©Clélia Villemin

Chemical deamidation or enzymatic modification of gluten proteins influences their patterns of interaction with immune cells.

A cellular model sensitively responds to biochemical modifications of allergens

Read more

Villemin C, *et al.*

Deamidation and enzymatic hydrolysis of gliadins alter their processing by dendritic cells *in vitro*.

Journal of Agricultural and Food Chemistry . 2020 - https://doi.org/10.1021/acs.jafc.9b06075

Tranquet O, *et al.*

Allergic reactions to hydrolysed wheat proteins: clinical aspects and molecular structures of the allergens involved.

Critical Reviews in Food Science and Nutrition . 2020 - https://doi.org/10.1080/10408398.2018.1516622

Contact

Sandra Denery

UR BIA

sandra.denery@inrae.fr

Context

Industrial processes enabling the diversification of food protein functionalities can modify their allergenicity. In animal models, enzymatic hydrolysis of gliadins, the major wheat allergens, reduces their allergenic potential or leaves it unchanged, whereas deamidation of gliadins was associated with severe allergic reactions.

We do not have enough hard science to link the biochemical characteristics of food proteins with their capacity to direct an immune response towards allergy or tolerance. Compounding the issue, there is still no validated *in vitro* test that could serve to assess the effect of food protein modifications on allergenicity and–ultimately–to assess the risk of new engineered ingredients triggering new allergies.

Dendritic cells are involved in capturing and presenting allergens to immune-system cells. Dendritic cell–food protein interaction is considered key as an early event that directs immune response towards tolerance or allergic sensitization.

Results

Working in collaboration with Dutch researchers on the COST (Cooperation in Science & Technology) Action ImpARAS (Improved Allergenicity Risk Assessment Strategy), we brought *in vitro* dendritic cells into contact with native, enzymatically-hydrolyzed or deamidated gliadins. Native gliadins have an immunostimulatory effect: they induce dendritic cell expression of several compounds involved in initiating immune responses–including compounds that help activate T-cells or help dendritic cells migrate towards the organs where allergic response will express.

Enzymatic hydrolysis and, to a lesser extent, deamidation lead to a decrease in the molecular weight of gliadins. In both cases, there is a loss of native gliadin epitopes, i.e. of antigenic sites in wheat allergy, but deamidation also generates new epitopes.

These modifications increase gliadin uptake and breakdown by dendritic cells, and mask the immunostimulatory effect of the gliadins. Therefore, both enzymatic hydrolysis and deamidation are found to heavily modify certain key properties of gliadins and gliadin–dendritic cell interactions.

Future outlook

This high-potential *in vitro* model needs however to be optimized to reproduce *in vivo* and clinical-practice observations and enable implementation of rapid and readily operable methods for a priori assessment of the allergenicity of functionally-modified ingredients. Progressing the model hinges on a validation phase with reference proteins known to be either highly or rarely allergenic.