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Cytotoxicity and Biomineralization Effects of a Novel Calcium-Silicate-Based Cement

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Objectives The objective of this *in vitro* study was to assess the biocompatibility and biomineralization effects of a novel calcium-silicate-based cement BIOfactor MTA (Imicryl Dental, Konya, Turkey) using human-derived dental pulp stem cells (DPSCs), comparing the results with those for BIO MTA+ (Cerkamed, Pawlowski, Poland), and Angelus MTA (Angelus, Londrina, Brazil).
Methods Discs (8-mm diameter, 2-mm thickness) were fabricated using sterile silicon molds. After a 48-hour setting period, each disc was immersed in cell culture media and 24-hour extracts were obtained. DPSCs were seeded at a density of 10^4 cells per well in 12-well plates and cultured with pure extract or 1:2, 1:4 or 1:8 dilutions of the extracts. Cell viability was evaluated by WST-8 assay after 24 hours of extract treatment. DMSO served as the positive control, while the culture medium served as the negative control. The alkaline phosphatase (ALP) activity of DPSCs was assessed after 7 days of treatment. Cytotoxicity data were statistically analyzed using Kruskal-Wallis and post hoc Games-Howell tests, while ALP data were statistically analyzed using one-way ANOVA and post hoc Tukey's tests.
Results Angelus MTA (Undiluted: 38.66±12.70% and 1/8 concentration: 56.76±36.86%) were found to exhibit cytotoxicity, as their viability percentages were below the threshold of 70% set by the ISO 10993. ALP activity of DPSCs demonstrated a significant decrease by exposure to BIO MTA+ extract ($p<0.05$), whereas no significant difference was observed for Angelus MTA and BIOfactor MTA compared with the negative control ($p>0.05$).
Conclusions The novel calcium-silicate-based cement BIOfactor MTA showed no cytotoxicity and its biomineralization effects were greater than BIO MTA+, demonstrating favorable biological properties on DPSCs viability and hard tissue formation ability.