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# BAKER'S YEAST MIGHT NOT ALWAYS BE GOOD FOR EVERYONE – A CASE OF PERCUTANEOUS GASTROSTOMY TUBE INDUCED *SACCHAROMYCES CEREVISIAE* PERITONITIS IN AN IMMUNOCOMPROMISED PATIENT

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## ABSTRACT

Peritonitis, the inflammation of the protective membrane surrounding parts of the abdominal organs, is a common clinical pathology with multifactorial aetiologies. While bacterial infections are well-recognised as a cause of peritonitis, fungal infections remain relatively uncommon especially *Saccharomyces cerevisiae*, which is commonly used for breadmaking and as a nutritional supplement. This fungus has been reported to induce peritonitis in patients on peritoneal dialysis. However, it has never been reported as secondary to percutaneous endoscopic gastrostomy (PEG) tube insertion in immunocompromised patients. We present a 64-year-old female with a history of human immunodeficiency virus (HIV) who developed *S. cerevisiae* peritonitis following PEG tube insertion. The case highlights the importance of considering rare organisms when treating immunocompromised patients with peritonitis, especially after gastrointestinal tract penetration or peritoneal membrane disruption.

## KEYWORDS

Percutaneous gastrostomy tube, *Saccharomyces cerevisiae*, peritonitis, HIV

## LEARNING POINTS

- Fungal infection can be a cause of peritonitis especially in an immunocompromised patient.
- *Saccharomyces cerevisiae* can be a pathological organism and induce serious infections.
- Early recognition of the cause of peritonitis and controlling the source is critical to prevent complications.

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## INTRODUCTION

The peritoneum is a significant membrane of squamous cells covered by microvilli, and it consists of two layers – the parietal and visceral peritoneum. While the parietal peritoneum lines the inner walls of the peritoneal cavity, the visceral peritoneum covers the surface of numerous intra-abdominal organs. Inflammation of the peritoneal layers is called peritonitis, which can be classified into primary or secondary. Primary peritonitis is characterised by inflammation of the peritoneum with no previous intra-abdominal pathology. However, secondary peritonitis, which is associated with pre-existing abdominal pathology, is much more common[1].

Secondary peritonitis has a variety of underlying causes and can be infectious or non-infectious. Common causes of infectious peritonitis include trauma and spillage of infected material from the intestinal tract or urogenital tract, or after contamination during surgical procedures. Although bacteria are the most predominant organisms in infectious peritonitis, fungal infection should be considered a critical differential diagnosis especially in immunocompromised patients, as early recognition and treatment can change the prognosis. Different fungi were reported in the literature to cause peritonitis *S. cerevisiae*, also referred to as baker's yeast or brewer's yeast, which is considered a healthy fungus that is frequently used for baking bread and fermenting alcohol, is also reported to induce peritonitis, mainly in patients on peritoneal dialysis. We present a report of a patient with *S. cerevisiae* peritonitis one month after insertion of the PEG tube, and a comprehensive review of *S. cerevisiae* infections[1,2].

## CASE DESCRIPTION

A 64-year-old female with a past medical history of coronary artery disease, congestive heart failure, left ventricular thrombus, cerebrovascular accident, HIV on doravirine and dolutegravir, and pre-diabetes presented to the emergency department from the rehabilitation centre. Her chief complaint was an altered mental state and respiratory distress. Of note, she was admitted twice in the three months before this presentation for ST-elevation myocardial infarction, followed by an acute exacerbation of congestive heart failure (ejection fraction of 10%–15%). She also had a PEG tube placement during the last admission one month earlier, due to low caloric intake. She has smoked one pack per day for 47 years and smokes crack cocaine (four bottles per day). She denied any alcohol abuse. Her medications include rivaroxaban, metoprolol succinate, losartan, aspirin, clopidogrel, darunavir/dolutegravir and albuterol/fluticasone/umeclidinium bromide inhalers. Family and surgical history are unremarkable.

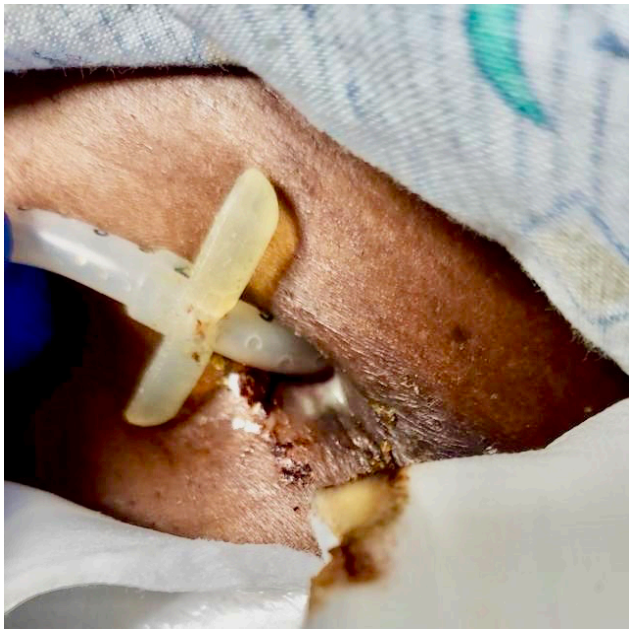

*Figure 1. PEG tube site indurated with erythema.*

On admission, she was hypotensive (58/34 mm of mercury), tachypnoeic (respiratory rate of 26), and saturating 97% on a 2-litre nasal cannula. Her heart rate was normal as she was on beta blocker. She was febrile with a Tmax of 38 °C. On examination, she was awake and alert but not oriented. The cardiovascular examination was remarkable for S3, but normal S1 and S2, and the respiratory examination revealed bilateral crackles. She has +2 bilateral pitting oedema. An abdomen examination revealed a tender abdomen with

| Detail | At the time of PEG tube insertion | At the time of admission | Normal Range |
|---|---|---|---|
| WBC | 6.8 x $10^3$/µl | 14.3 x $10^3$/µl | 4-10 x $10^3$/µl |
| Hgb | 11.5 gm/dl | 9.5 gm/dl | 12-15 gm/dl |
| Platelet | 196 x $10^3$/µl | 475 x $10^3$/µl | 150-410 x $10^3$/µl |
| BUN | 18 mg/dl | 48 mg/dl | 6-24 mg/dl |
| Creatinine | 0.5 mg/dl | 0.7 mg/dl | 0.5-1 mg/dl |
| Albumin | 3 g/dl | 2.5 g/dl | 3.6-5.1 g/dl |
| CRP | 1.2 mg/dl | 6.2 mg/dl | 0-0.8 mg/dl |
| Procalcitonin | 0.29 ng/ml | 3.88 ng/ml | 0-0.5 ng/ml |

Abbreviations - **WBC**, white blood cells; **Hgb**, haemoglobin; **BUN**, blood urea nitrogen; **CRP**, C-reactive protein

*Table 1. Blood test results at the time of PEG tube placement and on admission.*

foul-smelling fluid leaking from the PEG tube site. The PEG tube site was indurated with erythema, and the bumper was lightly attached to the skin *(Fig. 1)*.

Chest X-ray showed pulmonary vascular congestion with mild bilateral pleural effusion. A CT scan of the abdomen with oral contrast showed moderate ascites with extensive mesenteric and omental fat stranding, and she was admitted to the medical intensive care unit for septic shock secondary to peritonitis. As shown in *Table 1*, laboratory tests were significant for leukocytosis and elevated inflammatory markers. Liver function tests were normal. HIV-1 RNA by polymerase chain reaction test was undetectable with an absolute CD4 cell count of 93. The Fungitell® test value was 404 pg/ml (negative result if value less than 60 pg/ml). The patient was started on supportive measures; paracentesis was performed, and 1800 ml of cloudy ascitic fluid was removed.

Culture of the ascitic fluid grew *S. cerevisiae* and *Escherichia coli*. The PEG tube was removed, and the patient was started on piperacillin/tazobactam followed by ceftriaxone since *E. coli* was sensitive to ceftriaxone. She was also started on micafungin after fungal culture grew *S. cerevisiae*. Due to persistent leakage from the old PEG tube site, a Steris Padlock Clip® was applied endoscopically *(Fig. 2)*. The fever resolved after a few days of antimicrobial treatment, and inflammatory markers were trending down with the Fungitell® test. The patient passed away during hospitalisation due to acute coronary syndrome on top of her underlying comorbidities.

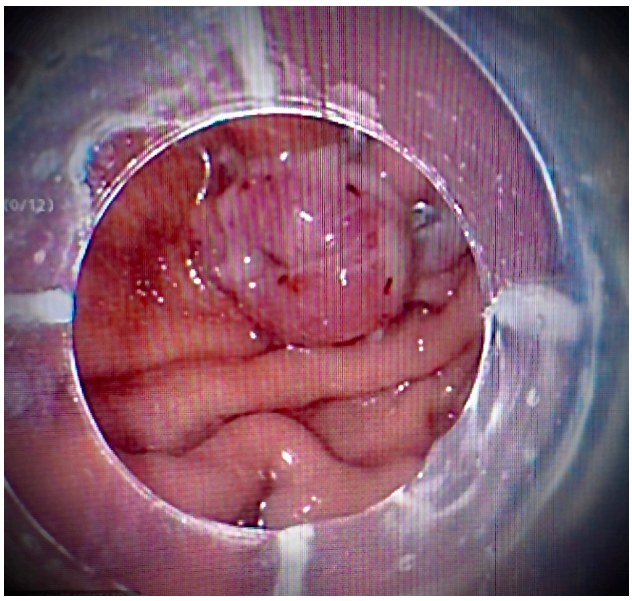

*Figure 2. Steris Padlock Clip® was applied endoscopically to close the PEG tube site.*

## DISCUSSION

Also known as baker's yeast or brewer's yeast, *S. cerevisiae* is a strain of yeast commonly used for breadmaking and alcoholic fermentation, recently gaining attention as a nutritional supplement by health enthusiasts. Due to its simple eukaryote nature and its many similarities with human chromosomes, *S. cerevisiae* is considered a model organism[2]. Thus, it can effectively mimic the biochemical and biological mechanisms of diseases found in humans. *S. cerevisiae*'s properties have been commonly utilised as a prophylaxis against gastrointestinal conditions, including antibiotic-associated diarrhoea, ulcerative colitis, and clostridium difficile infection (CDI)[3]. Its presence within the human body naturally decreases the likelihood that the yeast manifests as a pathology or infection; the yeast is typically considered non-pathogenic[4].

Mechanisms by which *S. cerevisiae* infection can occur are either translocation from the gastrointestinal (GI) tract or breaches in the skin barrier, primarily in the setting of indwelling intravascular devices. Clinical reports concerning *S. cerevisiae* infections have highlighted GI-derived saccharomycopsis following consumption of the yeast in significant doses (e.g. $10^7$–$10^{10}$ yeast cells/day) from foods or probiotics used for treatment or prophylaxis of diarrhoeal disease, in immunocompetent as well as immunosuppressed patients[5]. However, invasive *S. cerevisiae* disease after abdominal surgery was also reported in the absence of probiotics consumption[6,7], likely convincing its role as a coloniser.

An *in vitro* epithelial barrier model by Perez-Torrado et al.[8] revealed that *S. cerevisiae* has a low ability for epithelial adherence and restricted capacity to induce epithelial cytotoxicity or disrupt intestinal barrier integrity. Therefore, it requires both intestinal barrier dysfunction and a large enteral fungal burden to cause systemic infection[8]. In this immunosuppressed patient (HIV with acquired immunodeficiency syndrome) colonised by *S. cerevisiae*, the PEG tube insertion disrupts the intestinal barrier and leads to peritonitis. The culture of the ascitic fluid grew *E. coli*, which can be the cause of the peritonitis. However, a positive *S. cerevisiae* culture, in view of an elevated Fungitell® test value that trended down with treatment with antifungal, raised the suspicion of fungal peritonitis.

In the literature, there are published cases of peritonitis caused by this yeast in ambulatory peritoneal dialysis patients. However, we are reporting the first case of peritonitis associated with a PEG tube in an HIV patient.

*S. cerevisiae* colonies grow on Sabouraud dextrose agar as white-cream, smooth, moist colonies. They produce β-d-Glucan and therefore can be used as a surrogate marker for invasive disease, as reported in the case series[9]. However, no clinical studies have evaluated the diagnostic performance of this marker in this infection. In our case, we utilise this marker to monitor the response to therapy. Susceptibility testing for *S. cerevisiae* can be performed by disc diffusion and both micro- and macro-dilution methods. Choices of antifungal are variable in the literature as certain reports preferred amphotericin B, while others used caspofungin. Nonetheless, the sensitivity of culture offers helpful guidance[7,10,11].

In the literature, there are published cases of peritonitis caused by this yeast in ambulatory peritoneal dialysis

patients[11]. To our knowledge, this is the first case of *S. cerevisiae* peritonitis associated with a PEG tube in an HIV patient. In this immunosuppressed patient (HIV with acquired immunodeficiency syndrome) colonised by *S. cerevisiae*, PEG tube insertion disrupted the intestinal barrier and led to peritonitis.

## CONCLUSION

*S. cerevisiae* peritonitis is a rare but life-threatening complication of intestinal barrier disruption. This report highlights the importance of considering unusual pathogens, especially when evaluating immunocompromised patients with peritonitis following abdominal organ barrier disruption. Early recognition and prompt treatment are crucial for successful management.

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