



HPLC quantitative determination of acrylic monomers released from resins used in Dental Restoration

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INTRODUCTION

The polymerization in dental resins is not completed, therefore monomers are released to the environment. Due to the fact some of these monomers are toxic and have side effects in tissues, it is fundamental to characterize the resin. Hence, HPLC is commonly used to identify and quantify the molecules which dental material's are made of.

OBJECTIVE

Optimize and validate an analytical HPLC method for the identification and quantification of some monomers present in the temporary dental prostheses resins TAB 2000®, Protemp 4TM e Structur 3®.

METHODS

Five solutions at different concentrations were made from the standard solutions of the monomers hydroxyethyl methacrylate (HEMA), triethylene glycol-dimethacrylate (TEGMA), methyl methacrylate (MMA) and urethane dimethacrylate (UDMA), which were analyzed by RP-HPLC, obtaining the good calibration curve. Samples were prepared according to the manufacturers' instructions by a sink-in method, for periods of 24 hours, 7 days and 14 days.

RESULTS

The separation and identification of the monomers was possible as the constancy in retention times. TAB 2000® resin is made of MMA and TEGMA; Protemp 4TM is made of TEGMA and UDMA; and Structur 3® is made of TEGMA, MMA and UDMA. TAB 2000® is the one with the highest concentration of eluted monomers. UDMA concentration is higher on Structur 3®. In the first 24 hours, the concentration variation of all Structur 3® monomers and TEGMA on TAB 2000®, is the highest, increasing until the 7th day and decreasing afterwards until the 14th day.

CONCLUSION

The calibration of the HPLC method was achieved, with accurate retention times for each monomer. The studied molecules are released in toxic concentrations. TAB 2000® is made of MMA and TEGMA; Protemp 4TM is made of TEGMA and UDMA; and Structur 3® is made of TEGMA, MMA and UDMA. TAB 2000® is the one with the highest concentration of eluted monomers. The monomers release rate was modeled with two steps kinetic behavior, where the equilibrium is at the 7th day. In the first 24 hours the elution of the monomers is the highest.

RP HPLC OF COMMON MONOMERS USED IN DENTAL RESINS

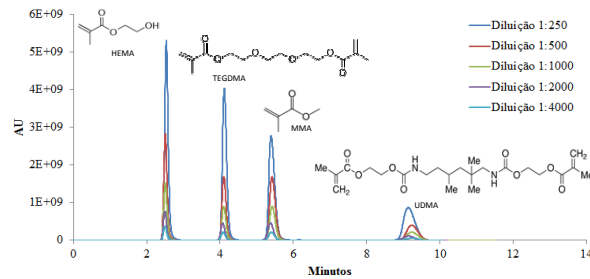
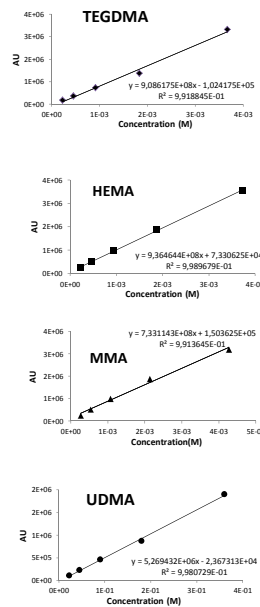


Figure 1 - Optimization of the HPLC: analysis of five solutions at different concentrations of the monomers HEMA, TEGMA, MMA and UDMA

MONOMERS CALIBRATION CURVES



Calibration curves obtained from HPLC: analysis of the monomers HEMA, TEGMA, MMA and UDMA

CHROMATOGRAMS OF RELEASED COMPOUNDS

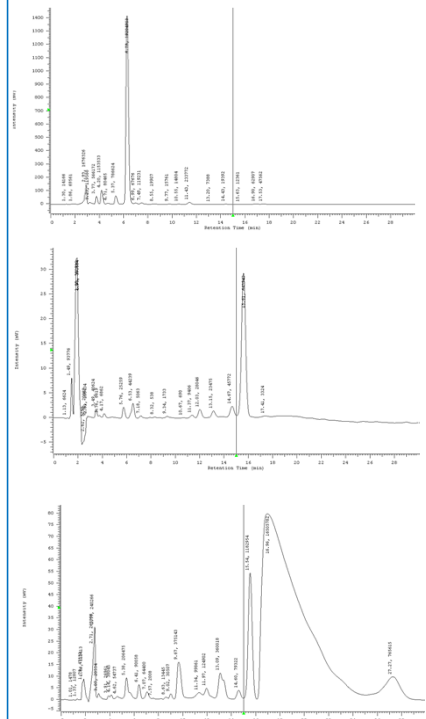


Figure 2 - HPLC chromatograms of released to solution compounds of TAB2000®, Protemp 4TM, Structur 3® resins

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