



A review of novel dental caries preventive material: Casein phosphopeptide–amorphous calcium phosphate (CPP–ACP) complex

Imran Farooq ^{a,*}, Imran A. Moheet ^{b,1}, Zonera Imran ^c, Umer Farooq ^d

^a Department of Biomedical Dental Sciences, College of Dentistry, University of Dammam, Saudi Arabia

^b Department of Substitutive Dental Sciences, College of Dentistry, University of Dammam, Saudi Arabia

^c General Dental Practitioner, Karachi, Pakistan

^d Glyndwr University, Mold Road, Wrexham, United Kingdom

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Abstract A paradigm shift is emerging in dentistry and dental treatments are now aimed at maximum conservation of tooth structure. It is nowadays considered an ethical duty of a dentist to provide their patients with minimally invasive treatment. Remineralization therapy is preferred in cases, where there is a chance of gaining success by preventive methods. Many novel caries preventive materials are now available in the market which contain components that have the ability to initiate remineralization. One such component which is caries preventive and is present in many dental materials is Casein phosphopeptide–amorphous calcium phosphate (CPP–ACP).

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Contents

1. Introduction	48
2. Novel dental caries preventive materials	48
3. Casein phosphopeptide–amorphous calcium phosphate complexes (CPP–ACP).	48
4. Mechanism of action	48

* Corresponding author. Tel.: +966 507643702.
E-mail addresses: drimranfarooq@gmail.com (I. Farooq), ia_moheet@hotmail.com (I.A. Moheet), drzoneraimran@gmail.com (Z. Imran), dr.u.farooq@gmail.com (U. Farooq).

¹ Tel.: +966–554839998.

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5. Delivery of CPP-ACP	49
6. Evidence of preventive role of CPP-ACP in dental caries present in the literature	49
7. Indications of CPP-ACP	50
8. Potential areas for improvement	50
9. Conclusion	50
References	50

1. Introduction

Dental caries belongs to a group of complex diseases and it ensues because of multiple contributing factors. Many strategies are nowadays being applied for the prevention of dental caries but no single strategy can guarantee 100% success.¹

Conventionally, it was believed that dental caries is an irreversible disease. The traditional approach of treating dental caries was to remove the caries affected enamel or dentine and to replace it with a restorative material.²

This approach resulted in a considerable loss of tooth structure. As a result of the recent studies, old concepts have changed and now there is a paradigm shift in the aetiology, diagnosis, preventive strategies and treatment of dental caries and many novel materials have been formulated for its prevention.

2. Novel dental caries preventive materials

The process of demineralization and remineralization occurs continuously in the oral cavity. Some methods or materials provide aided remineralization like the application of topical fluoride. A restorative material that contains preventive elements for dental caries has been desired for a long time.³

Many novel dental materials can aid remineralization like materials containing CPP-ACP and calcium sodium phosphosilicate or bioactive glasses.⁴

Dental research has shown the importance of calcium and phosphate ions in the remineralization process. Longbottom

C. et al., proposed in 2009 that an ideal caries preventive material should release calcium and phosphate in the oral environment.⁵ Therefore, manufacturers of novel caries preventive dental materials are now incorporating CPP-ACP in the composition of their products for the prevention of caries.

3. Casein phosphopeptide-amorphous calcium phosphate complexes (CPP-ACP)

CPP-ACP is a milk product which helps in remineralization and prevents dental caries. Casein phosphopeptide can deliver amorphous calcium phosphate and can also help the ACP to bind with the dental enamel. Casein phosphopeptide can also decrease the count of Strept. Mutans as it has got the ability to integrate in the pellicle⁶ (Fig. 1).

CPP is a peptide which contains elements that can bind calcium. Casein phosphopeptide can stabilize calcium phosphate present in the solution as amorphous calcium phosphate. Several *in vitro* studies have shown the role of CPP-ACP in the reversal of the early white spot lesion.^{9,10}

4. Mechanism of action

Casein phosphopeptide forms nanoclusters with amorphous calcium phosphate thus providing a pool of calcium and phosphate which can maintain the super saturation of saliva. Since CPP-ACP can stabilize calcium and phosphate in the solution, it can also help in the buffering of plaque pH and so calcium and phosphate level in plaque is increased. Therefore calcium

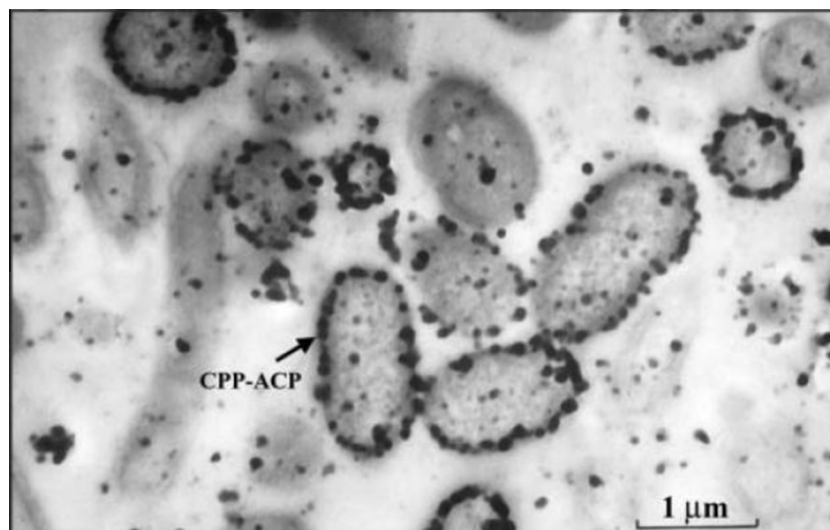


Figure 1 Electron histochemistry of a supragingival plaque sample demonstrating CPP-ACP nano complexes confined in the plaque matrix and on the surface of bacterial cells.^{7,8}

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