

Kinetics of monomer and bisphenol-A release from an orthodontic adhesive

Magda Trinajstić Zrinski¹, Dalibor Broznić², Višnja Katić¹, Stjepan Špalj¹.

AIM

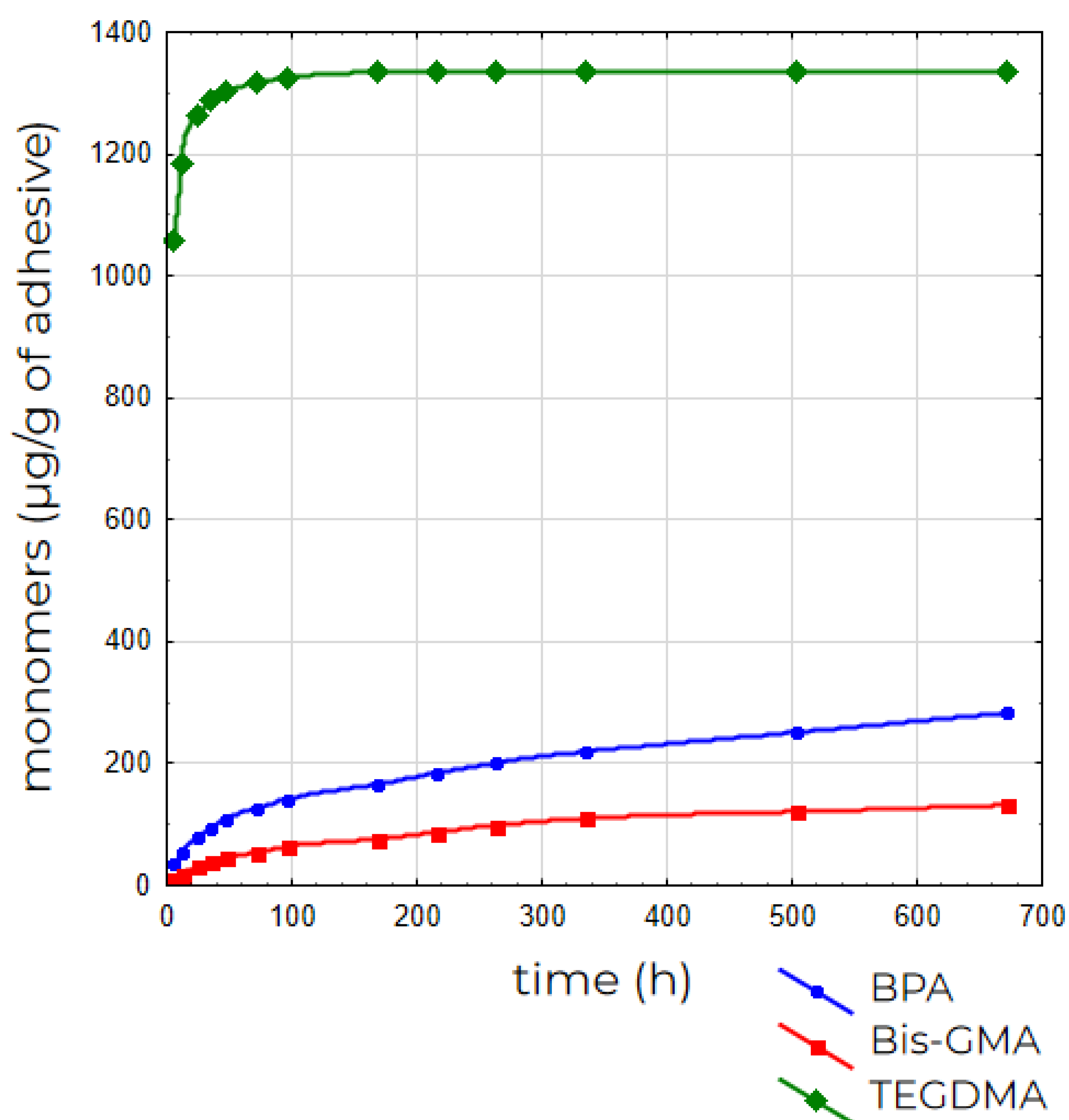
Dental resin monomers and bisphenol-A (BPA) show adverse biological effects. We aimed to evaluate the kinetics of Bis-GMA, TEGDMA and BPA release from an orthodontic adhesive.

METHODS

Ten samples of Transbond XT adhesive combined with the Transbond XT primer were produced under a metallic bracket in a simulation of the clinical procedure and illuminated for 20 seconds. Samples were placed in a glass tube containing 6 mL of distilled water and stored in a thermal chamber at 37° C. After 6 hours, the solution was removed and stored, while 6 mL of fresh distilled water was added to the tube. This process was repeated 12, 24, 36 hours, as well as 2, 3, 4, 7, 9, 11, 14, 21 and 28 days after polymerization. The solutions were analysed for the presence of Bis-GMA, TEGDMA and BPA using high-performance liquid chromatography on a Thermo Separation Products (Spectra System, USA) system equipped with a UV/VIS detector. The experiment was repeated 6 times. All analyses were performed on a Phenomenex Luna reverse phase C₁₈ column (250 mm length, 46 mm ID, 5 µm particle size). Calibration curves of BIS-A, TEGDMA and BIS-GMA were linear from 0.05 to 1, 0.025 to 15 and 0.1 to 5 mg/L respectively with a regression coefficient of $R^2 > 0.9996$ (six calibration points, in triplicate).

RESULTS

TEGDMA showed the highest release rate, peaking at 1337.01 µg/g of adhesive. Its release increased significantly during the first 4 days ($p \leq 0.043$), thus reaching a plateau. The release of Bis-GMA increased significantly between all consecutive testing times ($p \leq 0.03$), with a maximum of 132.44 µg/g of adhesive on the 28th day. Similarly, a significant increase in the release of BPA was found throughout the testing period ($p < 0.001$) and its maximal release was 283.58 µg/g of adhesive (Picture 1).



Picture 1. Release of monomers from Transbond XT in the first 28 days after polymerization

CONCLUSION

TEGDMA is released at a high rate during the early days after polymerization of the Transbond XT adhesive system. Bis-GMA and BPA have a lower and slower release rate that is, however, likely to be continued in the long term.

REFERENCES

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