The effect of propolis mouthwash on the microcirculatory response to a reactive hyperemia test

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Objectives: Nitrite produced by oral bacteria can increase nitric oxide (NO) availability, a potent vasodilator[1]. Chlorhexidine as an antimicrobial is used to manage gum disease, but can also harm oral nitrate-reducing species, leading to decreased NO availability and increased systemic blood pressure[2,3,4]. Hence we are seeking novel antibacterial products, that are effective against pathogenic bacteria, whilst preserving beneficial nitrate reducing species. Propolis is a biocompatible product from honeybees that has recently been shown to be antibacterial *in vitro*, but is not widely used as a mouthwash[5]. Thus, this study aimed to determine the effect of propolis mouthwash on the microcirculation in comparison to chlorhexidine.

Methods: This study was a randomised controlled double-blinded trial, involving healthy participants with no clinical signs of periodontal disease (BPE 0,1,2), using a 7-day intervention of either propolis (n=23) or chlorhexidine (0.2%) mouthwash (n=20) twice daily (10ml for 1 minute). Microvascular function was measured combining a reactive hypereamia test and the measurement of oxygenated haemoglobin (HbO_2) and deoxyhaemoglobin (HHb) on the left forearm (extensor digitorum) using a near-infrared spectroscopy (NIRS) device (NIRO-200NX, Hamamatsu, Japan) and automatic pneumatic cuff (Hokanson E-20, USA). Microvascular data was recorded at baseline (2 min), during occlusion (5 min at 200 mmHg) and reperfusion (5 min). Oral health was also assessed using O'Leary plaque (%PI) and bleeding scores (%BOP).

Results: Microvascular function represented as tissue oxygenation index (TOI) did not differ between chlorhexidine and propolis, but there was a trend for decreased TOI levels from 48.7% pre-treatment to 46.4% post treatment with propolis mouthwash (P=0.054). There was also a trend for increased ramp (Δ lowest to peak TOI during reperfusion) following the propolis intervention (P=0.054). Alongside this %PI reduced with both chlorhexidine and propolis (P<0.05), but to a greater extent with chlorhexidine. %BOP however, reduced with propolis mouthwash only (P<0.05).

Conclusions: These data demonstrated that propolis slightly improved reperfusion in the reactive hypereamia test, suggestive of an increased (or at least maintained) microvascular response and more NO, desirable for any new mouthwash. Propolis concurrently reduced gingival inflammation and plaque. Taken together propolis may be beneficial managing causative factors for gum disease, whilst maintaining vascular function and blood pressure, which is in contrast to previous studies with chlorhexidine alone. More research is now needed to investigate the effects of these treatments on the oral microbiome and nitrate reducing bacteria during periodontal disease, where the oral microbiome is in dysbiosis.

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