National Measurement System

Peanut allergen quantification: a tough nut to crack

LGC scientists have developed a unique allergen quality control material that is the first to be linked to clinical studies aimed at identifying threshold concentrations that elicit allergic responses. The QC material is a ‘real’ complex food matrix that can be used to help protect the 500,000 people in the UK with a peanut allergy. By contributing to the validation of allergen measurement methods, the materials will also help to prevent contamination in the food production process potentially saving the food industry millions of pounds.

LGC

The requirement

The prevalence of peanut allergy has nearly doubled in Europe over the past two decades and it now affects around 500,000 people in the UK [1]. Peanut allergy is the most common cause of fatal food allergy reaction. It occurs when the immune system mistakenly identifies peanut proteins as something harmful. The fear of accidental exposure in food reduces the quality of life of peanut allergy sufferers and severely limits the social habits of allergic individuals, their families and even their friends.

It is not only those with peanut allergies who have to worry about the risk of allergic reactions or death by anaphylaxis; it also creates problems for businesses. Testing for allergen proteins in food is difficult, as samples usually contain a lot of protein and it can be difficult to separate the allergen protein of interest. This has an impact on the ability of manufacturers and suppliers to adequately label their goods and also has implications for defining threshold levels and detecting food fraud.

All food companies throughout the EU are compelled by law to declare major allergens including peanut, if included in food products as ingredients. The current labelling rules, brought into force in December 2014 by European Regulation 1169/2011 (the EU Food Information for Consumers Regulation, EU FIC) ensure that all consumers are given highlighted information about the use of allergenic ingredients in pre-packed food [2]. This is to make it easier for people with food allergies to identify the foods they need to avoid. The EU FIC also extends to food sold loose or served when eating out. Prevention of cross contamination with peanut through product testing, validation and verification of cleaning, and checking of 'peanut-free' products requires exacting testing.

ELISA (enzyme-linked immunosorbent assay), PCR (polymerase chain reaction) and mass spectrometry (MS) methods can be used to detect food allergens, but there are problems obtaining reliable quantitative results with all three. Prior to this project, there were no suitable reference materials available in the form of a food matrix, making it difficult for laboratories and test-kit manufacturers to validate quantitative methods for allergen measurement.

The solution

A quality control (QC) material that is a real food, containing a known amount of specific allergen protein, and is stable and homogenous could assist laboratories in the validation and monitoring of their analysis. Consequently, a project was undertaken by LGC to develop a food matrix peanut allergen QC material.

The chosen matrix was a chocolate dessert product developed for low-dose threshold studies in food allergic individuals in the European research project 'EuroPrevall'.

Two QC materials were prepared by University of Manchester researchers in the form of chocolate dessert product pastes designed to be reconstituted with water before analysis. One material (LGCQC1011) was prepared as a peanut free negative control and the other material (LGCQC1012) was prepared as a positive control with the addition of light roast, partially defatted peanut flour (a commercial food ingredient) to give a peanut protein content of 10 mg kg^{-1}. The pastes were transferred to LGC, packaged in nitrogen-flushed sealed sachets to aid stability and the units were numbered sequentially in fill order. LGC assessed and proved their homogeneity and stability, underpinned by a validation study of the test method using a commercially available ELISA kit (Romer AgraQuant® Peanut kit). The National Measurement System funded the ELISA kit validation studies, and a Technology Strategy Board and LGC co-funded research and development project established the design and production of the QC material.

Impact

Failure in food allergen management means 'food-allergen' related incidents are the most common reason for product withdrawals and recalls in the United Kingdom according to the UK Food Standards Agency. The 34 recalls related to allergens in 2010 were estimated to cost stakeholders £10-15 million. In 2013, the number of Allergy Alerts issued to withdraw food or drink products had risen to 47.

Phil Goodwin, MD of Bio-Check (UK) a food allergen test kit manufacturer, has worked in this area for 30 years and welcomes LGC's recent initiatives:

> *"The science of food allergen detection, let alone quantitation, has failed to move forward anything like quickly enough since it began in the late 1980s. The emergence of such high quality QC materials as are being produced by LGC is a significant step forward to a time when all commercial test kits can be demonstrated to show good agreement on allergen levels. LGC are to be applauded for taking on this difficult challenge and I urge all allergen kit producers and analysts to use the material to improve their products and results."*

[1] http://www.mrc.ac.uk/news-events/publications/outputs-outcomes-and-impact-of-mrc-research-2013-14/

[2] http://allergytraining.food.gov.uk/english/rules-and-legislation/

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4250/LB/0215