

# Background and Objectives: Detection and Quantification of Allergens in Foods and Minimum Eliciting Doses in Food-Allergic Individuals

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The aims of this project are to develop harmonised reference methods for the detection and quantification of allergens in foods, and to generate quality data on Minimum Eliciting Doses (MED) and Minimum Observed Eliciting Doses (MOED). The purpose of this is to support the identification of the levels of allergens in food which are considered safe for most consumers with food allergies. This supports the development of risk-based approaches to the management of food allergens, supporting food-allergic consumers to avoid ingestion of their allergenic foods.

## Background

FSA contributed to the funding of the UK involvement in this project lead by the University of Manchester, who were awarded a grant under the European Food Safety Authority (EFSA) call GP/EFSA/AFSCO/2017/03 "Detection and quantification of allergens in foods and minimum eliciting doses in food allergic individuals". The project is also in collaboration with CNR-ISPA - Italy, ILVO - Belgium, CER - Belgium, INRA - France.

Food industry and regulatory authorities are developing risk-based approaches to food allergen management to support food-allergic consumers to avoid ingestion of unintentional allergens in their food. This approach requires methods of analysis which can detect and quantify allergenic proteins in food. It also requires access to quality data from scientific studies identifying the minimum levels or doses of allergens in food considered as safe for most consumers with food allergies. A threshold for a food allergen is the lowest amount that can trigger an allergic reaction. The ThRAI project aims to address these requirements.

## Research Approach

The ThRAI project aims to support the application of risk-based approaches to food-allergen management through two objectives:

**Objective 1: Develop reference (harmonised) methodologies for the detection and quantification of allergens in foods**

Exploring the development of a quantitative mass spectrometry-based prototype reference method for the detection of six foods causing IgE-mediated food allergies - cow's milk, hen's egg, soybean, peanut, hazelnut and almond - through use of available reference and quality control materials used in nationally funded projects (iFAAM, MANOE, Allersens, MoniQA and LGC Standards), together with incurred matrices developed to mimic highly processed foods.

## **Objective 2: Generate good quality data on Minimum Eliciting Doses (MED) and Minimum Observed Eliciting Doses (MOED)**

Developing a toolbox to support the generation of quality data from low-dose oral food challenges undertaken in food-allergic individuals which are used to define thresholds and minimum eliciting doses. This will be done through use of data collated from EU-funded projects such as iFAAM and EuroPrevall, and nationally funded projects in France (e.g. MANOE) and the UK, and through development of common protocols for collection and curation of data that will be applied to allergenic foods for which there are currently data gaps. Through this, known data gaps may be addressed, for example regarding fish and tree-nuts.

A list of publications which have resulted from the ThRAI project to date are provided below. You can view the final report for the project on the [EFSA website](#).

## **Published Papers**

1. Mills, E. N. C., Adel-Patient, K., Bernard, H., De Loose, M., Gillard, N., Huet, A. C., Larre, C., Nitride, C., Pilolli, R., Tranquet, O., Pouke, C. V. & Monaci, L. 2019. Detection and Quantification of Allergens in Foods and Minimum Eliciting Doses in Food-Allergic Individuals (ThRAI). *J AOAC Int*, 102, 1346-1353.
2. Pilolli, R., Nitride, C., Gillard, N., Huet, A. C., Van Poucke, C., De Loose, M., Tranquet, O., Larre, C., Adel-Patient, K., Bernard, H., Mills, E. N. C. & Monaci, L. 2020. Critical review on proteotypic peptide marker tracing for six allergenic ingredients in incurred foods by mass spectrometry. *Food Res Int*, 128, 108747.
3. Pilolli, R., Van Poucke, C., De Angelis, E., Nitride, C., De Loose, M., Gillard, N., Huet, A. C., Tranquet, O., Larré, C., Adel-Patient, K., Bernard, H., Mills, E. N. C. & Monaci, L. 2021. Discovery based high resolution MS/MS analysis for selection of allergen markers in chocolate and broth powder matrices. *Food Chem*, 343, 128533.
4. Huet, A. C., Paulus, M., Henrottin, J., Brossard, C., Tranquet, O., Bernard, H., Pilolli, R., Nitride, C., Larré, C., Adel-Patient, K., Monaci, L., Mills, E. N. C., De Loose, M., Gillard, N. & Van Poucke, C. 2022. Development of incurred chocolate bars and broth powder with six fully characterised food allergens as test materials for food allergen analysis. *Anal Bioanal Chem*, 414, 2553-2570.
5. Henrottin, J., Pilolli, R., Huet, A.-C., Van Poucke, C., Nitride, C., De Loose, M., Tranquet, O., Larré, C., Adel-Patient, K., Bernard, H., Mills, E. N. C., Gillard, N. & Monaci, L. 2023. Optimization of a sample preparation workflow based on UHPLC-MS/MS method for multi-allergen detection in chocolate: An outcome of the ThRAI project. *Food Control*, 143, 109256.