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Dentistry

Short Communication

Dental Biomaterials in Contemporary Oral Rehabilitation and Tissue Compatibility

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DESCRIPTION

Dental biomaterials have become an integral part of modern oral rehabilitation by providing reliable options for restoring damaged teeth, replacing missing structures, and supporting the regeneration of oral tissues. Continuous improvements in material science have resulted in products that closely resemble the physical, mechanical, and aesthetic characteristics of natural dental tissues. These materials are selected not only for their durability but also for their ability to interact safely with surrounding biological structures. Successful oral rehabilitation depends on the compatibility between restorative materials and the tissues of the oral cavity, ensuring that treatment outcomes remain functional, stable, and comfortable over extended periods.

A broad range of biomaterials is currently used in restorative and prosthetic dentistry, including ceramics, composite resins, dental alloys, polymers, zirconia, titanium, and bioactive materials. Each material possesses distinct characteristics that influence its clinical application. Ceramic materials are widely appreciated for their excellent appearance and resistance to staining, making them suitable for anterior restorations where aesthetics are highly valued. Zirconia has gained widespread acceptance because of its exceptional fracture resistance, wear characteristics, and favorable biological response. Composite resins continue to evolve with improved filler technologies that enhance strength, polish retention, and longevity while allowing minimally invasive restorative procedures.

Bioactive materials have introduced additional possibilities in restorative dentistry by participating in biological processes rather than serving solely as passive replacements. Materials containing calcium silicates, calcium phosphates, bioactive glass, and hydroxyapatite release ions that encourage mineral deposition and support tissue repair. These materials are commonly used in pulp capping, root-end fillings, bone graft substitutes, and regenerative procedures. Their ability to stimulate hard tissue formation contributes to improved healing and preservation of natural tooth structures.

Tissue compatibility remains one of the most significant considerations during material selection. Dental biomaterials are continually evaluated for cytotoxicity, inflammatory response, allergenic potential, and long-term stability within the oral environment. Materials intended for intraoral use undergo extensive laboratory testing and clinical evaluation before approval for patient care. Good biocompatibility minimizes adverse tissue reactions while promoting healthy integration with gingiva, bone, periodontal ligament, and surrounding oral tissues. The reduction of inflammatory responses contributes to improved healing and patient comfort after restorative or surgical procedures.

Regenerative dentistry has introduced biomaterials capable of supporting tissue engineering applications. Scaffolds composed of biodegradable polymers, collagen matrices, and bioactive ceramics provide structural support for stem cells and growth factors involved in tissue regeneration. These biomaterials encourage the formation of new bone, periodontal ligament, pulp tissue, and soft tissues. Continued progress in regenerative approaches may reduce the need for conventional replacement procedures by encouraging natural tissue repair.

CONCLUSION

In conclusion, dental biomaterials form the foundation of modern restorative and reconstructive dental procedures. Their evolution reflects continuous efforts to improve compatibility with oral tissues, enhance durability, and support functional and aesthetic outcomes in dental care. Continued research, combined with digital manufacturing technologies and regenerative strategies, is expected to further improve the quality, durability, and predictability of dental treatments. As material science progresses, clinicians will have access to increasingly sophisticated biomaterials that support conservative care, patient

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comfort, and lasting rehabilitation, contributing to improved oral health outcomes across diverse patient populations.

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