



A LABORATORY DIAGNOSIS OF ORAL THRUSH

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ABSTRACT

The purpose of this course is to review the types of oral candidiasis and how they present to better help clinicians and the dental team recognizes and treats all patients. Oral candidiasis is a less reported and discussed entity which is often encountered in clinical and laboratory practice. Further studies are required in this regard to understand its full aetiology, pathogenesis and clinical importance so that patients suffering from oral candidiasis are benefited and clinicians are fully abreast with the intricacies of the disease.

KEYWORDS: Candida spp.; Oral lesions; Diagnosis.

INTRODUCTION

Oral Candidiasis is a fungal infection of the top layer of the oral mucosa caused by *Candida albicans*. This very common dimorphic yeast exists in two forms: yeast (unicellular) and hyphal (multicellular). In the yeast form, the fungus is commensal with the host, but when the oral conditions change, the yeast can transform into the hyphal form, which is pathogenic. Up to 50% of patients can have yeast as part of their normal oral flora, with no signs or symptoms of disease.

Numerous factors and conditions can contribute to the development of an oral candidiasis infection: immune status, oral mucosal environment, and the virulence of the candida strain. Previously, candidiasis was thought to only occur as an opportunistic infection in patients who were inflicted with other diseases, such as those that modify immune status. *Candida* is commonly seen in newborns, the elderly, and those individuals who are immunocompromised. However, it can also be seen in otherwise healthy individuals.

Candidiasis is fungal infection due to any type of candida (a type of yeast).^[1] When it affects the mouth, it is commonly called thrush.^[1] Signs and symptoms include white patches on the tongue or other areas of the mouth and throat^[2]. Other symptoms may include soreness and problems swallowing.^[2] Infections of the mouth are most common among children less than one month old, the elderly, and those with weak immune systems. Conditions that result in a weak immune system include HIV/AIDS, the medications used after organ transplantation, diabetes, and the use of corticosteroids.

Other risks include dentures and following antibiotic therapy.^[3]

Causes

Candida yeast are generally present in healthy humans, frequently part of the human body's normal oral and intestinal flora, and particularly on the skin; however, their growth is normally limited by the human immune system and by competition of other microorganisms, such as bacteria occupying the same locations in the human body.^[4]

Candida requires moisture for growth, notably on the skin.^[5] For example, wearing wet swimwear for long periods of time is believed to be risk factor.^[6] In extreme cases, superficial infections of the skin or mucous membranes may enter into the blood stream and cause systemic candida infections.

Factors that increase the risk of candidiasis include HIV/AIDS, mononucleosis, cancer treatments, steroids, stress, antibiotic usage, diabetes and nutrient deficiency. Hormone replacement therapy and infertility treatments may also be predisposing factors.^[7] Treatment with zantibiotics can lead to eliminating the yeast's natural competitors for resources in the oral and intestinal flora; thereby increasing the severity of the condition.^[8] A weakened or undeveloped immune system or metabolic illnesses are significant predisposing factors of candidiasis.^[9] Almost 15% of people with weakened immune systems develop a systemic illness caused by candida species.^[10] Diets high in simple carbohydrates have been found to affect rates of oral candidiasis.^[11]

About 35-40% of humans possess *C. albicans* as part of their normal oral microbiota,^[12] with more sensitive detection techniques; this figure is reported to rise to 90%.^[13] This candidal carrier state is not considered a disease, since there are no lesions or symptoms of any kind. Oral carriage of candida is pre-requisite for the development of oral candidiasis. For candida species to colonize and survive as a normal component of the oral microbiota, the organisms must be capable of adhering to the epithelial surface of the mucous membrane lining the mouth.^[14] This adhesion involves adhesions (e.g., hyphal wall protein 1), and extracellular polymeric materials (e.g., mannoprotein).^[15] Therefore, strains of candida with more adhesion potential are more pathogenic than other strains.^[13] The prevalence of candida carriage varies with geographical location,^[13] and many other factors.

Higher carriage is reported during the summer months,^[13] in females,^[13] in hospitalized individuals,^[13] in persons with blood group "O" and in nonsecretion of blood group antigens in saliva.^[13] Increased rates of candida carriage are also found in people who eat a diet high in carbohydrates, people who wear dentures, people with xerostomia (dry mouth), in people taking broad spectrum antibiotics, smokers, and in immunocompromised individuals (e.g., due to HIV/AIDS, diabetes, cancer, Down syndrome or malnutrition).^[15] Age also influences oral carriage, with the lowest levels occurring in newborns, increasing dramatically in infants, and then decreasing again in adults. Investigations have quantified oral carriage of *Candida albicans* at 300-500 colony forming units in healthy persons.^[16] More candida is detected in the early morning and the late afternoon. The greatest quantity of candida species are harbored on the posterior dorsal tongue,^[15] followed by the palatal and the buccal mucosa.^[16] Mucosa covered by an oral appliance such as a denture harbors significantly more candida species than uncovered mucosa.^[16]

When candida species cause lesions the result of invasion of the host tissues-this is termed candidiasis.^{[17][14]} Some consider oral candidiasis a change in the normal oral environment rather than an exposure or true "infection" as such.^[18] The exact process by which candida species switch from acting as a normal oral commensal in the carrier (saprophytic) state to acting as a pathogenic organism (parasitic state) is not completely understood.^[13]

Several candida species are polymorphogenic,^[19] that is; capable of growing in different forms depending on the environmental conditions. *C. albicans* can appear as a yeast form (blastospores), which is thought to be relatively harmless; and a hyphal form associated with invasion of host tissues.^[12] Apart from true hyphae, candida can also form pseudohyphae-elongated filamentous cells, lined end to end.^[20] As a general rule, candidiasis presenting with white lesions is mainly

caused by candida species in the hyphal form and red lesions by yeast forms.^[15] *C. albicans* and *C. dubliniensis* are also capable of forming germ tubes (incipient hyphae) and chlamyospores under the right conditions. Pseudohyphae are elongated filamentous cells, lined end to end.^[20] *C. albicans* is categorized serologically into A and B serotypes. The prevalence is roughly equal in healthy individuals, but type B is more prevalent in immunocompromised individuals.

Diagnosis

At times, the diagnosis of candidiasis can be made with just the clinical presentation. If the symptoms are present but the clinical exam is not definitive, a culture may be performed to confirm the diagnosis. This is done by using a sterile cotton tip applicator to swab the patient's mouth, and then transfer the swab to Sabouraud's dextrose agar medium. Sabouraud's dextrose agar medium is used for dermatophytes and other fungi and is necessary for this procedure as the lowered pH inhibits growth of most bacteria.

The culture plate is left at room temperature for 48-72 hours. If positive, the agar will show creamy white colonies usually 1-3 mm in diameter. If colonies of yeast are suspected intraoral, an exfoliative cytology can be performed. In this procedure, a wet tongue blade is used to gently scrape the white lesion and the cells are then transferred to a glass slide and fixed with a high alcohol content hairspray. The slide is then processed with a periodic acid-schiff stain which highlights the cell wall of the fungi.

For identification by light microscopy, swab of the affected area is placed on a microscope slide. A single drop of 10% Potassium hydroxide (KOH) solution is then added to the specimen. The KOH dissolves the skin cells, but leaves the candida cells intact, permitting visualization of pseudohyphae and budding yeast cells typical of many candida species.

Germ tube test is a rapid method for identifying *C. albicans* and *C. dubliniensis* by its ability to produce short, slender, tube like structures called germ tubes when it is incubated in serum at 37°C for 2 hours.

Serological identification is not a standard routine procedure for laboratory diagnosis of candidiasis. Molecular diagnosis possible of restriction fragment length polymorphism (RFLP) analysis, tRNA profile analysis and polymerase chain reaction (PCR).

CONCLUSION

Several factors can contribute to developing oral candidiasis. It can occur in patients who are stressed, taking antibiotics, taking medications that cause dry mouth, or who have a hormone imbalance. Sometimes, the actual cause of the candidiasis may be hard to pinpoint. In patients with chronic dry mouth, drinking water throughout the day to keep the oral mucosa

hydrated can be beneficial in preventing a pH change that would allow for the yeast to outgrow the normal oral bacteria.

There are many forms of oral candidiasis. Some present in very classic ways and others are much more subtle. The use of cytology smears and cultures can aid in the diagnosis. While oral candidiasis is caused by the same organism as other forms, it requires a longer course of antifungal. It is crucial for the dental team to explore all possible diagnosis to aid in the treatment of the patient.

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