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Extended Abstract

Anti-Inflammatory Activity of Biomaterials Intended for Periodontal Disease Treatment †

Ana-Maria Seciu [1,2,*], Oana Craciunescu [2], Ligia Stan [2] and Otilia Zarnescu [1]

[1] Faculty of Biology, University of Bucharest, 91-95, Splaiul Independentei, 76201 Bucharest, Romania; otilia_zarnescu@bio.unibuc.ro

[2] National Institute of R&D for Biological Sciences, 296, Splaiul Independentei, 060031 Bucharest, Romania; oana_craciunescu2009@yahoo.com (O.C.); cristacge_ligia@yahoo.com (L.S.)

* Correspondence: ana.seciu@yahoo.com

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Periodontal disease is associated with chronic tissue inflammation, which besides bacterial plaque can lead to enzymatic degradation of the extracellular matrix components from the periodontal ligament, cementum, and alveolar bone [1]. Several studies have reported an increased level of pro-inflammatory cytokines, but also apoptosis events that resulted in cell detachment from the extracellular matrix [2]. The aim of this study was to evaluate the anti-inflammatory activity of natural polymeric biomaterials enriched with silver nanoparticles, in view of their use for periodontitis treatment.

Two types of biomaterials were prepared, one as a polymeric composite based on components of the extracellular matrix, collagen, chondroitin sulfate, and fibronectin [3] and one as a hybrid material by adding silver nanoparticles. Ultrastructural observations were performed by SEM with a Hitachi SU 1510 equipment (Tokyo, Japan), operated at 15 kV, in nitrogen atmosphere. To determine the anti-inflammatory activity, THP-1 cells (ATCC) inflamed with bacterial lipopolysaccharide were cultivated in the presence of biomaterials for 24 h and then the culture medium was analyzed for interleukin-1β (IL-1β) and tumor necrosis factor alfa (TNF-α) pro-inflammatory cytokines level using sandwich ELISA kits (R&D Systems Inc., Minneapolis, MN, USA). Statistical analysis was performed using Student *t*-test.

SEM images showed the presence of silver nanoparticles mainly on collagen fibrils and their homogeneously distribution within the polymeric matrix. Unlike the polymeric composite, the hybrid material presented a significant inhibition (60–70%; $p < 0.05$) of pro-inflammatory cytokines secretion (Figure 1). This effect was probably due to silver nanoparticles interference in distinct signaling pathways preventing cell proliferation, as discussed in previous studies [4].

The presence of silver nanoparticles within the hybrid material represented a clear advantage by increasing its anti-inflammatory activity and demonstrating its possible application in periodontitis treatment.

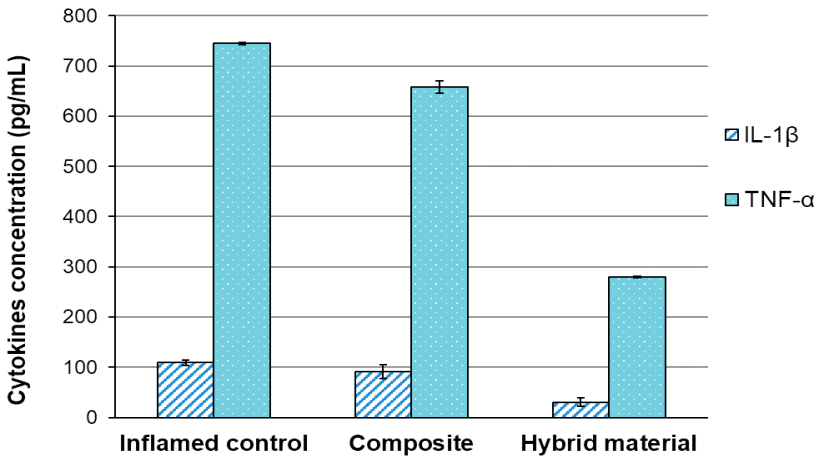

Figure 1. The effect of polymeric biomaterials on secretion of IL-1β and TNF-α in inflamed THP-1 cells, determined by ELISA sandwich assay. * $p < 0.05$.

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References

1. Hoare, A.; Soto, C.; Rojas-Celis, V.; Bravo, D. Chronic inflammation as a link between periodontitis and carcinogenesis. *Mediat. Inflamm.* **2019**, *2019*, 1029857.
2. Kaur, S.; White, S.; Bartold, P.M. Periodontal disease and rheumatoid arthritis: A systematic review. *J. Dent. Res.* **2013**, *92*, 399–408.
3. Craciunescu, O.; Gaspar-Pintiliescu, A.; Seciu, A.M.; Moldovan, L.; Zarnescu, O. Structure and cytocompatibility of a porous biomimetic material for oral tissue wound healing. *Phys. Status Solidi A* **2019**, *216*, 1800638.
4. Parnsamut, C.; Brimson, S. Effects of silver nanoparticles and gold nanoparticles on IL-2, IL-6, and TNF-a production via MAPK pathway in leukemic cell lines. *Genet. Mol. Res.* **2015**, *14*, 3650–3668.