



DETECTION OF ALLERGENIC EGG PROTEINS IN HEAT-TREATED PRODUCTS

Loredana Biondi¹, Barbara Cioffi¹, Anna Cutarelli¹, Morena Nappa¹, Daniela Manila Bianchi², Orlando Paciello¹, Yolande Thérèse Rose Proroga¹, Francesco Paolo Serpe¹

¹Dipartimento di Coordinamento di Sicurezza Alimentare. Istituto Zooprofilattico Sperimentale del Mezzogiorno, Portici (NA), Italy; ²Centro di Riferenza Nazionale per la rilevazione negli alimenti di sostanze e prodotti che provocano allergie o intolleranze (CReNaRia) - Istituto Zooprofilattico del Piemonte, Liguria e Valle D'Aosta, Torino, Italy.

The rising prevalence of food allergies necessitates reliable strategies for the prevention, assessment, and management of food allergen risks.

Food processing—specifically cooking—influences the metabolism of allergens in humans and, consequently, their allergenic potential; this applies to egg proteins, which are listed in Annex II of EU Regulation 1169/2011.

The aim of this study was to assess the detectability of the egg allergen via ELISA in various commercially available products with egg listed on the label, while also considering recent findings regarding the stability of egg proteins following heat treatment. Such treatments increase protein fragmentation and digestion rates while reducing the binding capacity between proteins and IgE.

The primary allergenic egg proteins—ovomucoid, ovalbumin (OVA), ovotransferrin, and lysozyme—are found in the egg white. α -livetin and lipoprotein YGP42 are two minor allergens present in the yolk.

Eggs possess high nutritional value, and approximately 30% of consumed eggs are ingested in processed form (1). Mostashri et al. recently examined in detail the impact of processing on egg protein allergenicity (2). Specifically, a molecular weight of at least 3.5 kDa is considered necessary to elicit an antibody response (3); indeed, when comparing different fractions of hydrolyzed egg white, peptides with a molecular weight below 3 kDa exhibit lower IgE and IgG binding capacity than fractions containing peptides of higher molecular weight (4). Therefore, given that allergenic peptides have a molecular weight exceeding 3 kDa, heat

treatment is a critical factor regarding both allergenicity and analytical sensitivity. In the course of this study, the following commercially available products were therefore tested using the R-Biopharm Ridascreen Ei/Egg ELISA kit (Darmstadt, Germany):

1. Egg-based dry snacks (Brand A)
2. Shortbread cookies with egg ingredient (Brand B, type a)
3. " (Brand B, type b)
4. " (Brand B, type c)
5. " (Brand B, type d)
6. " (Brand C, type a)
7. " (Brand C, type b)
8. " (Brand D)
9. Shortbread cookies with egg PAL (Precautionary Allergen Labelling) (Brand E)
10. Baked product without egg ingredient (Brand F)

The results obtained were as expected: for samples 1 through 4, the egg allergen was present and detectable despite the technological processing the food had undergone; for sample 5, which declared egg only via PAL, egg proteins were undetectable, just as—as expected—they were undetectable in sample 6.

In conclusion, the molecular structure of the allergenic proteins in the tested foods remains unaltered—regarding their sensitivity to analytical detection—following technological treatments (which are likely primarily thermal). This demonstrates that the described analytical approach adequately protects the health of allergic consumers and is applicable even to highly processed foods. (This activity was carried out within the framework of project RC 02/25 IZS PLV).