



## EBD spotlight:

# The role of calcium in the prevention of erosive tooth wear: a systematic review and meta-analysis



**Manas Dave<sup>1</sup>**  
considers  
topics  
discussed

in our sister journal  
*Evidence-Based Dentistry.*

**T**he role of calcium in the prevention of erosive tooth wear: a systematic review and meta-analysis was published in *Evidence-Based Dentistry* in 2024.<sup>1</sup>

### Background

Erosive tooth wear has been defined in the Consensus Report of the European Federation of Conservative Dentistry as a chemical-mechanical process resulting in a cumulative loss of hard dental tissue not caused by bacteria.<sup>2</sup> A multifactorial pathogenesis has been implicated such as diet (including the overconsumption of soft drinks), eating disorders and as a secondary consequence due to reflux.<sup>3</sup> The majority of fluoride products (such as toothpastes, mouth rinses and varnish) have only a mild effect on the prevention of erosive tooth wear.<sup>4</sup>

Calcium containing products contain casein phosphopeptide-amorphous calcium

### Author information

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phosphate (CPP-ACP) which provides a high bioavailability of calcium and phosphate ions aiding in the remineralisation of erosive lesions and preventing demineralisation.

Whilst there have been research studies into calcium containing products on remineralisation, there has been no review evaluating the role of calcium in the prevention of erosive tooth wear. Therefore, the aim of this review is to understand the role of calcium formulations in the prevention of erosive tooth wear.

## Methods

An electronic database search of PubMed, LILACS, Cochrane and Embase were conducted for studies until May 2023. The grey literature was searched through the register of clinical studies (US National Institute of Health), the National Research Register, and Pro-Quest Dissertation Abstracts and Thesis databases. In addition, the reference lists of included studies manually searched. Only studies published in English that were *in situ* randomised clinical trials involving adolescents and/or adults in their mixed or permanent dentition assessing the application of calcium formulation and prevention of erosive tooth wear were included. The Risk of Bias (2.0) tool was used for bias assessment and X2 and I2 used to assess heterogeneity.

## Results

- Twenty-one randomised control trials were included in this review whereby intraoral removable appliances were constructed for each participant to which enamel samples were attached during the treatment period. The samples were derived from human enamel (n = 13) and bovine enamel (n = 7). The total sample size included 1,787 enamel samples
- The most common calcium formulations applied were:
  - ◆ Blackcurrant juice with added calcium
  - ◆ Casein phosphopeptide-amorphous calcium phosphate (CPP-ACP)
  - ◆ Chewing gum containing CPP-ACP phosphate
- The most common comparators were:
  - ◆ Water
  - ◆ Orange juice
  - ◆ Chewing gum
  - ◆ Toothpaste
  - ◆ Blackcurrant juice
- Mean enamel loss: Regarding the effect of calcium-modified acidic drinks, all studies showed association with reduced enamel loss. For example, blackcurrant with calcium caused significantly less enamel loss than blackcurrant without calcium

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- ◆ Neither milk nor CPP-ACP pastes were significantly effective in reducing enamel and dentine loss
- Surface microhardness: Tooth mousse containing CPP-ACP significantly decreased the percentage of surface microhardness loss
  - ◆ Calcium modified orange juice showed the lowest percentage of surface microhardness change
- Softening depth: Blackcurrant with added calcium significantly reduced softening depth when compared with orange juice
  - ◆ Chewing gum containing citric acid and CPP-ACP resulted in significantly higher remineralisation when compared with chewing gum without CPP-ACP or citric acid or gum containing citric acid only
- Quality assessment determined five studies to be a low risk of bias, 12 at unclear risk of bias and four at high risk of bias
- Quantitative analysis demonstrated chewing gum containing CPP-ACP on surface microhardness of eroded enamel against chewing gum without CPP-ACP. Random-effect analysis demonstrated did not indicate any significant difference in mean surface microhardness (MD 2.22[95% CI -4.53, 14.21], p = 0.31, I2 = 71%)
- The second analysis compared the *in situ* effect of blackcurrant juice drink with added calcium on mean enamel loss against orange juice. Random-effect analysis demonstrated a significantly decreased mean enamel loss when blackcurrant juice with added calcium was compared with orange juice (MD -2.61 [95% CI -3.95, -1.27], p = 0.0001, I2 = 89%).

## Conclusions

The authors stated:

- ‘The following conclusions can be drawn:
- ...The addition of calcium in juice drinks led to reduced enamel loss
  - [There was a] statistically significant decreased mean enamel loss when blackcurrant juice with added calcium was compared to orange juice...
  - Concerning the effect of various formulations containing CPP-ACP, the results were controversial...’

## Commentary

This is a well conducted systematic review and meta-analysis which showed the impact of various interventions involving calcium for the prevention of erosive tooth wear. As the authors only included randomised control trials, the quality of evidence was high and subsequently, there is strong evidence for the concluding statements. A particular advantage of this systematic review was the use of *in situ* randomised control trials (thereby excluding *in vitro* studies which have limitations in replicating the dynamic features of the oral cavity). The authors have shown that the use of calcium in juice drinks does lead to reduced enamel loss. Foods in the UK and other countries have options to be fortified with nutrients such as iron and this study makes a case for calcium to be considered.<sup>5</sup> The additional insights into the utility of CPP-ACP on surface microhardness loss and softening depth help direct future research studies.

## References

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