

Qualitative analysis of dental material ingredients, composite resins and sealants using liquid chromatography coupled to quadrupole time of flight mass spectrometry

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In 2011, the World Health Organization has encouraged a global phase-down of the use of dental amalgam and actively supported the use of alternative, resin-based dental materials.^[1] Many monomers in these resin systems are (meth)acrylates derived from Bisphenol A (BPA), such as Bisphenol A glycidyl methacrylate (BisGMA) and Bisphenol A ethoxylate methacrylate (BisEMA). Other frequently used monomers, such as triethylene glycol dimethacrylate (TEGDMA) or urethane dimethacrylate (UDMA), lack the BPA backbone.^[2] Besides monomers, other compounds such as photo-initiators and stabilizing agents can be present in the dental resin matrices. Often the complete composition is not disclosed being regarded as a trade secret.

The current study consists in the development of an analytical method for the separation and identification of dental material components for suspect screening purposes using LC-QTOF-MS. The developed method was applied on several standards of dental material ingredients, unpolymerized composite resins and a dental sealant. The acquired data was analyzed using suspect screening techniques using an in-house developed library.

Next to the expected main components, isomers and several impurities related to the production of the main component have been detected and identified in the dental material ingredients. In the composite resins and sealants several major components such as BisEMA, BisGMA and TEGDMA were identified although they were not always stated in the material safety data sheets. Minor components included photoinitiators such as ethyl 4-dimethyl aminobenzoate (EDMAB) and (meth)acrylates impurities relating to major components.

References

[1] World Health Organization, *Future use of materials for dental restoration. Report of the meeting convened at WHO HQ, Geneva, Switzerland, 2011.*

[2] E. Dursun, H. Fron-Chabouis, J.P. Attal, A. Raskin, *Bisphenol A Release: Survey of the Composition of Dental Composite Resins*, 10, **2016**, 446-453.