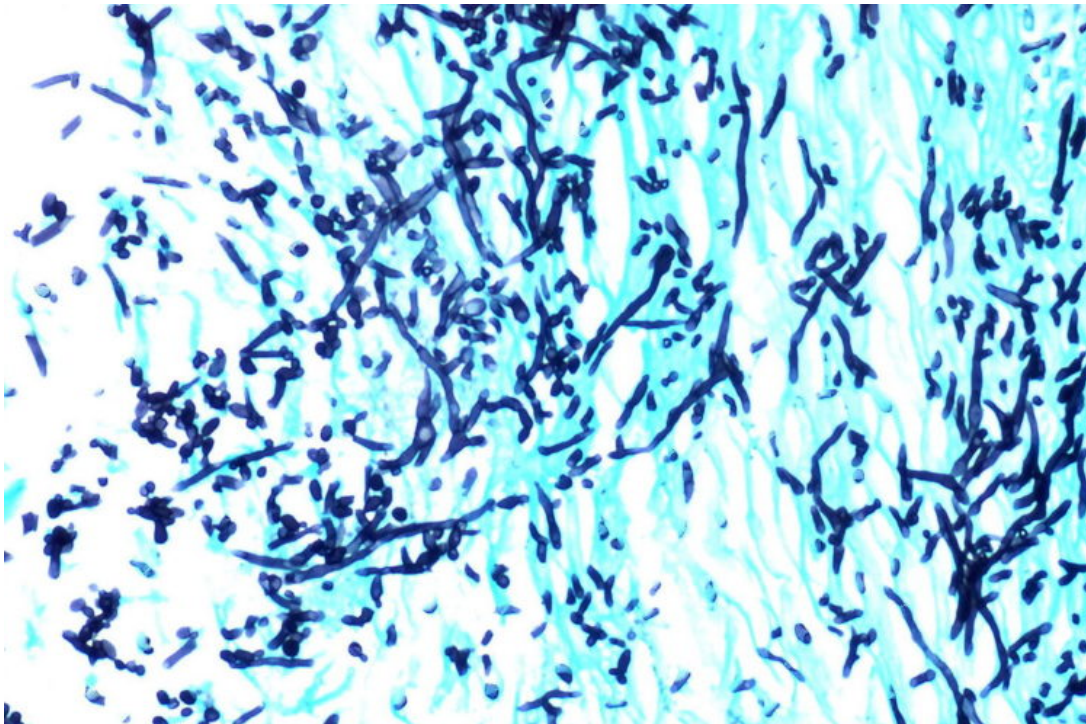


Candidiasis (Yeast Infection) — Symptoms and Treatment

[See online here](#)

Candidiasis is an opportunistic fungal infection that can affect the gastrointestinal tract, skin, or be systemic in immunocompromised patients. Clinical presentation is different from one patient to another and is dependent on the severity of immunosuppression and the anatomical site of the infection. Patients with candidiasis need topical antifungals for localized disease and systemic antifungals for esophagitis and systemic candidiasis. The important distinction between patients with neutropenia and without neutropenia can affect the choice of antifungals in systemic candidiasis.



Definition of Candidiasis

Candidiasis is a **fungal infection** that is caused by **Candida albicans**. Candidiasis is an opportunistic infection that has been getting more common in the recent decades due to the introduction of **immunosuppression** and the growth observed in the populations that are at risk for opportunistic infections. Cancer therapy, organ transplantation, [diabetes](#), and [AIDS](#) are common risk factors for candidiasis.

Epidemiology of Candidiasis

Candidiasis is considered as the most common fungal infection in the immunocompromised patient. **Candida asymptomatic colonization** is found in approximately 50% of the normal population.

Vulvovaginal candidiasis might be the most common form of the disease and is reported in approximately 75% of women in their lifetime.

Patients with HIV are at risk of developing **oropharyngeal candidiasis** and **esophageal candidiasis** if they do not get **highly active antiretroviral therapy (HAART)**.

Etiology of Candidiasis

Candidiasis is unlikely to occur in healthy subjects except for vulvovaginal candidiasis which is reported in at least 75% of women in their life-time. In order for a patient to develop candidiasis, he or she need to be immunocompromised.

Accordingly, any patient with liver cirrhosis, systemic collagen disorders, [diabetes](#), genetic disorders that predispose to immunosuppression, cancer patients, patients with [rheumatoid arthritis](#) who are receiving chemotherapy and patients receiving radiotherapy are at risk of developing candidiasis. Additionally, AIDS patients and patients with HIV who are not on HAART can develop candidiasis.

Patients who have undergone a recent **bone marrow transplantation, solid organ transplantation**, or who are severely immunocompromised due to **chemotherapy and/or radiotherapy** are at the highest risk of developing **systemic and disseminated candidiasis**.

Pathophysiology of Candidiasis

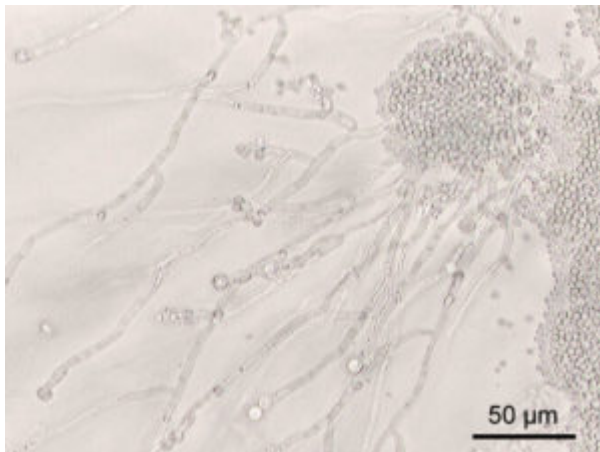


Image: "Microscopic image (200-fold magnification) of *Candida albicans* ATCC 10231, grown on cornmeal agar medium with 1% Tween80." by Y tambe - Y tambe's file. License: [CC BY-SA 3.0](#)

Candidiasis is caused by the fungus *Candida* which is known to infect humans and animals. Interestingly, candida species have been isolated from the hospital equipment such as hospital floors, air-conditioners, and medical devices. This finding explains why candidiasis is **common in intensive care unit patients** and in patients who undergo complex surgeries.

Candida has tRNA and mRNA characteristics that allow the fungus to become pathogenic in a susceptible host. On the cell wall, there are certain surface molecules that facilitate cell-to-cell adherence with the host cells.

These include the level of expression of putative virulence factors including **cell-surface adhesins, extracellular hydrolytic enzymes, and the type of morphology** exhibited by the colonising *C. albicans*. Additionally, candida produces certain proteases, such as **aspartic proteases (Saps)**, that has long been recognized as a virulence-associated trait of this pathogenic yeast that **allows for tissue penetration**.

For systemic candidiasis to happen, the patient's natural barrier and immunologic responses need to be impaired. Wounds, burns, catheters and surgical interventions break the mucocutaneous barriers that prevent candida from **entering the blood stream**. Abnormalities in [cell-mediated immunity](#) such as in patients with HIV infection, diabetes or who are on steroids also put the patient at risk of developing systemic candidiasis.

Clinical Presentation of Candidiasis

Depending on the affected site, candidiasis can cause different clinical syndromes and signs.

Cutaneous candidiasis can present as a generalized disease, intertrigo, candida folliculitis, or nail infection. Patients with generalized cutaneous candidiasis present with **wide-spread skin eruption** over the abdomen, chest and upper and lower extremities. **Maximum pruritus** is usually in the genital folds. Such patients are expected to be more immunocompromised when compared to the other types of cutaneous candidiasis.



[Image](#): "Intertrigo candidiasis" by Grook Da Oger - Own work.
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Intertrigo is defined as a localized skin infection in a skin fold, for example in the axilla, that presents with red rash, pustules, and vesicles. Eventually, a white rim develops over the rash due to the proliferation of candida.

Patients with **candida folliculitis** develop a localized infection of a hair follicle and are usually less immunocompromised than the other patients described above.

[Diabetes mellitus](#) is associated with an increased risk of **onychomycosis**, a fungal nail infection that is caused by candida species. Patients present with nail thickening, pain and redness under the nail, and a tense nail bed that is warm and inflamed. These forms of skin infection can become chronic in patients with [hypoparathyroidism](#), diabetes, [autoimmune disorders](#), and thymomas.

Patients with known history of HIV infection are at risk of developing **oropharyngeal candidiasis** especially when they are not on HAART. Additionally, diabetics and patients who receive [broad-spectrum antibiotics](#) may develop oropharyngeal candidiasis. Such patients present with a sore mouth, burning tongue and white patches over the oral mucosa. Physical examination reveals membranes that are white, **erythematous patches** on the hard and soft palates, and **angular cheilitis**.



Image: "This patient presented with a secondary oral pseudomembranous candidiasis infection. The immune system in suffers with HIV undergoes a dramatic reduction in its effectiveness, resulting in the greater possibility of secondary infections, as in this example. This infection responded to fluconazole 100 mg daily, for 1 week." Photo Credit: Sol Silverman, Jr., D.D.S. Content Providers: CDC/ Sol Silverman, Jr., DDS - This media comes from the Centers for Disease Control and Prevention's Public Health Image Library (PHIL), with identification number #6053. License: Public Domain

Esophageal candidiasis is common in patients who are more severely immunocompromised such as patients on chemotherapy and HIV infection. Patients present with dysphagia, chest pain, painful swallowing, and nausea and vomiting. Patients with esophageal candidiasis also have oropharyngeal candidiasis.

Women are at risk of developing **vulvovaginal candidiasis**, which usually presents with pain, vaginal discharge, **dysuria** and painful intercourse. This is **the most common form of candidiasis** that can be identified in healthy subjects without known risk factors. If such women have intercourse with a male partner, the male partner might develop **candida balanitis**. Candida balanitis presents as a penile whitish rash that is painful and also associated with dysuria.

Patients with neutropenia and malignancy are at risk of developing **systemic candidiasis**. **Hepatosplenic candidiasis** presents in these patients with fever, right upper abdominal pain, and jaundice that is not responsive to wide spectrum antibiotics.

Candidemia is another form of systemic candidiasis that is usually identified in hospitalized patients who develop a fever that is not responsive to antibiotics. Patients have a history of **prolonged intravenous catheterization** and are usually in the intensive care unit.

Disseminated candidiasis is another form of systemic candidiasis in which multiple organs are involved. Similar to candidemia, patients present with a fever that is unresponsive to antibiotic therapy and are usually hospitalized and severely ill.

Diagnostic Work-up for Candidiasis

Similar to different presentations according to the candidiasis syndrome, work-up is usually different from one patient to another.

Patients with cutaneous candidiasis benefit from a **wet mount** or **smear test** that is obtained from the skin rash. Microscopic examination shows **hyphae** and **pseudohyphae**. **Potassium hydroxide smears** are also helpful for the demonstration of the pseudohyphae. Cultures of the nail bed in **onychomycosis** can confirm the

diagnosis of candida infection.

Blood cultures are indicated in systemic candidiasis but are usually positive in only 60% of the cases. A faster and more sensitive test has been developed to detect systemic candidiasis is testing blood for **beta-glucan**, a fungal cell wall antigen.

Patients who present with vulvovaginitis due to candidiasis or balanitis benefit from a **urine analysis** which reveals white blood cells, red blood cells, and yeast cells. Urine cultures might be indicated when in doubt.

Patients with known risk factors for esophageal candidiasis need an **upper endoscopy study** with a biopsy to confirm the diagnosis and initiate treatment. Patients with hepatosplenic candidiasis usually have **cholestasis** and an **elevated alkaline phosphatase**.

Imaging studies plus upper endoscopy are indicated in patients with esophageal candidiasis. **Ultrasonography** can show echogenic foci in the **liver**, intra-abdominal abscess formation, renal abscess and renal fungus balls in patients with hepatosplenic candidiasis.

Patients with disseminated candidiasis benefit from **computerized tomography scan** to detect hepatosplenic abscesses, renal abscess, or **pyelonephritis**. **Echocardiography** is indicated to exclude **candida endocarditis** in which large valvular vegetations can be identified.

Treatment of Candidiasis

Patients with candidemia or disseminated candidiasis should be prescribed **fluconazole**. Similar to the symptom-specific work-up and presentation, treatment is also tailored to the specific anatomic site involved in the infection.



Image: "Nail candidiasis." by Innab - Own work. License: [CC BY-SA 3.0](#)

Topical ketoconazole, nystatin, clotrimazole or econazole can be used for localized cutaneous candidiasis. Patients with nail infections might need drainage of the abscess underneath the nail in addition to oral antifungal treatment with fluconazole. **Oral itraconazole** has been used successfully in patients with candida onychomycosis. Patients with oropharyngeal candidiasis might be treated with **topical nystatin** or **amphotericin B**. In case there is no response, patients can be prescribed **oral**

fluconazole or itraconazole.

Patients with HIV and oropharyngeal candidiasis should be prescribed a **higher dose of fluconazole** and should be initiated on **HAART. Amphotericin B** or **caspofungin intravenously with anidulafungin** is indicated in HIV patients with candidiasis who do not respond to oral fluconazole.

Patients with esophagitis might have severe pain on swallowing and **initial IV fluconazole** can be used at first. Once the symptoms improve, patients should take **fluconazole for an additional two to three weeks.**

Women with vulvovaginal candidiasis need a **single dose of oral fluconazole 150 mg** to achieve clinical and microbiological improvement.

Caspofungin, anidulafungin or **micalfungin** is indicated in patients with systemic candidiasis who are also neutropenic due to chemotherapy or hematologic malignancy. Patients with systemic candidiasis usually have a focus of infection such as an intravenous line which needs to be removed.

Patients with hepatosplenic candidiasis need more extensive treatment regimens that involve an **induction phase with amphotericin B for two weeks followed by 12 weeks of oral fluconazole.**

Patients who develop intraabdominal abscesses might need a **surgical intervention** to drain such abscesses in order for antifungal therapy to be effective. Patients who develop candida endocarditis always need a **valvular replacement surgery.**

Bone debridement is indicated in patients with **candida osteomyelitis.** Patients with prosthetic joints who develop a candida infection of the prosthetic joint might need the prosthesis to be removed.

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