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Chitosan in Dentistry: A Short Communication

Arpit Sikri[1]*, Jyotsana Sikri[2]

[1]*Associate Professor and Post Graduate Teacher, Department of Prosthodontics, Crown and Bridge and Oral Implantology, Bhojia Dental College and Hospital, Himachal Pradesh, India.*

[2]*Associate Professor and Post Graduate Teacher, Department of Conservative Dentistry and Endodontics, Bhojia Dental College and Hospital, Himachal Pradesh, India.*

**Corresponding author: Arpit Sikri.*

Abstract

Chitosan, a biopolymer derived from chitin, has gained significant attention in the field of dentistry due to its biocompatibility, antimicrobial properties, and regenerative potential. This short communication explores the various applications of chitosan in dentistry, including its role in periodontal therapy, endodontics, implantology, and restorative dentistry. The discussion also delves into the mechanisms of action, advantages, and limitations of chitosan-based materials. By synthesizing recent literature, this short communication highlights the current advancements and future prospects of chitosan in dental practice.

Keywords: antimicrobial; biomaterials; chitosan; dentistry; endodontics; implantology; periodontal therapy; regenerative dentistry

Introduction

Chitosan is a natural polysaccharide obtained by the deacetylation of chitin, a major component of the exoskeleton of crustaceans. It has been extensively studied for its biomedical applications due to its excellent biocompatibility, biodegradability, and antimicrobial properties [1]. In dentistry, chitosan has been explored as an alternative to synthetic biomaterials in various therapeutic and restorative applications. The objective of this review is to provide an in-depth analysis of chitosan's role in dentistry, highlighting its advantages, limitations, and future potential.

Discussion

Chitosan has been widely studied for its potential applications in different branches of dentistry. The literature indicates that its antimicrobial properties make it a valuable addition to dental materials, while its regenerative capabilities have been explored in tissue engineering.

Chitosan in Periodontal Therapy

Chitosan-based hydrogels and scaffolds have been investigated for periodontal regeneration. Studies suggest that chitosan enhances the proliferation of periodontal ligament cells and promotes alveolar bone regeneration [2]. Additionally, its antimicrobial activity helps in controlling periodontal pathogens such as Porphyromonas gingivalis [3].

Chitosan in Endodontics

Chitosan nanoparticles have been used in root canal disinfection due to their antimicrobial efficacy against Enterococcus faecalis, a common pathogen in endodontic infections [4]. Furthermore, chitosan-based irrigants have shown potential as biocompatible alternatives to traditional endodontic solutions [5].

Chitosan in Implantology

Dental implants require effective osseointegration for long-term success. Chitosan coatings on titanium implants have demonstrated improved bioactivity and reduced bacterial adhesion [6]. Research indicates that chitosan-functionalized implants can enhance bone healing and reduce peri-implantitis risks [7].

Chitosan in Restorative Dentistry

Chitosan has been incorporated into dental composites and adhesives to improve their mechanical and antimicrobial properties. Studies suggest that chitosan-containing glass ionomer cements exhibit enhanced antibacterial activity against cariogenic bacteria such as Streptococcus mutans [8].

Chitosan in Drug Delivery Systems

The mucoadhesive properties of chitosan make it an excellent candidate for drug delivery in oral health.

Chitosan nanoparticles have been used for the controlled release of antimicrobial agents and growth factors to promote tissue healing [9].

Advantages and Limitations

While chitosan offers several advantages, including biocompatibility, bioadhesiveness, and antimicrobial efficacy, certain limitations such as its solubility at physiological pH and mechanical weaknesses need to be addressed. Ongoing research focuses on modifying chitosan to overcome these challenges and enhance its clinical applicability [10].

Conclusion

Chitosan has emerged as a promising biomaterial in dentistry, with applications ranging from periodontal therapy to restorative and implant dentistry. Its unique biological properties make it an attractive candidate for improving dental treatments. However, further research is required to optimize its formulations and address existing limitations. Future advancements in chitosan-based materials could revolutionize dental practice by providing safer and more effective therapeutic options.

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