0042

Dust Particles of Dental Restorative Materials: Effects on Gingival Keratinocytes

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Objectives Objective: This investigation elucidates the biological effects of dust particles from dental restorative materials on human gingival keratinocytes (HGK). The study specifically focuses on cellular proliferation, differentiation and ECM synthesis, which are elemental for understanding the implications of dental material-derived particles on oral health.
Methods Methods: Dust particles from three dental composites (Admira Fusion, Filtek Supreme XTE, Ceram.x Spectra ST) were generated under standardized conditions. HGK exposure to these particles (300µg/µl) and derived eluates were analyzed by subsequent assessments of proliferation and differentiation markers Cytokeratin 1 (KRT1), Cytokeratin 10 (KRT10), Involucrin (IVL) and Filaggrin (FLG). Furthermore, the role of Fibronectin (FN) and the related signaling molecules ERK1/2, p38, and Yes-associated-protein (YAP) were analyzed.
Results Results: HGK exposed to dust particles showed a significant increase in fibronectin expression of up to 70-fold increase for Filtek Supreme XTE and 50-fold for Ceram.x Spectra ST, indicating enhanced cellular adhesion, cell motility and matrix synthesis. Furthermore, particle eluate exposure stimulated HGK proliferation and modulated significantly the differentiation profile, as evidenced by in part drastic changes in expression of the differentiation markers KRT1, KRT10, IVL and FLG.
Conclusions Conclusion: This study elucidates the impacts of dental composite-derived dust particles on gingival keratinocytes, underscoring the importance of assessing the biological consequences of dust particles from dental materials. Increased fibronectin synthesis, the promotion of cell proliferation and differentiation highlight potential tissue repair and regeneration implications. Understanding the cellular and molecular mechanisms underpinning these responses is essential for ensuring the safety and efficacy of dental restorative materials.