Short Communication

Attachment of *Candida albicans* to Denture Base Acrylic Resin Processed by Three Different Methods

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Denture stomatitis is a debilitating disease associated with the presence of adherent *Candida albicans*. This study compared the attachment capacity of *C albicans* to three different acrylic resin materials (self-curing [SC], conventional pressure-packed [CPP], and injection-molded [IM]) to determine whether the physical properties of the materials influenced candidal attachment. No significant differences in attachment between the isolates were observed for each acrylic resin. However, a comparison of the mean of all isolates showed significantly less attachment to SC than to CPP ($P < .05$). These data indicate that choice of denture acrylic resin material may influence the capacity for developing denture stomatitis. *Int J Prosthodont 2009;22:488–489.*

There are approximately 15 million denture wearers in the United Kingdom, representing a significant health care consideration.[1] The prevalence of denture stomatitis, which has a multifactorial etiology, is high among these individuals. The development of denture stomatitis is influenced by, among other factors, the denture base material. The impression surface of a maxillary denture in particular may be a common reservoir for microorganisms. *Candida albicans* is the most important and predominant oral fungal pathogen. It has the ability to adhere and proliferate on both soft and hard tissues, forming complex biofilm structures.[2] This is dependent on the initial attachment to the denture impression surface, which is in turn dependent on the physical properties of the material surface, such as porosity, surface free energy, hydrophobicity,[3] and roughness.[4] These variables are all influenced by the polymerization method, material used, and any surface modifications (eg, incorporation of fibers or surface coating).[4,5] This study aims to compare candidal attachment to three different denture base acrylic resin samples processed by autopolymerizing (self-curing [SC]), conventional pressure packing (CPP), or injection molding (IM).

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Materials and Methods

SC (PalaXpress autopolymerizing acrylic resin, Heraeus Kulzer), CPP (Trevalon, Dentsply), and IM (PalaXpress, Heraeus Kulzer) acrylic resins were prepared in accordance with each manufacturer's instructions. Acrylic resin samples were adjusted to remove excess material flash and trimmed into 10-mm^2 sections. Samples were then placed in sterile water for 3 days to remove any residual monomer. Immediately prior to use in this study, samples were sterilized using an ultraviolet light unit for 10 minutes.

C albicans ATCC 90028 and eight clinical isolates from a recent investigation were included in this study.[2] All isolates were stored on Sabouraud dextrose agar plates at 4ºC until use. Each isolate was propagated as budding yeast cells in a yeast peptone dextrose medium and standardized to 1×10^8 cell/mL in a phosphate-buffered saline (PBS).

Sterile samples of IM, CPP, or SC denture base materials were placed into a Petri dish and a 100-µL drop of the standardized *C albicans* was placed on the surface of each acrylic resin sample. Each sample was incubated at 37ºC for 1 hour. Samples were washed in PBS to remove nonadherent cells and attached cells were removed from the denture by mild sonication at 35 kHz for 5 minutes, and then quantified using the Miles and Misra plate count method.

Statistical Analysis

A one-way analysis of variance with the Bonferroni test for multiple comparisons was performed using GraphPad Prism version 4.0 for Windows (GraphPad Software).

Results

Quantitative analysis of yeast cell attachment from all nine strains of *C albicans* to either SC, CPP, or IM acrylic resins revealed that there were no statistical differences between the attachment capacity of each strain tested within each group of resin examined ($P > .05$). Quantitative analysis of the ability to attach to SC, CPP, or IM was subsequently performed on the mean of all nine isolates. Figure 1 illustrates that attachment to SC was significantly reduced in comparison to CPP ($P < .05$). However, the comparison of both SC and CPP to IM showed no significant changes in attachment capacity to these acrylic resins ($P > .05$).

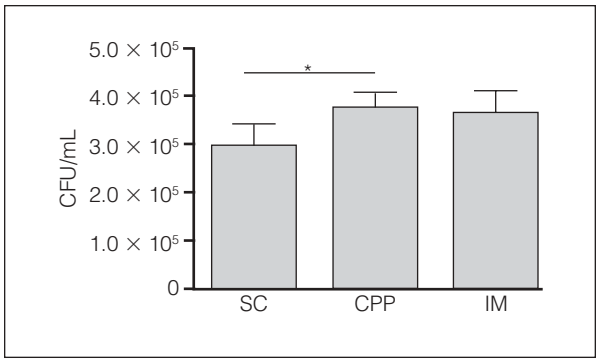

Fig 1 Mean colony forming unit (CFU) attachment of nine strains of *C albicans* on three denture materials: SC, CPP, and IM. A significant reduction in attachment was observed between SC and CPP ($P < .05$).

Discussion

The physical and chemical composition of denture base acrylic resin is particularly important in terms of reducing the ability of pathogenic yeast cells to attach and form biofilms. This limited study has clearly shown that where no significant variation of strain attachment to different surfaces is observed, a significant reduction in attachment to SC denture base acrylic resins was noted. These data indicate that material surface factors may play a greater role in promoting or preventing candidal adhesion than the organism itself per se. Reduction of candidal adhesion would ultimately improve overall oral hygiene through lessening the impact that biofilms have on the oral cavity. Such biofilms are difficult to remove through chemotherapeutic intervention and are associated with denture stomatitis and other forms of oral candidosis. Therefore, further consideration should be given to studies investigating the modification and development of improved denture base materials that may provide a more biocompatible material to the oral environment.

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References

1. Coulthwaite L, Verran J. Potential pathogenic aspects of denture plaque. Br J Biomed Sci 2007;64:180–189.
2. Coco BJ, Bagg J, Cross LJ, Jose A, Cross J, Ramage G. Mixed *Candida albicans* and *Candida glabrata* populations associated with the pathogenesis of denture stomatitis. Oral Microbiol Immunol 2008;23:377–383.
3. Yildirim MS, Hasanreisoglu U, Hasirci N, Sultan N. Adherence of *Candida albicans* to glow-discharge modified acrylic denture base polymers. J Oral Rehabil 2005;32:518–525.
4. Pereira-Cenci T, Cury AA, Cenci MS, Rodrigues-Garcia RC. In vitro *Candida* colonization on acrylic resins and denture liners: Influence of surface free energy, roughness, saliva, and adhering bacteria. Int J Prosthodont 2007;20:308–310.
5. Karaagaclioglu L, Can G, Yilmaz B, Ayhan N, Semiz O, Levent H. The adherence of *Candida albicans* to acrylic resin reinforced with different fibers. J Mater Sci Mater Med 2008;19:959–963.