Use of a Novel Peptide-Based Assay to Determine Potential Risk of Reaction to Lupine for Peanut Allergic Patients

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Lupine flour is a novel food ingredient derived from the endosperm of lupine beans and is increasing in popularity, primarily in Europe and Australia. Peanut allergy is the leading cause of food-induced anaphylaxis and approximately 1.4% of Americans report a peanut allergy. Lupine could pose a serious risk to peanut-allergic patients due to peanut and lupine's cross-reactive nature. Allergic reactions occur when the presence of specific peptides, or epitopes, on allergenic proteins cause IgE antibody binding. Determining which specific lupine peptides cross-react with allergenic peanut epitopes could help determine potential risk of reaction to lupine for a peanut-allergic patient. In phase one of research (2016), 62 lupine and peanut peptide pairs were analyzed using Vector NTI bioinformatics software. In phase two (2017), 20 of the most homologous lupine peptides were synthesized and used in a novel peptide-based assay with plasma samples from 26 patients with moderate to severe peanut allergies. The results of the assay suggested that 7 of the 20 lupine peptides could play a significant role in a cross-reaction. One peptide yielded antibody binding in 19.2% of patient samples, and five other peptides yielded a positive response in 11.6% to 15.4% of patient samples. Of the 26 plasma samples, 57.7% had antibodies bind to at least one of the lupine peptides. Additionally, an amino acid substitution analysis suggested that increasing numbers of amino acid substitutions of different groups, likely decreases the cross-reactivity of a specific peptide. Based on the findings of this study, it is recommended that patients with moderate to severe peanut allergies avoid lupine as there is a significant potential risk of cross-reaction and the development of anaphylaxis.

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