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Specializes in R&D and manufacturing of peptide synthesis equipment, providing comprehensive technical solutions and services.

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Synthetic Peptides for Dentin Remineralization & Secondary Caries Prevention

1. Research Background

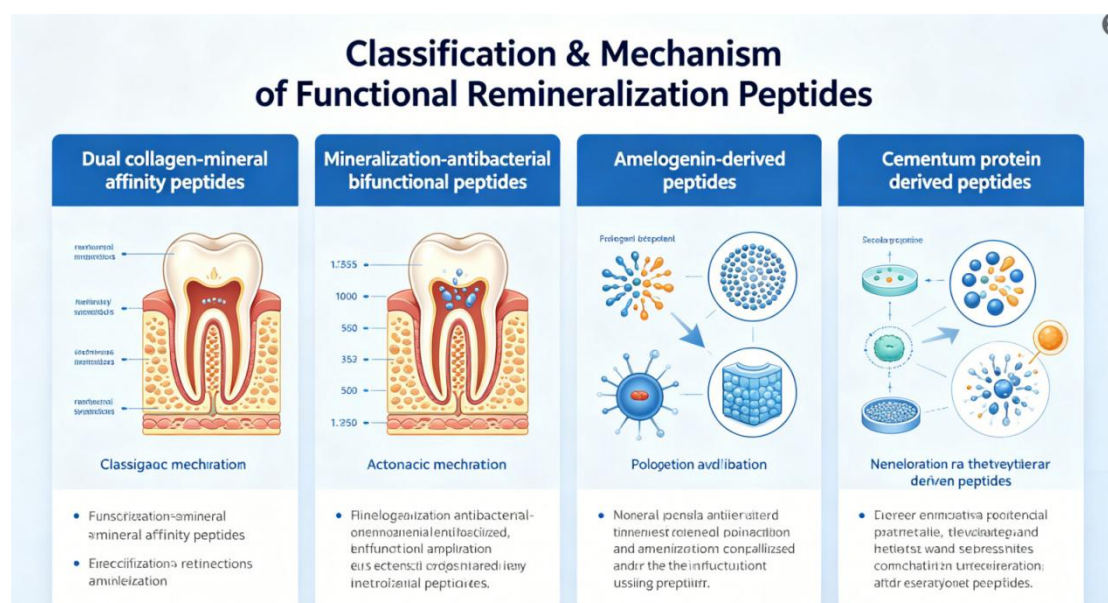
Secondary caries is the leading cause of dental filling failure, mainly triggered by microleakage between restoration and dentin, which leads to collagen degradation and hard tissue demineralization. Traditional remineralization approaches hardly realize deep intra-fibril mineralization of demineralized dentin. Natural non-collagen proteins can induce biomineralization yet suffer from scarce sources and complicated extraction. Synthetic peptides, designed to simulate natural protein functions, become a promising solution to realize dentin biomimetic remineralization and cut secondary caries incidence.

2. Research Purpose and Significance

This review systematically summarizes four mainstream types of functional synthetic peptides for dental application, elaborates their structural design, mineralization mechanism and anti-caries performance. Relevant findings provide theoretical basis for developing novel dental biomaterials, help improve the long-term stability of bonding interface and

lower clinical secondary caries failure rate.

3. Research Content



- Four categories of engineered peptides have achieved outstanding lab results:
- Dual collagen-mineral affinity peptides (CYP, DGP): Bind tightly to demineralized collagen and serve as mineralization template to induce ordered hydroxyapatite precipitation inside and between collagen fibrils, significantly improving dentin mechanical property.
- Mineralization-antibacterial bifunctional peptides (GAPI, GA-KR12): Combine anti-cavity bacterium activity and calcium phosphate induction capability, inhibit biofilm acid secretion while creating favorable remineralization environment.
- Amelogenin-derived peptides (QP5, sADP5): Guide continuous mineral layer formation to block dentinal tubules; sADP5 can accelerate mineral deposition for rapid pre-bonding dentin repair.

- Cementum protein derived peptides (CEMP1-p series): Trigger biomineralization and activate stem cell mineralization-related signaling pathway for dentin regeneration.

4. Conclusion & Outlook

Various functional synthetic peptides show remarkable effects on dentin remineralization and secondary caries prevention via biomimetic mineralization and antibacterial effects, while challenges including short in-situ retention under continuous saliva flushing still exist. Future development will focus on optimizing peptide carrier systems such as chitosan nanoparticles to realize sustained release, further optimizing peptide sequence design and advancing from laboratory research to clinical dental material development for practical restorative dentistry application.