

The Association of Yeast Infections in Periodontal Diseases and Operatory Cleanliness

There has been an increase of oral yeast infections in the last 23 years. Oral yeast infections occur most frequently among patients with HIV infection, patients on antibiotics, corticosteroids or cytotoxic drugs, chemotherapy and patients receiving radiation therapy. In addition to that patients who are diabetic and/or subjects wearing intra-oral removable appliances have more yeast infections. A number of other local and general factors can lead to oral yeast infections. In the mouth, *Candida albicans* is the most commonly isolated species, accounting for 70 to 75% of the samples taken. *C. glabrata* and *C. tropicalis* are the second common species, and each constitute about 7%. The prevalence of yeasts in periodontal pockets has been reported to be 14 to 24% of those sampled.

According to experts the primary etiology of gingivitis is poor or ineffective oral hygiene which leads to the accumulation of a mycotic and bacterial matrix at the gum line, called dental plaque. What most professionals may not be aware of in this seemingly obvious cause of gingivitis by plaque is that yeast infections are a crucial component of plaque formation. What may also be unfamiliar to many dental professionals is the association of yeast infections in periodontal pockets.

In a study completed in 2003 entitled, "Oral Distribution of Genera, Species and Biotypes of Yeasts in Patients with Marginal Periodontitis" which was published in the publication Microbial Ecology in Health and Disease, many types of oral fungi were sampled to determine which species might cause or contribute to periodontal disease. In this study it was found that most of the oral yeasts in both healthy and marginal periodontitis (MP) patients were identified as *Candida albicans*, however, the most variable yeast *Candida dubliniensis* was associated with infection. In addition to this, *C. dubliniensis* adheres to the bacterial periodontal pathogen *F. nucleatum*. To quote from their article on the significance for that:

"*C. dubliniensis* differs from *C. albicans* with respect to potency of virulence factors such as higher tendency to phenotype switching (24), and enhanced adherence to buccal epithelial cells (25) and to *Fusobacterium nucleatum* (26). *F. nucleatum* is a major anaerobic bacterium in periodontal pockets, and may play an important role in microbial colonization of the oral cavity (27). The ability of *C. dubliniensis* to adhere to *F. nucleatum* may aid in the microbial colonization of deep pockets."

The study found that most of the varieties of yeast were harbored on the buccal mucosa and this reservoir was most likely a source for yeast in the oral cavity. The conclusions of this study are sited here:

"Marginal periodontitis did not increase the carrier rate of yeasts in the oral cavity, but the variation in yeast colony morphology, species and biotype was higher in the MP patients than in the healthy subjects. Among the oral sites examined in the MP patients, i.e. the buccal mucosa,

periodontal pocket and palate, the buccal mucosa was the major site for yeast colonization. Species and biotypes differed between the MP patients and the healthy subjects, as well as among the oral sites of the MP patients. *C. albicans* was most dominant in all the oral sites of the MP patients and the healthy subjects. Among the other *Candida* species, *C. dubliniensis* was the most prominent in the periodontal pockets.”

In another study done in 2009 published online in the US National Library of Medicine titled, “Periodontal conditions, oral *Candida albicans* and salivary proteins in type 2 diabetic subjects with emphasis on gender” it was found that *C. albicans* was greatly increased in subjects with diabetes and interestingly this seems to have a greater risk to female patients periodontitis than it did with males. There was also an increase in IgG Immunoglobulins in both sexes because this immunoglobulin enters the mouth through the gingival sulcus and increases in the presence of gingival infection.

“Clinical and salivary parameters of periodontal inflammation (BOP and IgG (μ g)/mg protein) were higher in type 2 diabetic females with oral *C. albicans* colonization compared to males in the same group. These gender-specific features may offer a route to improve oral healthcare for females with T2D”

From the two articles cited in this paper one can see that the main harbor spot for yeast infections is the buccal mucosa and that all forms of yeast infections are increased in the presence of certain systemic diseases including metabolic syndrome and other debilitating illnesses. From the University studies done on Oracare at the University of Iowa and from West Virginia it was found that Oracare was remarkably effective at killing yeast infections in both planktonic and biofilm infections in vitro.

In another published in vivo pilot study on chlorine dioxide treatment of oral *Candida* infections entitled “Clinical and microbiological efficacy of chlorine dioxide in the management of chronic atrophic candidiasis: an open study”, International Dental Journal, 2004, the authors concluded there was “clinical and microbiological evidence for the safety and effectiveness of the topical antiseptic chlorine dioxide (0.8%) in the management of chronic atrophic candidiasis.”

And finally, in a related article of importance from Ann Agric Environ Med 2006, **13**, 177-179, in the abstract entitled, “Exposure to Airborne Fungi During Conservative Dental Treatment” a number of fungi were isolated from operatory air during dental hand piece operation. Here is a quote from the findings of that article:

“The volume of the sampled air was 100 litres. Before disinfection, the concentration of fungi in the collected air samples at individual operative sites ranged from 4×10^1 cfu/m³ to 34×10^1 cfu/m³. The most common species was *Penicillium herquei*

(62.17% of the total count), followed by other fungi: *Alternaria alternata* - 12.68%, *Penicillium roseopurpureum* - 9.41%, *Rhizopus nigricans* - 5.93%, *Aspergillus terreus* - 3.89%, *Geotrichum candidum* - 2.25%, *Aspergillus glaucus* group - 2.04%, *Cladosporium cladosporoides* - 1.23% and *Penicillium diversum* - 0.41%. The concentration of *Penicillium herquei* at individual operative sites ranged from 0 to 34×10^1 cfu/m³, mean 121.6 cfu/m³, *Penicillium roseopurpureum* - from 0 to 11×10^1 cfu/m³, mean 18.4 cfu/m³ and *Alternaria alternata* - from 0 to 18×10^1 cfu/m³, mean 24.8 cfu/m³. After disinfection, like before disinfection procedures, the prevailing species of fungi were: *Penicillium herquei*, *Penicillium roseopurpureum* and *Alternaria alternata*, which amounted to 62.6%, 18.28% and 11.36% of the isolated fungi, respectively. The recorded levels of total airborne fungi were lower after DUWL disinfection compared to those before disinfection.

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This final study is included to emphasize the importance of pre-procedural rinsing before all operative and hygiene procedures in the dental treatment rooms. Not only fungi but viruses and bacteria are sprayed into the room by hand pieces and ultrasonic scalers creating a contaminated operatory for cross contamination to patients but also increasing the chances of microbial inoculation of the blood stream and eye infections of operatory staff. With the remarkable killing power of chlorine dioxide on yeast organisms, it would be very important to also use it for this purpose as well as a periodontal irrigate.

