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## Cytotoxicity of denture base resins and preventive measures.

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### ABSTRACT

Acrylic resins are being widely used in the fabrication of complete and partial dentures. Possibly toxicity or allergy to PMMA could be due to the contact with polymer, residual monomer, benzoyl peroxide, hydroquinone, pigments, or a reaction product between some components of denture base resins and its environment. Among the above mentioned products the residual monomer is the one which causes irritation. The residual monomer concentration varies with the method of polymerization. This review article gives us information on how to prevent such problems in a clinical set up especially in academics based on the review articles and studies done over the past few years.

**Keywords:** Denture Base Resins, Cytotoxicity, Monomer, Allergy.

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## INTRODUCTION

Heat polymerizing and auto polymerizing polymethacrylate resins are used for the fabrication of complete and partial dentures. The polymerization of chemically activated resins is never as complete as the polymerization of heat activated materials. Failure to achieve a high degree of polymerization will predispose the denture base to dimensional instability and may lead to soft tissue irritation. Few complete denture patients also complain of irritation and ulcers during the complete denture treatment procedure [1]. This makes the patients uncooperative. Several authors cite the most frequent complaints with complete dentures post treatment are those pertaining to retention and stability, esthetics, comfort while eating, the accumulation of food under the prosthesis and allergic response to denture bases. This study deals with the preventive measures of the problems encountered in the patients due to the allergic responses or cytotoxic effects of the acrylic resin during the complete denture treatment procedure.

### CYTOTOXIC EFFECTS OF RESINS:

Toxicity is usually manifested by the release of several chemical constituents from the material, which can induce allergic responses in terms of localized or generalized stomatitis [2]. Furthermore, contact sensitivities are more common to occur with cold or autopolymerized resins than heat cured denture base materials.

Acrylic resins were found to cause hypersensitive reactions, irritation, inflammation, and allergic responses of the oral mucosa in patients due to the residual monomer in which there is incomplete conversion of monomer to polymer. Resins polymerized via chemical activation generally displace 3% to 5% free monomer. Whereas heat activated resins exhibit 0.2% to 0.5% free monomer. Under in vivo and in vitro conditions, formaldehyde and methyl methacrylate were significantly leached into human saliva and saliva-substitute buffer, especially from autopolymerized resins. Clinical signs show erythema and burning sensations.

### STEPS TO PREVENT CYTOTOXIC EFFECTS OF ACRYLIC DENTURE BASE RESINS IN PATIENTS DURING TREATMENT:

The factors that affect the cytotoxicity of denture base resins are:

#### **Polymer to monomer ratio:**

Polymer to monomer ratio are one of the causes of cytotoxicity. The more monomer added to the mixture, greater will be the amount of residual monomer and thus it has more potential for cytotoxicity [1]. Also it has been observed that resins that are prepared with higher proportions of monomer to polymer (5:3, the normal being 3:1) will reduce the amount of residual monomer thus making it less toxic to the wearer [3]

#### **Polymerization method:**

The degree of polymerization that is achieved in chemically activated resins is not as complete as heat activated resins thus leaving a greater amount of unreacted monomer when fabricated in chemical activation [4][5]. The cytotoxic effect is greater in auto polymerized resins than in heat polymerized resins [6].

#### **Storage time and water storage:**

The cytotoxic effect may occur for several days after polymerization, but it can be reduced if the prostheses are stored in water for 24 hours because the toxic substances into the medium within the first 24 hours are either broken down over the time or complexed with other chemicals in the medium that may alter the cytotoxic effect [7]. Thus it is recommended that the denture is soaked in water for at least 24 hours prior to the placement of the denture in the patient's oral cavity at 60°C to reduce the amount of released monomer [5]. Furthermore surface monomer is completely removed within 17 hours [8]. Studies also say that the immersion of the prostheses in hot water decreased the hypersensitive reactions in patients. By immersing the prosthesis in heated water, monomer molecules diffuse more rapidly, reaching the remaining free radicals

and leading to a complementary polymerization cycle [9]. For chemically activated resins the coefficient of water in denture reins are relatively low, the time required for a denture base to reach saturation is thus considerable. This depends upon the thickness and storage conditions of the prostheses. A typical denture base may require a period of 17 days to become fully saturated with water [10].

#### Precautions:

Repeated or prolonged contact with monomer can also cause contact dermatitis. Hence the dental personnel should refrain from handling such materials with bare hands. Inhalation of monomer vapor may be detrimental. Therefore, the use of monomer should be restricted to well ventilated areas [11].

#### CONCLUSION

The initial signs of cytotoxicity are not very prominent. This review article gives us an idea on how to overcome and prevent such problems especially in academics and clinical set up. On the basis of the review, it may be concluded that the cytotoxic effect of denture base acrylic resins may be related to storage time, powder to liquid ratio, polymerization method, and cycle. Auto polymerized resins are the most cytotoxic denture base material. To avoid such problems the denture must be stored for 24 hours in hot water prior to trial and usage.

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