

Toxicology and Allergology of Dental Plastic Materials

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Dental materials should not only look good and last a long time, they should also be well tolerated. Questions about their toxicology/biocompatibility have raised a growing interest. Monomer and co-monomer compounds are used in dental medicine, e.g. in composites and dentin adhesives. These compounds can be possibly released from these materials and end up in the human body through resorption.

One important aspect in the evaluation of toxicology is the determination of the resorption, metabolism and elimination of a substance in an organism. Only resorbed substances can cause damage. Animal studies have shown that the (co)monomers hydroxyethyl methacrylate (HEMA), triethylene glycol dimethacrylate (TEGDMA) and bisphenol glycidyl methacrylate (BisGMA) released from composites and swallowed are completely resorbed and broken down to CO₂ in the body. It has also been shown that intermediates produced during this metabolism can have strong toxic effects themselves - leading to "poisoning". During the decomposition of HEMA and TEGDMA in human liver microsomes, the formation of an epoxy intermediate, 2,3-epoxymethacrylic acid, has been detected. Epoxy compounds are considered carcinogenic and mutagenic. For a scientifically supported risk analysis, it is important to know how much of a substance will be released by a material, how much is actually absorbed by the organism, and at what level do health problems start manifesting in the organism. In the past 10 years, a growing number of patients have shown increased manifestations of adverse effects (e.g. lichenoid reaction, asthma, eczema) after dental restoration. The trigger of such reactions has now been conclusively identified as methacrylates HEMA and TEGDMA, which are commonly used in dental medicine. In continued personal research, the release rate of such compounds was determined for many of the commercially available composites and adhesives and the world's largest and only database established. In collaboration with the clinics at LMU Munich, allergy tests were developed to prove the possible presence of any existing allergies to substances from dental materials.

Selection of the best tolerated dental materials before a dental restoration:

LMU Munich has recently established the *International Advisory Centre for the Tolerance of Dental Materials* (www.dentaltox.com). Today, it is possible after allergy testing and using the available, world's largest database to select the optimal, best tolerated filling material for a given patient before a planned dental restoration. Patients with known allergies and intolerance reactions are emphatically advised to consult this dental toxicology advisory centre at LMU before undergoing dental restoration. At this centre it can also be determined whether the patient currently has dental material in his or her mouth that is responsible for the symptoms. If that is the case, the patient should have the material removed as quickly as possible and replaced by the recommended, best tolerated dental material.

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Typical examples of lingua plicata - fissured tongue

Typical examples of lingua geografica - benign migratory glossitis



Perioral dermatitis after application of a ceramic inlay with an adhesive

Adverse effects of composite/adhesive applications in patients:
 Lingua plicata (fissured tongue) and Lingua geografica
 (benign migratory glossitis)