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Mise en place et validation de stratégies nutritionnelles visant à réduire le risque de réponses allergiques

Abstract

Food allergy is a dysfunction of the immune system that affects around 5% of the world population. The susceptibility to develop an allergy is influenced by multiple factors such as genetic and environmental factors, the duration of exposure to allergens etc... Gut microbiota seems to play a primordial role in the establishment of this pathology, starting from birth. Our current lifestyle, characterized by a decreased exposure to a broad spectrum of microorganisms, influences the diversification of the intestinal microbiota and thereby the maturation of the immune system. Currently, there are no effective treatments or preventive strategies for food allergies. The only option for those affected is the elimination of the foods in question from their diets. Nevertheless, accidental ingestion is always a possibility and the health consequences can be severe.

During this thesis, two nutritional preventive strategies were considered. The first strategy consisted of searching for molecules capable of interacting with potentially allergenic proteins and masking the immuno-reactive parts in order to inhibit their recognition by the immune system and thus limiting the allergic reaction. The second strategy aimed to limit allergic responses by modulating the intestinal microbiota using a synbiotic, a mixture of probiotic strains and a prebiotic.

For the first strategy, we focused on phenolic compounds known to naturally interact with proteins and especially wheat gliadins, described as major allergens. The selection and characterization of various plant extracts rich in phenolic compounds was carried out. The gliadin/phenolic compounds interaction capacity was measured by electrophoresis and by a novel HPLC technique for quantifying simultaneously phenolic compounds and unreacted proteins. We have highlighted a plant extract capable of masking the immunoreactive parts of the allergen. When the allergen complexed to the extract was given to animals sensitized to wheat gliadins, no allergic response was detected.

To limit the symptoms during an allergic reaction, a symbiotic has been preventively given to animals allergic to ovalbumin. After multiple provocations with the allergen, this treatment showed a real decrease in symptoms. The evaluation of the composition of the intestinal microbiota by metagenomic analysis showed that bacteria from the Firmicutes phylum were maintained, thus avoiding the increase of bacterial populations involved in intestinal inflammation phenomena. Hence, the intake of the synbiotic exerted a preventive action on the dysbiosis.

The two nutritional strategies developed during this thesis showed beneficial results both in vitro and in vivo making it possible to envision an application on humans.

Keywords: Allergy - Phenolic compounds - Synbiotic - Intestinal microbiota -Dysbiosis