Protein mass spectrometry of allergens in foods.

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Currently there is no accepted cure for either IgE- or non-IgE mediated food allergies and as a consequence patients have to practice food avoidance (usually life-long) and carry rescue mediation should they accidentally consume their problem food. In order to help allergic consumers practice food avoidance manufacturers have to list priority food allergens on ingredient labels. However, the risks posed by unintended allergens are more difficult to manage and involve application of risk assessment approaches. Central to implementing allergenicity risk assessment in manufacturing is the availability of tools to determine the levels of allergenic food protein(s) to monitor either factory cleaning, or ingredients and finished products. These tools are also becoming important for monitoring food ingredients used to diagnose or treat food allergies. Untargeted data-dependent and data-independent analysis has been undertaken to profile allergens in two model allergic foods, peanut and gluten which has been mined using curated allergen sequences. These approaches have been used to define the effects of food processing on allergen profiles of peanut, including ingredients used for diagnosis of food allergies using oral food challenges. These data have been used to support the identification of a suite of peptide targets for use in a multi-analyte MS method for profiling allergens in a range of food matrices. However, achieving sufficient sensitivity has been challenging. Application of mass spectrometry (MS) methods to allergen analysis is also a key goal of the EU-funded iFAAM project and a systematic approach has been taken to identifying effective extraction and digestion conditions. Separation technology has proven essential during sample preparation to ensure optimal extraction whilst minimising sample interference, through the use of filter-aided digestion approaches. In addition the liquid chromatography separation of peptides has proven crucial, with conventional chromatographic separation unable to achieve the sensitivity of nano-flow, with microfluidic devices proving especially effective. The resulting assays have sensitivity comparable to existing ELISA based methods but wider dynamic range and with improved recoveries. MS methods have the potential to provide orthogonal methods for allergen determination of foods, with potentially improved capacity for quantification of allergenic proteins compared to ELISA methods. They also add an additional means of detecting adulteration of foods, such as spices, with allergens which has led to product recalls in the recent past.

References


