TOXICITY OF MONOMERS

The term “resin-based dental materials” refers to dental materials containing polymers, like composites, adhesives, cements and denture base material. Usually, these polymers are formed by in situ polymerization of methacrylate monomers. The polymerization process never reaches completion, and unreacted monomers can leak out of the material after curing. The availability of data concerning patient side effects caused by leakage products is sparse, but side effects linked to these materials have been reported. Mucosal changes near the material are most likely to occur.

Monomers bind to proteins in the human body.

Hypersensitivity reactions to resin-based materials in dental personnel strongly indicate that monomers bind to proteins in the human body. Detailed knowledge of the possible toxicity of the leakage products and underlying mechanisms is, however, mainly based on results from laboratory studies. In these in vitro studies, cells are exposed to different methacrylates and cell viability and function are measured. In all studies, methacrylates are shown to have a cytotoxic potential.

Both cell death and inhibition of cell growth have been observed in different cell types. Further studies aimed to elucidate the underlying mechanism for the cytotoxicity. It has been suggested that the toxic responses are caused by oxidative stress and DNA damage in cells exposed to methacrylates. Not all studies support this view and another mechanism such as direct interaction with proteins has also been advocated as a key event.

Although in vitro experiments can provide valuable information on the potential of possible toxicants to interfere with cellular molecules, homologous cell cultures lack the complexity of multicellular tissues like the oral mucosa. Furthermore, cells in a culture also differ from their in vivo counterparts, e.g. by altered expression of certain metabolic enzymes. Hence, translation of results from in vitro to an in vivo situation is associated with great uncertainty and should be done with caution.

Read more:
Samuelsen JF, Dahl JE. Toksisitet av plastmaterialer. Aktuell nordisk odontologi, Universitetsforlaget, 01/2016: 185-194
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