Comprehensive multi-omics analysis of serum and fecal samples in a dietary intervention model with pectins for lipid transfer proteins (LTP) food allergy

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The gut microbiota is believed to play a crucial role in food allergen sensitization, with intestinal dysbiosis being linked to the risk of developing food allergy (FA). In this context, dietary interventions with prebiotics, such as pectin, might be beneficial. Therefore, this study aimed to explore the effects of a dietary intervention with pectin on lipid transfer proteins (LTP) allergic patients. To this end, 34 allergic patients to the peach LTP, Pru p 3, were included in this study. These patients were orally administered one of two pectin varieties or placebo twice a day for two months and were divided into three groups. Paired serum and fecal samples (Placebo, n=4/9; Active 1, n=13/6; Active 2, n=12/6; respectively), obtained before and after the intervention, were analyzed to perform proteomics on a panel of 92 inflammation-related proteins; and targeted metabolomics on bile acids and short-chain fatty acids (SCFA) by liquid chromatography coupled to mass spectrometry (LC-MS). Lastly, oral food challenge with peach was performed after the intervention to assess tolerance. Following pectin dietary supplementation, specific serum proteomic changes indicating a downregulation of the Th2 response were observed, characterized by decreased levels of IL2, IL4, and IL13 compared to the placebo group. These findings were confirmed by metabolomics, which revealed alterations in the systemic and fecal levels of secondary microbial-derived bile acids (including isolithocholic, deoxycholic, and hyodeoxycholic acids) when comparing both pectin treatments to the placebo. Additionally, reduced levels of branched SCFA, such as isobutyric and 2-methyl butyric acids, were detected in the same comparisons. Taken together, our results provide evidence that dietary intervention with both pectins induced a differential metabolic and proteomic profile in LTP-allergic patients, giving rise to elucidate new potential immunomodulatory mechanisms and therapeutic targets in FA.