

# Candidiasis

**Candidiasis** also known as **Moniliasis**, **Thrush**, or **Yeast infection** refers to infection and illness caused by several species of *Candida* organisms. *Candida* is a genus of yeast that can cause infections of the skin, mucous membranes, and most internal organs. The occurrence of Candidiasis has been rising in recent years due to an increased use of antibiotics and immunosuppressant drugs (drugs used to intentionally weaken the immune system) used to treat cancer and organ transplants, and with the rise of immunodeficiency diseases such as HIV/AIDS.

## Types

Candidiasis occurs in two main forms: mucocutaneous candidiasis where *Candida* species infect the skin or the mucous membranes (the lining of the nose and mouth, vagina, and anus), and invasive candidiasis where the fungus invades the blood stream and internal organs in the body.

### Mucocutaneous

Forms of mucocutaneous candidiasis include the following:

- Oropharyngeal candidiasis (OPC or thrush) involving the mouth and back of the throat.
- Vulvovaginal candidiasis (VVC) involving the vagina and external genitalia in women.
- Chronic mucocutaneous candidiasis <sup>[1]</sup> (CMC) referring to *Candida* infection of the skin, mucous membranes, and nails in people with a specific type of immune dysfunction.
- Generalized cutaneous candidiasis, an unusual form of Candidiasis characterized by a widespread *Candida* rash over the trunk, arms and legs.
- Erosio interdigitalis blastomycetica, <sup>[2]</sup> *Candida* infection between the fingers or toes leading to cracked, weeping and reddened skin.
- *Candida* folliculitis where *Candida* infects the hair follicles, often affecting the beard in men.
- *Candida* balanitis, or infection of the penis, usually under the foreskin.
- Diaper rash, candidiasis around the anal area and skin between the legs in infants.
- Intertrigo, a common skin condition caused by *Candida* at sites where the skin surfaces are in close proximity, such as the buttocks, in between the legs and under the arms.
- Paronychia, infection of the base of the fingernail, and onychomycosis, infection of a finger or toenail with *Candida* species.
- *Candida* esophagitis where the organism infects the lining of the esophagus, the tube that carries food from the throat to the stomach (although this is an internal organ, the infection with *Candida* is not invasive in most cases, thus this is a form of mucocutaneous candidiasis).

### Invasive

Invasive candidiasis represents deep tissue invasion by the fungus, usually in internal organs.<sup>[3]</sup> *Candida* organisms can invade internal organs either directly from the gastrointestinal tract or skin, or through spread by the blood stream. The most common clinical syndromes seen in this type of Candidiasis include the following:

- Central nervous system candidiasis, or infection of the brain and surrounding structures.
- Respiratory tract candidiasis, infection of the lungs and the lining of the bronchial tree.
- Cardiac candidiasis, infection of the structures of the heart, including the heart muscle (myocarditis), the membrane surrounding the heart (Pericarditis) and the valves of the heart (endocarditis).
- Urinary tract candidiasis where the urethra (tube leading out from the urinary bladder), the bladder, or the kidneys are infected by *Candida*.
- Ocular candidiasis, infection of the eye by *Candida*, either through spread in the bloodstream, or by direct inoculation of the fungus into the eye during surgery or trauma.
- Bloodstream candidiasis (sepsis) which can be a life-threatening illness.
- Other rarer sites of involvement such as the bones, joints, liver, spleen, gallbladder and lining of the abdomen.

## Signs and Symptoms

Signs and symptoms of candidiasis are determined by what area of the body is involved with the fungal infection, and the underlying condition of the infected person.

### Mucocutaneous

- Oropharyngeal candidiasis—symptoms of OPC include white patches on the tongue and in the mouth and throat. These patches are easily scraped off and reveal shallow ulcers underneath in the most severe forms. There may be pain in the mouth or pain with swallowing, but in mild cases there often is no pain. Cracking at the corners of the mouth (angular cheilitis) may occur.
- Vulvovaginal candidiasis—women with VVC usually experience genital itching or burning, with or without a thick, white vaginal discharge. They may also have redness and swelling of the external genitalia, and there may be pain with intercourse. Men with genital candidiasis may experience an itchy rash on the penis.

- Candida esophagitis can result in pain with swallowing, feeling of obstruction on swallowing, and substernal pain (pain behind the breastbone).
- Chronic mucocutaneous candidiasis (CMC) is characterized by persistent skin rash that can range from a mild form to one that is severe and can lead to disfigurement (Candida granuloma).
- Other forms of mucocutaneous disease involve a red, itchy, often scaly rash involving the skin. Hair loss may result from folliculitis. Involved finger and toenails can become thickened, cracked, and painful.

## Invasive

Signs and symptoms of invasive candidiasis can be numerous. Exact symptoms depend on which organ system is involved.

- Central nervous system candidiasis can lead to abscesses in the brain or meningitis. Symptoms can include headache, stiff neck, fevers, altered consciousness, and coma.
- Respiratory tract candidiasis can lead to bronchitis or pneumonia with cough, fever, wheezing, and shortness of breath.
- Candidiasis of the heart can have many symptoms including high fevers, chest pain, heart arrhythmias and blood clots that break off from heart valves and spread to other areas of the body.
- Urinary tract candidiasis can result in burning with urination, cloudy urine stream, urgency to void, fever, and lower back pain.
- Candidiasis of the eye can lead to eye pain, red eye, and blindness.
- Bloodstream candidiasis is a serious infection and can result in high fevers, shaking chills, low blood pressure, shock and death.

## Causes

Candidiasis is caused by Candida yeast which are fungi that exist predominately in a unicellular (single cell) form. The most common species affecting humans is *Candida albicans*. Other organisms that have been found in human illness include *C. glabrata*, *C. tropicalis*, *C. parapsilosis*, and *C. krusei*. Rarely, other Candida species can cause disease. Candida are commensal organisms, meaning they normally inhabit the skin, mucous membranes, and gastrointestinal tract in humans without causing illness. For this organism to become a pathogen (able to cause disease), there must be interruption of normal body defense mechanisms. Factors responsible include other illness that can alter immune defenses such as:

- Diabetes Mellitus
- HIV/AIDS
- Cancer
- Medical manipulations

In the latter category, one of the most important is the use of antibiotics. When antibiotics are used for a bacterial infection, a side effect can be a reduction in the number of healthy bacteria that live in the gastrointestinal tract. When this happens, fungi such as Candida can multiply and cause disease. Another medical intervention that can lead to Candidiasis is insertion of catheters, or small tubes, into veins to give fluids, nutrients and antibiotics. Insertion of intravenous catheters results in a break in natural defenses (the skin) and a foreign body (the catheter) upon which Candida can grow.

## Diagnosis

The diagnosis of candidiasis can be made clinically in many mucocutaneous cases. Thrush in a person with AIDS has a typical appearance and diagnosis can be based on the clinical picture. In other cases, looking at samples of oral or vaginal secretions under the microscope may be required to confirm a diagnosis. Cultures can also be taken.

Invasive candidiasis is usually diagnosed by either culture of blood or tissue or by examining samples of infected tissue under the microscope. The procedure for microscopic examination of Candida is as follows: a scraping or swab sample of the lesion is placed on a slide and a drop of 10% potassium hydroxide (KOH) is applied. The KOH dissolves the surrounding cells and the Candida will remain on the slide. The characteristic hyphae and pseudospores are seen on the slide and Candida infection is confirmed.

## Treatment

### Mucocutaneous

Prescription treatments for oropharyngeal candidiasis include:

- Clotrimazole troches (lozenges)
- Nystatin suspension (nystatin “swish and swallow”)
- Oral fluconazole

There are emerging drugs that may treat resistant cases of oropharyngeal candidiasis (see Research).

Several antifungal drugs are available to treat vulvovaginal candidiasis. Antifungal vaginal suppositories or creams are commonly used. The duration of the treatment course of suppositories and creams ranges from single dose therapy to 7 days of therapy. Uncomplicated vulvovaginal candidiasis may also be treated with single-dose, oral

fluconazole. Oral fluconazole should be avoided in pregnancy. These drugs usually work to cure the infection (80%-90% success rate), but some people will have recurrent or resistant infections. Short-course treatments should be avoided in recurrent or resistant infection.

## Invasive

There are a number of antifungal drugs that are now available to treat invasive candidiasis.<sup>[4]</sup> Fluconazole is a drug that can be taken by mouth or given intravenously (IV) to treat invasive candidiasis. Another class of antifungal drugs, the echinocandins, are also commonly used to treat invasive candidiasis. There are three echinocandins, all IV only: caspofungin, micafungin, and anidulafungin. All three are effective in treating invasive candidiasis. Other drugs that are sometimes used to treat invasive candidiasis include voriconazole (by mouth or IV) and amphotericin B formulations (IV only).

Candida species can become resistant to antifungal drugs over time. Use of more potent drugs may be necessary in these circumstances. The death rate in people who develop the invasive form of Candidiasis can reach 50%, particularly with bloodstream infection.

## Chances of Developing Candidiasis

Most cases of candidiasis are caused by the person's own Candida organisms which normally live in the mouth or digestive tract. In situations where there is a disruption in the body's normal defense mechanisms, Candida can multiply and cause disease.

### Risk factors

Risk factors for mucocutaneous candidiasis include the following:

- Use of antibiotics
- Diabetes Mellitus
- Abnormal or damaged immune system (for example in people with AIDS or who are undergoing chemotherapy for cancer)
- Pregnancy
- Sexual contact with a woman who already has vulvovaginal candidiasis
- Use of inhaled steroid medications

Risk factors for invasive candidiasis are:

- Immunosuppression (weakened immune system) due to medications or illness
- Low white blood cell (neutropenia) count due to chemotherapy or underlying disease
- Chronic illness and prolonged hospitalization
- Gastrointestinal or heart surgery, particularly with the simultaneous use of prolonged antibiotics.
- Implanted prosthetic devices, particularly prosthetic heart valves.
- Intravenous catheters (small tubes in the vein used to deliver drugs, fluids, and nutrients) that have been in place a long time.

## Prevention

### Holistic and alternative treatments

There is evidence that ingestion of yogurt containing *Lactobacillus acidophilus* may prevent vulvovaginal candida infections.<sup>[5]</sup> In addition, probiotic cheese has been shown to decrease the amount of oral candidiasis in elderly patients with decreased salivation.<sup>[6]</sup>

## How Candidiasis is Spread

Candida species can be recovered from the soil, from hospital environments, inanimate objects, and food. Candida can be spread from one person to another on the hands in the hospital setting,<sup>[7]</sup> or occasionally through having sex with a woman who has vulvovaginal candidiasis. There have also been reports of spread to newborns during birth from women who have the vulvovaginal form.

Most cases of candidiasis, however, come from Candida organisms that are already on the skin or in the gastrointestinal tract. Candida species are a normal part of the microbes that live in the human body and that are essential for health. Only with uncontrolled growth and penetration of immune barriers does Candida cause disease. There is no evidence that candidiasis can be spread from one person to another by touching affected skin of someone with the mucocutaneous form.

## Research

Clinical research is ongoing in the following areas: Treatment of oral candidiasis in people with cancer and HIV<sup>[8]</sup> Evaluation of other species of Candida that may cause human infection<sup>[9]</sup> Newer antifungal agents<sup>[10]</sup> Treatment of candidiasis in infants and toddlers<sup>[11]</sup><sup>[12]</sup> The use of oral probiotics as adjunctive therapy for vaginal candidiasis

## Expected Outcome

Most cases of oral or vulvovaginal candidiasis can be adequately treated with antifungal medications. Some types of mucocutaneous candidiasis, such as chronic mucocutaneous candidiasis, can be difficult to treat, and symptoms can come and go.

In the invasive form of the disease, up to 50% of people may have a poor prognosis.

## Epidemiology

Candidiasis is the fourth most common cause of infections in the bloodstream that are acquired while in the hospital.<sup>[14]</sup> In the United States there are about 8 cases of candidemia (Candida in the blood) per 100,000 people. There appears to be a higher incidence of this illness among African Americans and among newborn children. Recent work has suggested that in the United States alone, the cost of invasive candidiasis is approaching \$1 billion per year.<sup>[15]</sup>

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