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Effect of prebiotic supplementation in markers of intestinal permeability, pH and mucosal immunity

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Gut microbiome fermentation of prebiotic fibre increases short-chain fatty acids (SCFA), which can stimulate mucosal B-cells to express secretory IgA in distant tissues[1,2], and can support gut barrier function. Secretory IgA levels have been associated with reduced upper-respiratory tract infections incidence in immune-compromised populations[3,4]. However, it is not known if prebiotic supplementation would be effective in healthy adults. This study investigated whether inulin can increase mucosal immunity (sIgA) and intestinal permeability markers, alongside acceptability of intervention.

Healthy adults (n = 23, BMI: 23.85 ± 3.2 kg.m^{-2}, age: 33.4 ± 10.1 years) took part in this randomisedcontrolled cross-over trial. Participants were randomly allocated to inulin syrup (12g/day) or placebo syrup (20% diluted honey) for 2-weeks. This was followed by 2-weeks wash-out, and then conditions were switched for a final 2-week supplementation. Before and after each supplementation, faecal pH was measured with glass probe, and salivary sIgA and plasma lipopolysaccharide binding protein (LBP, marker of intestinal permeability) were measured with ELISA kits. Time to provide 2ml of saliva through passive drooling was recorded, and used to calculate saliva flow (ml/min) and thus IgA secretion rate (µg/min). Participants were asked to report on their diet intake (4-day food diary) before and after each supplementation phase, as well as reporting on any respiratory and gastrointestinal symptoms using a validated questionnaire. Differences between groups were analysed with one-way ANOVA on post outcome values, adjusted for outcome baseline values, and chi-squared for categorical data (SPSS software).

There was a significant reduction in LBP levels in inulin compared to placebo condition (-3.15, 95%CI -5.18, -1.12; $p = 0.03$). Mean differences between groups (inulin vs placebo) were not significant (p> 0.10) for pH (0.43 95%CI −0.32,0.41) and IgA secretion rate (31.80 µg/min 95%CI 150.90, 87.29). Gastrointestinal symptoms were not different between groups (p>0.05), except for mild bloating/rumbling (reported in 70.8% inulin vs 44.4% placebo, $p = 0.01$). Respiratory symptoms were lower in inulin compared to placebo (runny nose 19.2% inulin vs 38.2%, p = 0.03). Inulin condition resulted in higher fibre intake compared to placebo, with no other differences in dietary intake (+5.43 g/day 95%CI 0.09, 10.86 p = 0.05). 90% of participants reported the intervention as acceptable and easy to follow.

Inulin was well tolerated with minimal side effects of gastrointestinal bloating and rumbling. While markers of mucosal immunity did not change, intestinal permeability markers improved suggesting that in healthy populations prebiotic supplements can support gastrointestinal health but not necessarily improve mucosal immunity.

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