REVIEW ARTICLE

Release of Components of Dental Alloy and Denture Materials:An Insight

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ABSTRACT

The properties of certain alloys and Polymers enable us to use them in dental practice by their property of biocompatibility. Dental alloys and dental materials are exposed daily to different conditions in the oral cavity. The oral environment is particularly ideal for biodegradation of materials because of thermal, microbiological and enzymatic properties. Chewing force may be high, pH of the saliva may fluctuate between acidity and alkalinity, thermal fluctuations added with microbial action is more conducive to decay. So there can be a release of metal ions and leaching of other material from the denture materials and casting alloys. The Elemental release is more important because it plays a significant role in material biocompatibility.

KEYWORD: Dental Alloy, Denture Materials, Sealants, Liners

INTRODUCTION

Any material to be used in oral cavity should be biologically compatible. It means being harmonious with life and not the having toxic or injurious effect on biological function.

- It should be inert under any condition.
- It should not contain the toxic diffusible substance that can be released and absorbed into the circulatory system to cause any systemic effects.
- It should be free of any sensitizing agents that are likely to cause an allergic response.
- It should have no carcinogenic potential .

Dental materials are used in humans for short and long period, and these materials function in close contact with human tissues. In this regard host environment for dental biomaterials are especially complicated bacteria, debris, corrosive properties of saliva and other fluid.The article reviews release of ions and other products of dental material in the oral cavity in different conditions.

DENTAL CASTING ALLOYS

Cobalt chromium along with nickel and molybdenum alloys are commonly used for cast partial denture. The nickel content is usually 0.5%, but in some products, the percentage may exceed.

The saliva concentration of cobalt and chromium showed a large variation between patients.Metals from cobalt chromium dentures are readily detected in the oral cavity.[1] Newer and large denture released more metals than old dentures. Thus there exists an inverse relationship between metal release and age of the denture.[1] This indicates that the alloys become more strongly passivated with time. Cobalt chromium and nickel are the most common constituents of dental materials causing allergic reaction.[2] Chromium release is twice than that of cobalt.[1]

It is hypothesized that acidic environment increased elemental release. High noble and noble alloys were resistant to the acid environment. A pH of 4 did not increase the release. But at pH 1 there was a slight release of Ag, Cu, and Pd in some alloys.[3,4]

Cobalt-chromium alloys used for implants corrode in vivo.[5,6,7] Shell splinters containing cobalt in the shoulder arm region of the patients have caused cobalt allergy.[8] An increase cobalt content in the patients with metal hip joint restorations has been reported.[9]

The dynamic nature of intraoral condition extends beyond a simple reduction in pH. Alloys also experience mechanical disruption from occlusal forces and tooth brushing.The role of these dynamic conditions on the release of the elements from alloy is virtually unknown, but it has been indicated that they are important.[4]

DENTAL CASTING ALLOYS

Ever since its discovery denture polymers play a vital role in modern dentistry. They are chemically of poly methyl methacrylate and the monomers are methacrylate.

The resin should be chemically stable and not deteriorate in the oral cavity.It should preferably polymerase to completion without leaching any residual monomers.

Denture base acrylic resins have low water solubility, and the little that occurs is a result of leaching out of traces of unreacted monomer and water soluble additives into the

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Functions	Substances
Monomer	MethylMethacrylate (MMA),Ethylene Glycol di -methacrylate
Monomer degrades to	Methacrylic acid
Monomer oxidizes to	Formaldehyde
Stabiliser	Hydroquinone,Resorcinol,Pyrogallol
Accelerator	N,N- dimethyl P toluidine
Matrix monomer of light curing resin	Poly (ethyl methacrylate) Ethoxylisedbisphenol A dimethacrylate
matrix monomer of microwave curing resin	Urethane dimethacrylate
Initiator	Benzoyl peroxide
Reaction product of DBP	Biphenyl, phenylbenzoate,benzoic acid
Photoinitiator	Camphoroquinone
Plasticizer	Dibutylphthalate,dicyclohexyl phthalate
UV absorbers	Phenyl salicylate
Coloring agents and fillers	Cds,Cdse,inorganic fillers,cu

Table 1: Percolating agents and ingredients of Polymethyl ethacrylate[10,11]

oral cavity.Auto polymerizing acrylic resin exhibited higher residual monomer than heat cure resin.

Marginal Percolation is caused by a difference in coefficient of thermal expansion.

DENTAL SEALANTS

Many of the composites resin and sealants used in dentistry are mainly based on bisphenol glycidyl ether ethaacrylate (Bis GMA). Reports revealed that in situ polymerization is incomplete and that free monomers can be detercted in different analytic methods.[12 13]

DENTAL LINERS

Resilient denture lining materials are widely used in prosthetic dentistry. Though these materials are used by the clinician to restore the health of the inflamed denture-supporting tissues they have disadvantages in their physical properties and their response to microbial growth. Effective plaque control is necessary for clinical use of these materials. Denture cleansers are considered an effective method to prevent Candida Albicans invasion and plaque control. But certain denture cleansers cause significant deterioration of the tissue conditioners in relatively short time[14]and this leads to the leaching of plasticizers and hardens the liner in relatively short time.

CONCLUSION

The science of dental biomaterials must be based on a broad information of certain biologic consideration are associated with the use of certain materials designed for the oral cavity. Strength or resistance to deformation is unimportant if the material is injurious to the pulp or oral tissues. Poly ethyl methacrylate resin may leaches 0.1 – 5% of residual monomer and additives mainly methacrylate and formaldehyde which have possible carcinogenic potential. There is a need to develop nonleachable resins and liners

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