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Effects of dietary nitrate supplementation on markers of oral health: A systematic review

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The oral cavity is a vital part of the digestive system. Poor oral health can impact an individual's ability to eat and has been associated with increased risk of non-communicable diseases and reduced longevity. Conversely, positive oral health has been associated with improved cardiometabolic, cognitive and systemic health and greater longevity. Consumption of dietary nitrate, which is processed in the mouth into nitrite, and is subsequently converted into nitric oxide (NO) in the body⁽¹⁾, has been demonstrated to reduce blood pressure, improve endothelial function, and enhance exercise performance. Interestingly, recent studies suggest that nitrate consumption could also positively modulate markers of oral health⁽²⁾. To our knowledge, no systematic review has been published examining the effect of inorganic dietary nitrate on oral health. However, this could be valuable to summarise current state of the knowledge, identify effect modifiers and highlight gaps for future research. Therefore, this systematic review aims to investigate the effects of dietary nitrate supplements on markers of oral health *in vivo* in randomised controlled trials (RCTs).

This study was pre-registered with PROSPERO (CRD42023411159). Five databases (PubMed, The Cochrane Library, CINAHL, MEDLINE, and SPORTDiscus) were searched from inception until March 2023 to identify studies that met the following criteria: adult participants (≥ 18 years) and RCTs investigating the effects of oral dietary nitrate versus placebo on markers of oral health. A narrative synthesis of data was conducted. Risk of bias was assessed using the Cochrane Risk of Bias 2 tool.

Nine articles reporting data on 284 participants were included. Nitrate was provided via beetroot juice (six studies), a beetroot-derived supplement dissolved in mineral water (one study), and lettuce juice (two studies). The duration of the interventions ranged from one day to a maximum of six weeks. Dietary nitrate supplementation increased the relative abundance of several individual bacterial genera including *Neisseria* (increased in three studies) and *Rothia* (increased in three studies). Dietary nitrate supplementation increased salivary pH (increased in two studies) and decreased salivary acidification resulting from the consumption of a sugar-sweetened beverage (decreased in two studies). Furthermore, dietary nitrate supplementation resulted in a decrease in the gingival inflammation index in one study. Overall, the risk of bias in studies was mixed. One study had a low risk of bias, while the rest were rated as having some concerns. No study was considered to have a high risk of bias.

The results show that dietary nitrate is a potential nutritional strategy that can potentially benefit oral health by modifying the oral microbiome, altering salivary pH, and minimising gingival inflammation.

References

1. Blekkenhorst LC, Bondonno NP, Liu AH *et al.* (2018) *AJCN* 107(4), 504–522.
2. Rosier BT, Palazón C, García-Esteban S, *et al.* (2021) *Front Cell and Infect Microbiol* 11.