Programmed Cell Death Induced in WEHI 13 var Cultured Fibroblasts by Exposure to Dental Composite Resin Eluates

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Purpose: Earlier studies have shown that in vitro exposure to single compounds released from composite resins is able to induce cell death via apoptosis and/or necrosis. The purpose of this study was to evaluate the effect of eluates of commercially available composites used for direct (Tetric Ceram/Ivoclar-Vivadent, Simile/Pentron, Filtek Z-250/3M ESPE) and indirect restorations (Adoro/Ivoclar-Vivadent and Conquest Sculpture/Pentron) on the type of cell death of cultured WEHI 13 var fibroblasts. ***Materials and Methods:*** Cells exposed to eluates of the materials were assayed by MTT for cytotoxicity, flow cytometry for cell death, biochemically for caspase-3 activation and fluorescent microscopy with Acridine Orange for morphological changes. ***Results:*** The 3 direct composite resin eluates induced extensive apoptosis characterized by externalization of phosphatidylserine at the cell surface, activation and positive cytoplasmic expression of caspase-3, and chromatin disintegration. This was accompanied by morphological changes, such as cell enlargement micromultinucleation and membrane blebbing. On the other hand, the other 2 composite resins for indirect restorations were much less cytotoxic in all biological endpoints investigated. ***Conclusion:*** These findings suggest that composite resins used for direct and indirect restorations differ extensively in their cytotoxic potential and their ability to induce programmed cell death. This signifies the role of composition and polymerization of these 2 classes of biomaterials with respect to their biologic behavior.

Dr Athina A. Bakopoulou was born in Athens, Greece in 1978. She graduated from the Dental School of the National and Kapodistrian University of Athens in 2000 and from the Aristotle University of Thessaloniki in 2007, where she received a Certificate of postgraduate education in Prosthodontics and a Doctorate Degree (PhD). She is currently a clinical instructor at the Post-Graduate Clinic of the Department of Fixed Prosthodontics and Implantology of the Aristotle University of Thessaloniki. Her research activities are focused on biocompatibility of dental materials, biomechanical aspects, and tissue engineering. For her research activities, she was the recipient of the Young Prosthodontostist Award in 2005 and of the First Place Award for Poster Presentation in 2007.

What was your rationale for choosing this research topic? What compelling conclusions can be drawn from the results?

The rationale for focusing on this research area is the increased interest in improved dental materials that are not only biocompatible, but also able to positively interact with the living tissues they are replacing (bioactive materials). The results raise significant concerns on the biological behavior of components released by commercially available, widely used composite resins—primarily those used for direct dental restorations. They also emphasize the importance of conducting extended clinical trials in order to assess the precise risk for patients and dental personnel.