



Regenerative Dentistry – A Current Overview of Dental Medications Utilized for Rejuvenation

Nanda Kishore Ghoshal*

Assistant Professor, Department of Dental Hygiene and Dental Technique, India

***Corresponding Author:** Nanda Kishore Ghoshal, Assistant Professor, Department of Dental Hygiene and Dental Technique, India.

Received: June 29, 2026

Published: July 06, 2026

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Regenerative dentistry harnesses the body's natural healing processes to mend or restore damaged or unhealthy oral tissues. Unlike conventional restorative dentistry that focuses on replacing lost structures, regenerative dentistry aims to regenerate them. Utilizing concepts from tissue engineering, stem cell therapy, and growth factor application, this discipline strives to repair a range of tissues, such as dentin, enamel, and periodontal structures.

This brief note aims to shed light on certain medications that demonstrate regenerative properties, which stimulate pluripotent cells in the pulp and periodontium to rejuvenate dental tissues through clinical trials.

Tideglusib is a thiazolidinone that serves to inhibit neurodegeneration and inflammation. In human neuroblastoma cells and murine primary neurons, it permanently inhibits GSK-3, reduces tau phosphorylation, and prevents apoptosis. Additionally, it promotes stem cell activity and activates the Wnt/-cat signaling pathway to facilitate recovery. Administering tideglusib at the site of dental damage may trigger this pathway, enabling stem cells to generate reparative dentin and naturally restore the affected dentin. Currently, tideglusib is under investigation for its potential application in various neurodegenerative disorders, particularly Alzheimer's disease. In a study conducted by Cao, *et al.* (2022), bioactive glass nanoparticles loaded with tideglusib (tideglusib-BgNPs) were synthesized and incorporated at varying concentrations into calcium silicate cement to evaluate their biomechanical and bioactive properties in comparison

to biodentine, which served as the control. The calcium silicate cement containing 10 weight percent tideglusib-BgNPs exhibited biomechanical properties that were comparable to those of biodentine. Furthermore, the most significant finding was that the evaluation of cytotoxicity and bioactivity—assessed through cell proliferation, wound healing, and cell migration assays—demonstrated enhanced bioactivity, characterized by improved wound healing, increased proliferation, and superior migration of human dental pulp stem cells compared to biodentine.

Dental pulp stem cells (DPSCs) play a vital role in the regeneration of periodontal tissue; however, their therapeutic efficacy is constrained by inadequate osteogenic differentiation.

Liraglutide (LIRA), an agonist of the glucagon-like peptide-1 receptor, demonstrates anti-inflammatory effects and protective qualities for bone health in different studies.

Periodontitis resulted in heightened infiltration of inflammatory cells, a rise in macrophage accumulation, and increased gene expression levels of tumor necrosis factor- α and inducible nitric oxide synthase within the gingiva, all of which were mitigated through the use of liraglutide. This exceptional property encourages its use in Micro Drug Delivery systems (MDD) in Periodontal issues.

Metformin, a well-established anti-diabetic medication, has been shown to activate the AMPK signaling pathway, encouraging mesenchymal stem cells, such as dental pulp stem cells and periodontal ligament stem cells, to generate new bone and dentin.

It also plays a critical role in suppressing prolonged inflammatory markers like IL-1 β , which significantly impede tissue recovery during conditions such as periodontitis. Furthermore, metformin enhances the expression of key genes involved in dentin and bone synthesis, including RUNX2, DMP1, and DSPP. Current research is exploring the use of metformin-loaded biomaterial scaffolds and topical gels to recruit stem cells and facilitate bone regeneration in deep periodontal pockets. Additionally, innovative formulations of metformin-incorporated resins have shown promise in treating tooth root caries while promoting the regeneration of surrounding periodontal tissues.

Mecina (herbal extract) was studied by Aydin, *et al.* in combination with xenogeneic graft material (bovine bone graft). As an effective bone formation agent, Mecina Hemostopper increased cell proliferation. Mecina was found to be an effective option in the augmentation of critical-size defects in rats when combined with xenogeneic bone grafts.

Naringin is a compound found in *Rhizoma drynariae* that inhibits retinoic acid-induced osteoporosis in rats, stimulates bone formation, and increases BMP-2. Radiographic bone density and the area around titanium implants were evaluated in micro Implants placed in the tibia of rats.

Rasouli-Ghahroudi, *et al.* studied the effects of the herbal selenium medicine Semelil. It promotes new bone formation when used with semelil (ANGIPARS) and Bio-Oss. None of the groups showed foreign body reaction (FBR). Combining ANGIPARS with Bio-Oss increased bone formation and maturation, proving that it works synergistically. Providing osteogenic properties to osteoconductive and space-maintaining materials like Bio-Oss may be possible. These findings may be a breakthrough in implant dentistry and maxillofacial defect restoration.

These medications are currently being utilized in clinical trials aimed at regenerating dental tissues. While they do not replace restorative dentistry, they could represent a significant advancement in the field of regenerative medicine. If successfully applied in clinical dentistry, this could transform community dental health and complement restorative dentistry. But more extensive trial and large sample population is necessary to establish and to introduce them in dental practice.