Hypoallergenic Edible Peanut Protein Matrix to Enable Novel Functional Food & Immunotherapy Applications

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Peanut allergies can present life-threatening consequences; therefore, there is an intense interest in developing therapeutic strategies that could reduce the danger and severity of the allergic reaction in peanut sensitive patients. We have developed a unique technology to modify or mask allergenic epitopes in peanut flour by complexing them with health-protective phytochemicals derived from fruits and vegetables, without using solvents or artificial additives. Allergenicity of modified peanut flours was evaluated in vitro using SDS-PAGE and Western Blotting to measure IgE binding after exposure to sera from peanut-allergic patients. The ability of the modified flours to attenuate degranulation and histamine release from basophils was also evaluated using blood from peanut-allergic patients. Flours complexed with proanthocyanidin-rich cranberry juice concentrate demonstrated a significant reduction in IgE binding such that only trace binding was observed. These flours also showed less degranulation, compared to unmodified peanut flour preparations. Peanut flours enriched with cranberry polyphenols had significantly reduced basophil activation capacity (~50%), compared to unmodified peanut flours. Flours fortified with purified cranberry anthocyanins or proanthocyanidins in the presence of tyrosinase enzyme also showed a substantial decrease in basophil degranulation. Additionally, attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR) spectra suggested that the secondary structures of the proteins were significantly altered after complexation with proanthocyanidin-rich extracts, but not by extracts containing only anthocyanins and other flavonoids. Our results demonstrate this technology is successful for modifying the allergenicity of milled peanut flour by complexing with fruit polyphenols, in particular, oligomeric proanthocyanidins. The polyphenol-fortified peanut protein edible matrix has potential in immunotherapy and novel functional food applications.