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Editorial

Nanomaterials with Antibacterial Effect in Dentistry

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Bacterial infections continue to be one of the main challenges in dentistry today, contributing significantly to periodontal diseases, caries, and restorative treatment failures. Microbial resistance and the formation of biofilms have limited the effectiveness of conventional treatments, which has prompted the search for innovative strategies. Among these, nanomaterials with antibacterial properties have emerged as a promising solution[1].

Nanomaterials, such as silver nanoparticles (AgNPs), zinc oxide (ZnO), copper nanostructures, and magnesium (Mg)-based composites[2], have demonstrated significant antibacterial activity against oral pathogens such as *Streptococcus mutans*, *Porphyromonas gingivalis* and *Enterococcus faecalis*, among other dental biofilm-forming species. These materials act through various mechanisms, including alteration of the bacterial cell membrane, generation of reactive oxygen species (ros), and inhibition of metabolic processes essential for bacterial replication and survival[3]. Recent findings suggest that the incorporation of nanomaterials in composite resins, dental cements, and implant coatings not only improves their mechanical properties but also reduces the risk of postoperative infections. In addition, studies have shown that some of

these nanomaterials have low cytotoxicity in human tissues, reinforcing their potential for safe clinical applications[4].

Despite these advances, significant challenges remain; among them, the regulation and approval of these materials for clinical use require rigorous evaluations of their biocompatibility and long-term effects. In addition, research must focus on developing formulations that maximize antibacterial activity without compromising patient health. It is also essential to evaluate the environmental impact of these materials since their uncontrolled release could generate ecological problems in the future. Another crucial aspect is the accessibility and cost of these treatments. Although nanotechnology offers innovative solutions, its large-scale implementation in dental practice requires strategies that allow its production at reasonable costs, ensuring that the benefits reach a larger population.

In conclusion, nanomaterials with antibacterial effects represent a revolutionary alternative in dentistry, offering an effective solution to fight persistent endogenous and nosocomial infections. However, it is essential to continue exploring their clinical application with additional studies to ensure their safety, accessibility, and feasibility in dental practice. Collaboration between scientists, clinicians, and regulatory bodies will be the key for this technology to become standard in the prevention and treatment of oral diseases.

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