CA4557

Difference Between Classes Of Implants And Their Surface Contamination

Ljupka Arsovski [1*], Kiro Papakoca [1], Sonja Rogoleva Gjurovski [1], Verica Toneva Stojmenova [1], Daniela Veleska-Stevkovska [2], Sofija Carceva Salja [1], Bruno Nikolovski [1]

[1] *Faculty of Medical Sciences, Goce Delcev University, Stip, North Macedonia, Stip, North Macedonia;* [2] *Faculty of Medical Sciences, University Sv. Kiril I Metodij, Skopje, North Macedonia, Skopje, North Macedonia*

Aim or purpose: The aim of this study was to differentiate the surface of high-end and low-end implants, i.e. which chemical elements are present on them during cleaning of the implants.

Materials and methods: One group (10 implants) consisted of high-end implants that have been extensively studied in scientific and clinical research and have been available on the market for a long time. The second group (10 implants) included newer implants that are relatively recent to the market, with limited research data available and a lower price point compared to the first group. The analysis focused on the surface of the dental implants and was conducted using a Scanning Electron Microscope (SEM). The Electron Sample analysis can be performed using SE (Secondary Electron) and/or BSE (Backscattered Electron) detectors. With proper sample preparation, resolutions better than 5 nm can be achieved.

Results: Using scanning electron microscopy, a range of chemical elements was detected on the surfaces of implants across all study groups. The first group (low-end implants) showed a high presence of these elements. In contrast, the second group (high-end) of implants exhibited a notably different surface composition, containing only a minimal number of chemical elements.

Conclusions: Titanium is the primary choice for implants due to its biocompatibility and durability, while the addition of elements such as calcium, phosphorus, zinc, magnesium, and silver can significantly enhance the process of osseointegration, increase stability, and reduce the risk of infections.

Key Words: contamination, classes, implants, success surface,.

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M2 Macrophage Exosomes Promote Bone Regeneration Via Mitophagy

Yige Dai [1*]

[1] *Xuzhou Medical University, China*

Aim or purpose: Senescent bone marrow mesenchymal stem cells (O-BMSCs) exhibit reduced osteogenic potential due to senescence-associated secretory phenotype (SASP). While M2 macrophage-derived exosomes (M2-Exos) show regenerative capacity, their mechanism in aging remains unclear[1-3]. [1] BI J, et al. Age-related bone diseases: Role of inflammaging [J]. J Autoimmun, 2024, 143: 103169. [2] BORLONGAN M C, et al. Stem Cells for Aging-Related Disorders [J]. Stem Cell Rev Rep, 2021, 17(6): 2054-2058. [3] KUSHIOKA J, et al. Bone regeneration in inflammation with aging and cell-based immunomodulatory therapy [J]. Inflamm Regen, 2023, 43(1): 29.

Materials and methods: O-BMSCs were isolated from 18-month-old male SD rats. RT-qPCR and Western blotting assessed osteogenic/SASP/autophagy markers. Mitochondrial ROS and autophagic flux were evaluated by confocal microscopy and flow cytometry. For in vivo studies, MBG-loaded M2-Exos were implanted in critical-sized calvarial defects of aged SD rats, with bone regeneration assessed by micro-CT.

Results: In vitro, M2-Exos activated PINK1/Parkin-mediated mitophagy in O-BMSCs, reducing ROS levels and suppressing SASP, thereby enhancing osteogenic differentiation. This effect was reversed by the autophagy inhibitor cyclosporine A (CSA). In vivo, MBG-loaded M2-Exos synergistically ameliorated age-associated bone microstructure deterioration, BMD reduction, and SASP accumulation.

Conclusions: M2-Exos attenuate SASP and enhance bone regeneration through mitophagy activation, suggesting a novel therapeutic approach for age-related bone disorders.

Key Words: M2 exosomes, Mitophagy, SASP, Bone regeneration, PINK1/Parkin.

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Gt-F Hydrogel: Photodynamic And Regenerative Multifunctional Adhesive

Jiarun Li [1*]

[1] *Hospital of Stomatology, Guangdong Provincial Key Laboratory of Stomatology, Institute of Stomatological Research, Guanghua School of Stomatology, Sun Yat-sen University, Guangzhou, China*

Aim or purpose: This study introduces a novel injectable multifunctional hydrogel adhesive with light-controlled antibacterial properties and cell growth promotion, addressing challenges in peri-implantitis management.

Materials and methods: This study developed a novel injectable multifunctional hydrogel (GT-F hydrogel) for peri-implantitis management. The hydrogel integrates vinylated tannic acid nanoparticles (vTA NPs), photosensitizer chlorin e6 (Ce6), Cu^{2+} ions, transglutaminase (TG), and gelatin. Key components include: vTA NPs: Provide wet adhesion and ROS scavenging. Ce6: Enables light-activated antibacterial activity. Cu^{2+}: Promotes angiogenesis and tissue regeneration. TG and gelatin: Ensure biocompatibility and mechanical stability. The hydrogel was prepared by mixing components at optimized concentrations and crosslinking at 45–55°C. Its injectable nature allows precise adaptation to irregular tissue gaps.

Results: 1.Antibacterial Efficacy: Light-activated Ce6 rapidly killed bacteria without cellular toxicity. 2.Biocompatibility: The hydrogel supported soft tissue regeneration. 3.ROS Clearance: vTA NPs effectively scavenged excess ROS. 4.Tissue