

Candidiasis

Oral Candidiasis (kan-duh-di-uh-sis)

Synonyms: Candidosis, Thrush, and Moniliasis

Infection of the oral cavity caused by Candida species (commonly C. albicans).

Introduction

Microorganisms such as viruses, bacteria and fungi are everywhere, including in and on your own body. In general, the relationship between you and the microorganisms in your body is mutually beneficial. You provide nutrition, protection and transportation for them, while they stimulate your immune system, synthesize essential vitamins, and help protect against harmful viruses and bacteria.

But your relationship to microorganisms in the world at large is more complex. Some microbes are highly beneficial, whereas others — such as those that cause malaria and meningitis — can be deadly. For that reason, your immune system works to repel harmful invading organisms while maintaining a balance between "good" and "bad" microbes that normally inhabit your body.

But sometimes these protective mechanisms fail. Candida infections occur when your immune system is weakened by disease or drugs such as prednisone, or when antibiotics disturb the natural balance of microorganisms in your body. There are many other reasons, which are listed later.

Oral thrush causes creamy white lesions, usually on your tongue or inner cheeks. The lesions can be painful and may bleed slightly when you scrape them or brush your teeth. Sometimes oral thrush may spread to the roof of your mouth, your gums, tonsils or the back of your throat. Sometimes the lesions are red, and even “pebbly or cobblestone” in appearance and not as painful.

Although oral thrush can affect anyone, it occurs most often in babies and toddlers, older adults, and people whose immune systems have been compromised by illness or medications. Extended wearing of a denture and inadequate hygiene also can cause candida infections. Oral thrush is a minor problem for healthy children and adults, but for those with weakened immune systems, symptoms of oral thrush may be more severe, widespread and difficult to control.

Introduction to fungal infections

Fungal infections of the skin are also known as ‘mycoses’. They are common and generally mild. However, in very sick or otherwise immune suppressed people, fungi can sometimes cause serious disease.

Characteristics of fungi

Fungi are parasites or saprophytes i.e. they live off living or dead organic matter.

Mycologists identify and classify fungi according to their appearance by microscopy and in culture, and by the method of reproduction, which may be sexual or asexual.

Growing fungi have branched filaments called hyphae, which make up the mycelium (like branches are part of a tree). Some fungi are compartmented by cross-walls (called septae).

Arthrospores are made up of fragments of the hyphae, breaking off at the septae. Asexual spores (conidia) form on conidiophores. The sexual reproductive phase of many fungi is unknown; these are 'fungi imperfecta' and include those which infect humans.

Yeasts form a subtype of fungus characterised by clusters of round or oval cells. These bud out similar cells from their surface to divide and propagate. In some circumstances they form a chain of cells called a pseudomycelium.

Oral candidiasis is predominately caused by *Candida albicans*, although other related *Candida* species may be involved. *Candida* is commensal organism and part of the normal oral flora in about 30% - 50% of the population, and is capable of producing opportunistic infections within the oral cavity when appropriate predisposing factors exist.

More on Candida Types

Candidiasis is an opportunistic infectious condition caused by a ubiquitous, saprophytic fungi of the genus *Candida*, which includes eight species of fungi, the most common of which is *Candida albicans*. Oral candidiasis is most commonly associated with *Candida albicans*, although other species, such as *C. glabrata* and *C. tropicalis*, are frequently part of the normal oral flora. Candidiasis is usually limited to the skin and mucous membranes. Common clinical types of mucocutaneous candidiasis include: **oropharyngeal** (affecting the oral cavity and/or pharynx), **vulvovaginal** (affecting the vaginal and vulvar mucosa), **paronychia** (affecting the nail beds and folds), **interdigital** (usually affecting the skin in between the fingers), **intertriginous** (affecting the skin of the submammary areas or the groin and/or scrotum). Systemic, invasive, infections of candidiasis can occur, especially in those patients with severe immunosuppression. The gastrointestinal tract, trachea, lungs, liver, kidneys and central nervous system are all potential sites for infection in disseminated systemic candidiasis and may result in septicemia, meningitis, hepatosplenic disease, and endocarditis.

Epidemiology

Oral candidiasis is predominately caused by *Candida albicans*, although other related *Candida* species may be involved. *Candida* is commensal organism and part of the normal oral flora in about 30% - 50% of the population, and is capable of producing opportunistic infections within the oral cavity when appropriate predisposing factors exist. Thrush is commonly seen in infants. It is not considered abnormal in infants unless it lasts longer than a couple of weeks. *Candida albicans* can also cause yeast infections in the vagina.

Oral candidiasis, a common infection among the elderly and others, has several forms. A number of factors predispose patients to develop candidiasis: infancy, old age, antibiotic therapy, steroid and other immunosuppressive drugs, xerostomia, anemia, endocrine disorders, and primary and acquired immunodeficiency. Acute pseudomembranous candidiasis (thrush) is characterized by leukoplakic plaques that appear as white patches and that can be scraped away to expose an erythematous base; hyperplastic candidiasis, by confluent leukoplakic plaques that cannot be scraped away; angular cheilitis, by leukoplakic and erosive lesions at the lip commissures; and atrophic candidiasis, by painful erythematous mucosal lesions, frequently located beneath dentures.

This organism lives in your mouth and is usually kept in check by healthy organisms that also live there. However, when your resistance to infection is low, the fungus can grow, leading to lesions in your mouth and on your tongue. Thrush appears as whitish, velvety plaques in the mouth and on the tongue. Underneath the whitish material, there is red tissue that may bleed. The lesions can slowly increase in number and size.

If you are immunocompromised (for example, you are HIV positive or receiving chemotherapy), the infection can spread to other organs, like the esophagus (causing pain with swallowing), or throughout your body, which can be fatal.

The following can lessen your resistance to infection and increase your chances of getting thrush:

1. Being very old or very young
2. Taking antibiotics or steroid/corticosteroid medications, or broad spectrum antibiotic treatment
3. Contraceptive pill or injection, or pregnancy
4. Being in poor health
5. Having [diabetes](#), diabetes mellitus, [Cushing's syndrome](#) and other endocrine conditions
6. Serious underlying disease: primary and acquired immunodeficiency and cancers. Among these are [HIV infection \(human immunodeficiency virus\)](#) or [AIDS](#), cancer or infection associated with receiving [chemotherapy](#) for cancer or drugs to suppress your immune system following an organ transplant, and immune deficiencies e.g. low levels of immunoglobulins.
7. Underlying skin disease e.g. [psoriasis](#), [lichen planus](#)
8. Dry mouth due to disease of the salivary glands or medications e.g. antihistamines, diuretics
9. Dentures (especially if they are not regularly cleaned or fit badly)
10. Smoking
11. Injury to the mouth
12. Nutritional deficiency e.g. iron &/or B-vitamin deficiency
13. Inhaled corticosteroids used to treat asthma e.g. beclometasone, budesonide, fluticasone. Drink water after inhalation to reduce this

complication

In more detail, these illnesses or conditions may make you more susceptible to oral thrush infection:

1. **Chronic mucocutaneous candidiasis.** Usually affecting children younger than age 3, this group of rare disorders is marked by a chronic *Candida* infection of the mouth and fingernails and of the skin on the scalp, trunk, hands and feet. Scaly, crusted lumps known as granulomas also may develop in the mouth or on the nails and skin. Adults occasionally develop the disorder — usually as a result of a tumor on the thymus gland (thyoma).
2. **HIV/AIDS.** The human immunodeficiency virus (HIV) — the virus that causes AIDS — damages or destroys the cells of your immune system, making you more susceptible to opportunistic infections your body would normally resist. One of these opportunistic infections is oral thrush. Thrush is rare in the early stage of AIDS, usually appearing only when counts of helper T cells — one of the key cells in the immune system — fall below 350. Although oral thrush is the least serious of the fungal infections that can affect people with HIV, it may be an indication that HIV is worsening. *Candida esophagitis*, which occurs when thrush spreads to the esophagus, generally develops when T cell counts are 200 or less and is considered an AIDS-defining illness — an opportunistic illness that indicates a person with HIV is developing AIDS.
3. **Cancer.** If you're dealing with cancer, your immune system is likely to be weakened both from the disease and from treatments such as chemotherapy and radiation, increasing the risk of *Candida* infections such as oral thrush.
4. **Diabetes mellitus.** If you don't know you have diabetes or the disease isn't well controlled, your saliva may contain large amounts of sugar, which encourages the growth of *Candida*.
5. **Vaginal yeast infections.** It's estimated that three out of every four women will have a vaginal yeast infection (*Candida vulvovaginitis*) at least once before menopause. Vaginal yeast infections are caused by the same fungus that causes oral thrush. Although a yeast infection isn't dangerous, a pregnant woman can pass the fungus to her baby during delivery. As a result, her newborn may develop oral thrush within the first several weeks after birth. Up to 5 percent of healthy newborns with oral thrush are infected through mother-to-child transmission.
6. **Dry mouth (xerostomia).** This occurs when the salivary glands don't produce enough moisture. Dry mouth disrupts the balance of normal microorganisms in your mouth, increasing your risk of oral thrush. Although not itself a disease, dry mouth can be a symptom of certain illnesses, including Sjogren's syndrome — an autoimmune disease that causes an extremely dry mouth and eyes. Bone marrow transplants, stress or anxiety, depression, and certain nutritional deficiencies also can cause a dry mouth. So can chemotherapy,

radiation to the head and neck area and hundreds of medications — especially antidepressants, pain and high blood pressure drugs, tranquilizers, diuretics and antihistamines.\

Risk factors include salivary gland dysfunction, certain drugs (eg, antibiotics, antineoplastics, corticosteroids, immunosuppressants), diabetes mellitus, and other immunocompromising conditions. Because some factors may be occult, they should be sought when an elderly person presents with oral candidiasis and, if present, managed. Diagnosis is based on symptoms and signs and can be confirmed by culture, smear, or biopsy. The presence of candidal hyphae in oral smears indicates that the oral mucosal barrier has been breached and that the patient is at risk of systemic infection.

Signs and tests

Your doctor or dentist can almost always diagnose thrush by looking at your mouth and tongue. These fungal lesions have a distinct appearance. If not entirely clear, one of the following tests may be performed to look for the candida organisms:

1. Microscopic examination of mouth scrapings
2. Culture of [mouth lesions](#)

Treatment

There are two goals when treating oral thrush in adults. The first is to improve your immune system's ability to function. For example, in diabetics, good control of diabetes may be enough to clear the infection without other treatment. There are two goals when treating oral thrush in adults. The first is to improve your immune system's ability to function. For example, in diabetics, good control of the [diabetes](#) may be enough to clear the infection without other treatment.

The second is to directly treat the infection. For this purpose, a topical antifungal agent would be prescribed like nystatin, clotrimazole, or miconazole. These may be used as mouth washes or troches (lozenges that you suck on) and are usually continued for 5 to 10 days. If these don't work, a single dose of an oral medication may be prescribed.

The second is to directly treat the infection. For this purpose, your doctor may prescribe an antifungal mouthwash or lozenges to suck on. These are usually used for 7-14 days. If they don't work, other medication may be prescribed.

If the infection has spread throughout your body or you have HIV/AIDS, stronger medications may be used, such as ketoconazole (Nizoral) or fluconazole (Diflucan).

Treatment with topical and/or systemic antifungal drugs is required, and ***an infected denture must be treated.*** Dentures must be kept out of the mouth for long intervals, particularly during sleep. Dentures should be cleaned and soaked for 10 minutes in solutions containing benzoic acid, 0.12% chlorhexidine, or 1% sodium hypochlorite, then rinsed thoroughly.

Oral Candidiasis The most common method of treating oral thrush is to use a medicated liquid that is swished around the mouth and swallowed, or a lozenge that is sucked, dissolved in the mouth, and swallowed. Patients with refractory candidiasis may require systemic drugs.

The most common treatments are:

Clotrimazole (Mycelex®) troches: These troches, or lozenges, are used either four or
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<p>five times a day for one or two weeks. Lozenges should be dissolved in the mouth slowly and should not be chewed or swallowed whole. Clotrimazole can cause stomach upset. Rx: clotrimazole troches 10 mg qid should be given for 10 to 14 days</p>
<p>Nystatin (Mycostatin® liquid or pastilles): Nystatin is available in liquid and pastille (lozenge) form. The liquid dose is 5 milliliters four times a day for one or two weeks; it should be swished around the mouth slowly, for as long as possible (i.e., a few minutes), and then swallowed. One or two pastilles are taken four or five times a day for 7 to 14 days; they should be dissolved in the mouth slowly and should not be chewed or swallowed whole. Rx: nystatin oral suspension 100,000 U/mL, 5 mL qid, swished for 5 minutes and swallowed; nystatin pastilles 200,000 U qid Nystatin-triamcinolone acetonide ointment is effective for angular cheilitis.</p>
<p>Fluconazole (Diflucan® tablets): Diflucan is a tablet that must be swallowed. Studies have demonstrated that it is just as effective as clotrimazole and nystatin, but is more convenient and better tolerated. Rx: fluconazole 200 mg immediately, then 100 mg once daily for 7 to 14 days</p>
<p>Itraconazole (Sporanox® liquid suspension): This medication is a liquid that must be swallowed. While it is as effective as the three medications listed above, it is not as well tolerated as fluconazole tablets. Rx: itraconazole 100 mg bid for 10 to 20 days</p>
<p>Ketoconazole (Nizoral®) or itraconazole (Sporanox®) capsules: These capsules, which must be swallowed, are less effective than fluconazole. However, they are alternative options if the four medications listed above cannot be used. This is used for systemic treatment. Rx: ketoconazole 200 mg once daily 10 to 20 days.</p>

Treatment Details

Oral candidiasis may be treated either topically or systemically. Treatment should be maintained for 7 days. Response to treatment is often good; oral lesions and symptoms may disappear in a fairly short period (ranging from 2 to 5 days), but relapses are common because of the underlying immunodeficiency. As with other causes of oral candidiasis, recurrences are common if the underlying problem persists.

Topical Treatment

Topical treatments are preferred because they limit systemic absorption, but the effectiveness depends entirely on patient compliance. Topical medications require that the patient hold medications in the mouth for 20 to 30 minutes. If the patient uses formulations containing sweetening agents for long periods, consider as concurrent treatment daily fluoride rinses (e.g., ACT or Fluorigard, available as over-the-counter preparations) for 1 minute once a day and then expectorated.

Clotrimazole is an effective topical treatment (one oral troche [10-mg tablet]) when dissolved in the mouth five times daily. Used less frequently, one vaginal troche can be dissolved in the mouth daily. Nystatin preparations include a suspension, a vaginal tablet, and an oral pastille. Regimens are nystatin vaginal tablets (one tablet, 100,000 units, dissolved in the mouth three times a day), or nystatin oral pastille (available as a

200,000-unit oral pastille, one or two pastilles dissolved slowly in the mouth five times a day). Nystatin suspension has a high sugar content and cannot be held in the mouth long enough to be effective. Topical creams and ointments containing nystatin, ketoconazole, or clotrimazole may be useful in treating angular cheilitis. Another therapeutic choice is amphotericin B (0.1 mg/ml). Five to 10 ml of oral solution is used as a rinse and then expectorated three to four times daily.

Systemic Treatment

Several agents are effective for systemic treatment. Ketoconazole (Nizoral) is a 200-mg tablet taken with food once daily. Patient compliance is usually good. Careful monitoring of liver function is necessary for long-term use because of reported side effects, including hepatotoxicity (toxic to the liver). Lack of efficacy of ketoconazole may occur because of poor absorption in those with an abnormally high gastric pH.

Fluconazole (Diflucan) is a triazole antifungal agent effective in treating candidiasis (100-mg tablet taken once daily for 2 weeks). Several studies suggest fluconazole is effective as a prophylactic agent, although the most effective prophylaxis dosing regimen is still unclear. Numerous reports, however, describe oral and esophageal candidiasis failing to respond to treatment with fluconazole, and in some of these cases investigators isolated resistant strains. Itraconazole (100-mg capsules) may be used for the treatment of oral candidiasis (200 mg daily orally for 14 days) Itraconazole oral suspension is now available (200 mg daily for 2 weeks. Salivary levels of itraconazole are maintained for several hours after administration.

Ketoconazole, fluconazole, and itraconazole may interact with other medications including rifampicin, phenytoin, cyclosporin A, terfenadine, digoxin, coumarin-like medications, and oral hypoglycemic medications.

Expectations (prognosis)

In adults, oral candidiasis can be cured. However, the long-term outlook is dependent on your immune status and the cause of the immune deficit.

Complications

The candida organism can spread throughout your body, causing infection in your esophagus ([esophagitis](#)), brain ([meningitis](#)), heart ([endocarditis](#)), joints ([arthritis](#)), or eyes ([endophthalmitis](#)).

Calling your health care provider if:

1. You are a teen or adult with lesions that are consistent with thrush.
2. You have pain or difficulty swallowing.
3. You have symptoms of thrush and you are HIV positive, receiving chemotherapy, or take medications to suppress your immune system.

Self-care

These suggestions may help during an outbreak of oral thrush:

1. Practice good oral hygiene. Many dentists recommend brushing at least twice a day and flossing at least once. If you have problems with strength or dexterity in your hands, an electric toothbrush can make brushing easier. *Avoid mouthwash or sprays — they can destroy the normal flora in your mouth.*

2. Try warm saltwater rinses. Dissolve 1/2 teaspoon of salt in 1 cup of warm water. Or rinse with a mild baking soda solution — 1 teaspoon of soda in 1 cup of warm water. If you wear dentures take them out of the mouth, and swish the rinses, but ***don't swallow***. Repeat 5 times a day

Prevention

There are no specific preventative measures available for adult oral candidiasis. Instead, the underlying cause must be determined and corrected whenever possible. If you have frequent outbreaks of thrush, your doctor may recommend taking antifungal medication on a regular basis to avoid recurrent infections.

The following measures may help reduce your risk of developing Candida infections:

1. Try using yogurt or acidophilus capsules when you take antibiotics.
2. Treat any vaginal yeast infections that develop during pregnancy as soon as possible.
3. If you smoke, ask your doctor about the best ways to quit.
4. See your dentist regularly — at least every six to 12 months — especially if you have diabetes or wear dentures. Brush and floss your teeth as often as your dentist recommends.

Try limiting the amount of sugar and yeast-containing foods you eat, including bread, beer and wine. These may encourage the growth of Candida.

To prevent spread of HIV infection, follow safe sex practices and universal precautions when working with blood products.

Other in depth information:

Clinical Features

The clinical appearances of oral candidiasis vary. The most common presentations include pseudomembranous and erythematous candidiasis, which are equally predictive of the development of AIDS, and angular cheilitis. These lesions may be associated with a variety of symptoms, including a burning mouth, problems eating spicy food, and changes in taste. All three of these common forms may appear in one individual.

Pseudomembranous Candidiasis (Thrush)

Characteristic creamy white, removable plaques on the oral mucosa are caused by overgrowth of fungal hyphae mixed with desquamated epithelium and inflammatory cells. The mucosa may appear red when the plaque is removed. This type of candidiasis may involve any part of the mouth or pharynx.

Erythematous Candidiasis

Erythematous candidiasis appears as flat, red patches of varying size. It commonly occurs on the palate and the dorsal surface of the tongue. Erythematous candidiasis is frequently subtle in appearance and clinicians may easily overlook lesions, which may persist for several weeks if untreated.

Angular Cheilitis

Angular cheilitis appears clinically as redness, ulceration, and fissuring, either unilaterally or bilaterally at the corners of the mouth. It can appear alone or in conjunction with another form of candidiasis.

Hyperplastic Candidiasis

This type of candidiasis is unusual in persons with HIV infection. The lesions appear white and hyperplastic. The white areas are due to hyperkeratosis and, unlike the plaques of pseudomembranous candidiasis, cannot be removed by scraping. These lesions may be confused with hairy leukoplakia. Diagnosis of hyperplastic candidiasis is made from the histologic appearance of hyperkeratosis and the presence of hyphae. Periodic acid-Schiff (PAS) stain is often used to demonstrate hyphae.

Candida Organism Types

Candidiasis is an opportunistic infectious condition caused by a ubiquitous, saprophytic fungi of the genus *Candida*, which includes eight species of fungi, the most common of which is *Candida albicans*. Candidiasis is usually limited to the skin and mucous membranes. Common clinical types of mucocutaneous candidiasis include:

oropharyngeal (affecting the oral cavity and/or pharynx), **vulvovaginal** (affecting the vaginal and vulvar mucosa), **paronychia** (affecting the nail beds and folds), **interdigital** (usually affecting the skin in between the fingers), **intertriginous** (affecting the skin of the submammary areas or the groin and/or scrotum). Systemic, invasive, infections of candidiasis can occur, especially in those patients with severe immunosuppression. The gastrointestinal tract, trachea, lungs, liver, kidneys, and central nervous system are all potential sites for infection in disseminated systemic candidiasis and may result in septicemia, meningitis, hepatosplenic disease, and endocarditis.

These illnesses may make you more susceptible to oral thrush infection:

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2. HIV/AIDS. The human immunodeficiency virus (HIV) — the virus that causes AIDS — damages or destroys the cells of your immune system, making you more susceptible to opportunistic infections your body would normally resist. One of these opportunistic infections is oral thrush. Thrush is rare in the early stage of AIDS, usually appearing only when counts of helper T cells — one of the key cells in the immune system — fall below 350. Although oral thrush is the least serious of the fungal infections that can affect people with HIV, it may be an indication that HIV is worsening. *Candida* esophagitis, which occurs when thrush spreads to the esophagus, generally develops when T cell counts are 200 or less and is considered an AIDS-defining illness — an opportunistic illness that indicates a person with HIV is developing AIDS.
3. Cancer. If you're dealing with cancer, your immune system is likely to be weakened both from the disease and from treatments such as chemotherapy and radiation, increasing the risk of *Candida* infections such as oral thrush.

4. Diabetes mellitus. If you don't know you have diabetes or the disease isn't well controlled, your saliva may contain large amounts of sugar, which encourages the growth of *Candida*.
5. Vaginal yeast infections. It's estimated that three out of every four women will have a vaginal yeast infection (*Candida vulvovaginitis*) at least once before menopause. Vaginal yeast infections are caused by the same fungus that causes oral thrush. Although a yeast infection isn't dangerous, a pregnant woman can pass the fungus to her baby during delivery. As a result, her newborn may develop oral thrush within the first several weeks after birth. Up to 5 percent of healthy newborns with oral thrush are infected through mother-to-child transmission.
6. Dry mouth (xerostomia). This occurs when the salivary glands don't produce enough moisture. Dry mouth disrupts the balance of normal microorganisms in your mouth, increasing your risk of oral thrush. Although not itself a disease, dry mouth can be a symptom of certain illnesses, including Sjogren's syndrome — an autoimmune disease that causes an extremely dry mouth and eyes. Bone marrow transplants, stress or anxiety, depression, and certain nutritional deficiencies also can cause a dry mouth. So can chemotherapy, radiation to the head and neck area and hundreds of medications — especially antidepressants, pain and high blood pressure drugs, tranquilizers, diuretics, and antihistamines.

Etiology and Pathogenesis

Neville, *et al.* have identified three general factors that may lead to clinically evident oral candidiasis. These factors are: (1) the immune status of the host, (2) the oral mucosal environment, (3) the particular strain of *C. albicans* (the hyphal form is usually associated with pathogenic infection). The following is a list of specific conditions that may predispose a patient to develop oral candidiasis.

Factors that alter the immune status of the host:

1. Blood dyscrasias or advanced malignancy
2. Old age/Infancy
3. Radiation therapy/Chemotherapy
4. HIV infection or other immunodeficiency disorders
5. Endocrine abnormalities:
6. Diabetes mellitus
7. Hypothyroidism or Hypoparathyroidism
8. Pregnancy
9. Corticosteroid therapy/Hypoadrenalism

Factors that alter the oral mucosal environment:

1. Xerostomia
2. Antibiotic therapy
3. Poor oral or denture hygiene
4. Malnutrition/Gastrointestinal malabsorption
5. Iron, folic acid, or vitamin deficiencies

6. Acidic saliva/Carbohydrate-rich diets
7. Heavy smoking
8. Oral epithelial dysplasia

Diagnosis

The diagnosis of oral candidiasis is most frequently made on the basis of clinical appearance along with exfoliative cytology examination. This involves the histologic examination of intraoral scrapings that have been smeared microscope glass slides. A 10% - 20% potassium hydroxide preparation ("KOH prep") can be used for immediate microscopic identification of yeast cell forms. Alternatively, the slide containing the cytologic smear can be sprayed with a cytologic fixative and stained using PAS (Periodic acid - Schiff) stain prior to microscopic examination.

If you have any questions about candidiasis, please feel free to ask us.