate of 122/min, blood pressure of 100/60 mmHg, and respiratory rate of 16/min. Other vital parameters were within normal limits. On abdominal examination, there was tenderness and guarding. Other systemic examinations were unremarkable. Blood investigations were as follows: hemoglobin of 14.5 gram%, total white blood cell count of 3,700 $mm^3$ (borderline leukopenia), platelet count of 1.65 lacs/$mm^3$, blood glucose level (random) of 112 mg/dL, blood urea level of 34 mg/dL, serum creatinine of 1.3 mg/dL, $Na^+$ of 130 meq/L, $K^+$ of 5.0 meq/L, and serum amylase of 450 IU/l. Tests for HIV, HBsAg, and HCV were nonreactive.

The patient was admitted to the surgical ICU with a diagnosis of duodenal perforation with peritonitis, and she underwent surgery the next day. Exploratory laparotomy was performed under general anesthesia, with closure of the duodenal perforation with omentopexy. The peritoneal fluid was sent to the microbiology laboratory for routine investigations. Gram staining of the specimen revealed inflammatory cells with Gram-positive budding yeast cells. The bacterial culture was sterile. On Sabouraud dextrose agar, confluent growth of *Rhodotorula* mucilaginosa was observed after 3 days of incubation. On the $4^{th}$ postoperative day, the patient had a high-grade fever without chills, which did not subside with antipyretics. The operative site was healthy and showed no signs of infection. Taking into consideration the culture report for the peritoneal fluid, blood was immediately collected in biphasic medium containing brain-heart infusion agar with broth for culture. The IV catheter was removed and also sent for culture.

### 2.1. Laboratory Findings

The specimens were subjected to bacteriological and mycological examinations. The IV catheter was sterile for both bacterial and fungal cultures. The blood culture showed growth of glistening, creamy, mucoid colonies with distinctive orange-red pigmentation after 3 days of incubation (Figure 1). The fungal isolate was identified as *Rhodotorula mucilaginosa* based on the production of mucoid colonies with carotenoid pigment; multilateral budding yeast cells; assimilation of glucose, sucrose, maltose, trehalose, D-xylose, and raffinose; production of urease; and inability to assimilate inositol or to ferment sugars. The isolate was sent to PGIMER, Chandigarh, for confirmation of the species. Antifungal susceptibility testing was carried out on both of the isolates with the broth microdilution method, according to the Clinical and Laboratory Standards Institute (CLSI) M27-A3 guidelines (9). The minimum inhibitory concentration (MIC) was very high for fluconazole (MIC90, 64 $\mu$g/mL), intermediate for flucytosine (MIC90, 8 $\mu$g/mL), and low for voriconazole (MIC90, 0.125 $\mu$g/mL). Amphotericin B showed the lowest MIC (MIC90, 0.25 $\mu$g/ mL) after 48 hours of incubation.

**Figure 1.** Biphasic Medium Showing Growth of Smooth, Glistening, Orange-Red-Pigmented Mucoid Colonies of *Rhodotorula mucilaginosa*

After the blood culture reports were positive for *Rhodotorula*, therapy with IV amphotericin B at a dose of 1 mg/kg/day was immediately initiated, without waiting for antifungal susceptibility reports. The patient responded well to the therapy, and her fever subsided within 3 - 4 days. A repeat blood culture was sterile. The antifungal therapy was stopped and the patient was discharged.

## 3. Discussion

*Rhodotorula fungemia* should be considered an emerging infection in hospitalized patients with depressed immune systems. In the present report, abdominal surgery in a patient with infected peritonitis is the factor that can be associated with the development of *Rhodotorula fungemia*. Spiliopoulou et al. (10) reported a similar type of situa-

tion in a patient who had undergone consecutive abdominal surgeries while receiving fluconazole prophylaxis. Fluconazole is known to cause breakthrough *Rhodotorula fungemia*; however, in our case, no such prophylaxis was given (2). The administration of broad-spectrum antibiotics has been consistently reported in patients who developed *Rhodotorula fungemia* (2). Thus, in our case, intermittent antibiotic therapy and borderline leukopenia, which predispose patients to fungal infections, might have led to overgrowth of this commensal flora in the GI tract, leading to infection of the peritoneal fluid. Unlike in other studies, the peritonitis due to *Rhodotorula* species was not due to continuous ambulatory peritoneal dialysis in our case (1).

The major risk factor for *Rhodotorula fungemia* is prolonged use of indwelling IV catheters in patients with underlying chronic disease (2, 11). However, our patient's indwelling IV catheter did not grow *Rhodotorula* species on culture, so the possibility that the fungus could have entered the bloodstream through disruption of the GI mucosa cannot be denied. Although this yeast can survive in the extreme conditions of the GI tract, it is still unclear whether it has the potential to transfer from the GI tract to the bloodstream (1).

*Rhodotorula* species have shown in vitro resistance to azoles and echinocandins (10, 11). *Rhodotorula* bloodstream infections can be successfully treated with amphotericin B, as in our case, and a few studies have reported management with line removal alone, antifungals without line removal, and a combination of both (3, 8, 11).

In conclusion, peritonitis due to *Rhodotorula* species was the only identified source leading to a *Rhodotorula* bloodstream infection in the reported case. Additional investigations to study this species' survival and growth on the skin and in the GI tract would lead to a better understanding of the epidemiology of this rare fungus.

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## Footnotes

**Authors' Contribution:** Vijaya Rajmane developed the original idea and protocol, performed laboratory work, and drafted the manuscript; Shivkumar Rajmane contributed to the administrative support; Ashok Kshirsagar provided details about the case; and Virendra Patil revised the manuscript.

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