REVIEW PAPER

Microbiology

CANDIDA SPECIES IN ORAL CAVITY & CHANGE IN THEIR PREVALENCE OVER YEARS.

KEY WORDS: Candida albicans, Non- Candida species, Oral cavity

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ABSTRACT

Asymptomatic oral carriage of Candida organisms has been recognized for many years and the prevalence is 3-70% in healthy individuals. Changes in the local and systemic conditions may lead to these organisms becoming virulent and responsible for oral Candidiasis. Several factors affect quantity and pathogenicity of Candida in the oral cavity. Candida albicans is the most studied among the Candida species & is generally considered the prototype of this yeast. The prevalence of Candida species in oral cavity which was earlier limited to mainly Candida albicans & negligible percentages of non-candida species has also shown a drastic change in recent years.

SUMMARY OF ARTICLE - In this article the other species of Candida that were generally ignored in the scientific researches & publications pertaining to oral cavity is discussed. Review of studies that have shown the increased prevalence of non-candida species in oral cavity in health & disease is included in this article.

INTRODUCTION

Candida albicans and non-albicans species are closely related but differ from each other with respect to epidemiology, virulence characteristics and antifungal susceptibility. Evidence suggests that some species have a greater propensity to cause superficial, systemic and nosocomial infections than do other species. Candida species identification is therefore important for successful management. Candida albicans is widely studies, but other species need to be understood in terms of above characteristics for better management of infection by this yeast.

Origin of the term "Candida"

Berkout proposed the name Candida from the Latin word "toga candida", which referred to the white robe worn by the Roman senate candidates. Albicans also comes from the Latin word "albicare" which means "to whiten".

CANDIDA SPECIES

The spores of Candida are a commensal that exists as a commensal of humans. It is a normal commensal of the mucosal surfaces of the oral cavity, female reproductive tract and the digestive tract. It is a dimorphic fungus which is generally harmless, but becomes invasive and pathogenic pseudohyphae when there is a disturbance in the balance of flora or in debilitation of the host. [1]

According to Mycologists there are 100,00 described species of fungi and there are a similar number of species waiting to be discovered. [2]

Pathogenic & Opportunistic Fungi

The true pathogenic fungi are those species that are able to elicit disease process in the normal human host, but opportunistic infections find their way when the patient's immune system is compromised before infection is established, as the organisms are of relatively low virulence. The rise of these opportunistic infections is mainly due to increased use of antibiotics, cytotoxins, immunosuppressive drugs, steroids, and other procedures that result in lowered resistance of the host. [3]

TAXONOMY AND TYPING OF CANDIDA

The genus Candida is a collection of some 150-200 yeast species. The genus candida is within the class **Deuteromycetes.** Within the genus, species are characterized primarily by colonial morphology, carbon utilization, and fermentation. There are seven Candida species of major medical importance, the most important being Candida albicans, the one most frequently isolated and the most virulent in man. It can be isolated from human body as a commensal or as an opportunistic pathogen. [3]

Seven Candida species are of major medical importance, and of these C. albicans, C. tropicalis, and C. glabrata are the most frequently isolated (more than 80%) from medical specimens. The other pathogenic Candida species encountered in human infections are C. parapsilosis, C. stellatoidea, C. guilliermnondii, C. krusei, and C. Pseudotropicalis, C. Lusitaniae, C. Dubliniensis and C. Kyfer. [3,4]

CANDIDAL CARRIAGE IN ORAL CAVITY

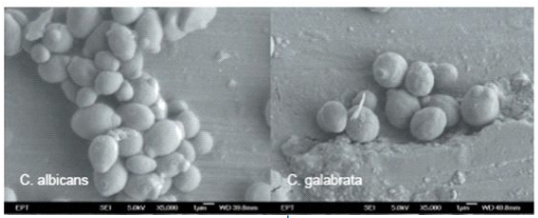
Symptom-free oral carriage of Candida organisms has been recognized for many years. Figures obtained on the frequency of yeast carriage in the oral cavity are dependent on isolation techniques and the time of sampling (**Odds, 1988**). The reported prevalence in clinically sound oral cavity of healthy adults ranges from 3 to 48% (Arendorf and Walker, 1980). C. albicans is the most dominant species, followed by C. tropicalis, C. glabrata, C. parapsilosis, and C. krusei. Other Candida species and genera (Rhodotorula, Saccharomyces, etc.) are rare and transient (**Stenderup, 1990**). [5]

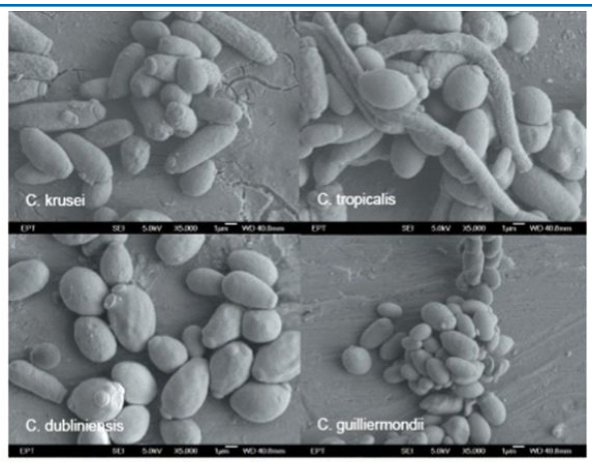
Non-Candida albicans Candida (NCAC) strains, however, are isolated in increasing numbers in medically compromised patients. These strains may cause systemic infections and are often resistant to commonly used antifungal agents such as fluconazole. [6] The role of these other species also referred to as non-candida albicans species (NCAC) have become increasingly important, especially in high-risk patients [7] Some factors that influence carriage include- salivary factors, temporal variation, smoking, oral topography, immune status and oral microflora. [8]

FACTORS PREDISPOSING TO ORAL CANDIDOSIS

Factors predisposing to Oral Candidosis are Chronic local irritants, Ill-fitting appliances, Inadequate care of appliances, Disturbed oral ecology or marked changes in the Oral microbial flora by antibiotics, corticosteroids, Xerostomia, Dietary factors, Immunological and endocrine disorders, Malignant and chronic diseases, Severe blood dyscrasias, Radiation to the head neck, Abnormal nutrition, Age, Hospitalization, Oral epithelial dysplasia and Heavy smoking. [9]

NON-CANDIDA ALBICANS SPECIES





e 1. Scanning electron microscopic images of some non-Candida albicans Candida strains.

Fig.- 1. Non Candida albicans species [6]

CANDIDA TROPICALIS- Candida tropicalis has been the most prevalent & virulent pathogenic yeast species of the Candida-non-albicans group. It is usually isolated from the oral cavity and skin.[6] **Fromtling et al.,** in **1987** through clinical and experimental observations suggested that morbidity and mortality rates are higher due to C. tropicalis infection than due to C. albicans infection. Its high virulence may be due to due to its ability to adhere to epithelial cells in vitro and its ability to secrete moderate levels of proteinase.. [9]

CANDIDA KRUSEI- C. krusei causes infection mainly in critically ill patients and is most often isolated in hematology patients with severe neutropenia. C. krusei, but generally shows less invasiveness than C. albicans or C. tropicalis. It is claimed to be intrinsically resistant to fluconazole and may have reduced susceptibility to amphotericin. [10]

CANDIDA DUBLINIENSIS- Candida dubliniensis is a recently identified species of Candida was first described in 1995. It produces germ tubes giving false positive results hence they were previously hidden among the germ tube positive strains of C. albicans.[11] It is comparatively less virulent than C. albicans, suggested reason being its lower capacity to form hyphae compared to C. albicans. Decreased susceptibility or resistance has been reported in isolates recovered from HIV-patients receiving fluconazole therapy. [12]

CANDIDA PARAPSILOSIS:- C. parapsilosis has an extensive distribution in nature and is also a normal human commensal. It is the most common Candida species causing invasive disease worldwide resulting in deep-seated infections, and has a mortality rate ranging from 4% to 45%.[13]

CANDIDA GLABRATA- In diabetic individuals, C. glabrata has been identified as the second most frequently isolated species after C. albicans. Compared with other non-albicans Candidal infections, the mortality rate of C. glabrata infections is the highest (50%-cancer & upto 100%-bone marrow transplant patients). [14]

CANDIDA STELATOIDEA & CANDIDA GUILIERMNONDI- C.stellatoidea is a pathogenic yeast which has been recovered sometimes from oral cavity particularly in cases of denture stomatitis.. [15] Oral colonization has by C. Guiliermnondi been described in immunocompentent individuals, patients with cancer, as well as in those treated with oral inhaled corticosteroids. [6]

CANDIDA PSEUDOTROPICALIS & CANDIDA LUSITANIAE- C. Pseudotropicalis occasionally appears as indigenous flora in humans and as a rare cause of fungemia, and disseminated disease.[16] C. Lusitaniae is a rare pathogen and few studies have been performed on it. It is less pathogenic than C. tropicalis and C. parapsilosis and causes infection mainly in immunocompressed hosts with prolonged administration of broad-spectrum antibiotics, prolonged hospitalization, cytotoxic or corticosteroid therapy, or granulocytopenia. [6]

CONCLUSION

Candida albicans is a normal commensal within the oral cavity and simply the presence of the fungal species itself does not relate to the etiology of various oral diseases which shows its presence. Although Candida albicans is the predominant isolate, nonalbicans species also have been proven to be emerging pathogenic opportunistic infection in recent years. They differ from each other with respect to epidemiology, virulence, and antifungal susceptibility. All may cause a similar spectrum of disease but differences in disease severity and susceptibility to antifungal agents are seen. Due to the changing pattern of prevalence of Candida species, studies involving isolation and identification of various species of Candida in immune compromised individuals is important for better treatment strategies and thus a good control over the disease.

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