Aggregation induced by heating decreases allergic potential of gliadins, this latter is recovered after limited pepsin hydrolysis

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Aims: Wheat is one of the most important crops in the world in terms of human nutrition. Both technological and nutritional properties of wheat flours and wheat-derived foods are determined by starch and gluten proteins, the storage proteins of the seed. As regard to health aspects, some individuals exhibit wheat-related disorder such as celiac disease (CD) or food allergy to wheat (FAW) after ingestion of wheat-containing products. In both disorders gluten was involved and in particular the gliadins, that are the main proteins responsible for CD and FAW. Food processing as well as digestibility and gut permeability are key factors to consider since they may affect, positively or negatively, the allergenic potential of food allergens. Because wheat is always consumed after some heat processing, our aim was to investigate the effect of heating and digestion on gliadins (well-known allergens of wheat) and their capacity to maintain their allergenic potential.

Methods: The effect of heating and peptic digestion at different times on gliadins fraction was studied by electrophoresis. The remaining epitopes (after thermal processing and/or proteolysis) were checked by immunoblotting with specific anti gliadins antibodies and patient sera. Furthermore the capacity of these modified proteins/peptides to cross the intestinal barrier and to induce the mast cell degranulation was investigated through Caco-2 and RBL-SX38 in vitro model respectively.

Results: The heat treatment resulted in large gliadins aggregates which are partially hydrolysed. The digestion resulted in polypeptides missing of epitopes at N- and C-terminal as revealed by immunoblotting with specific IgG. The digested products were also less recognized by patients sera than the native gliadins. Permeability studies revealed the capacity of aggregated and digested gliadins to cross the Caco-2 cell and furthermore to induce the mast cell degranulation, despite this, the native proteins were the better allergenic form.

Discussion: This work revealed the digestibility resistance of the repetitive domains of these gliadins aggregates. Immunogenic peptides or even intact proteins crossed the barrier modeled by Caco2 layer. There is still uncertainty as to the forms of the allergen which passed the barrier.

Conclusion: Aggregation induced by heating decreases allergic potential of gliadins, this latter is recovered after limited pepsin hydrolysis.