



Interactions between proteins and faba bean polyphenols during gastrointestinal digestion

This thesis is part of the ANR LETSPROSED project, the main focus of which is legumes, in particular faba beans. These legumes are sources of protein as well as polyphenols. Among the latter molecules, tannins have a strong affinity for proteins, and in the context of digestion, these may be proteins from the food matrix or from the host (e.g. salivary proteins, digestive enzymes, mucins from the gastrointestinal tract). The thesis project will study the interactions between proteins and tannins during digestion (simulation of the oral, gastric and intestinal phases). The project aims to determine the impact of protein-tannin interactions on digestive proteolysis, as well as on the integrity of the intestinal mucosa.

The approach adopted is to work on model systems consisting of a purified food protein, a recombinant salivary protein and purified tannins. The project will characterize food protein-tannin assemblies, and the reactivity of these assemblies in the presence of a salivary protein with a high affinity for tannins (IB-5): modification of complexes (shift of equilibrium towards salivary protein-tannin complexes, tripartite supramolecular assemblies, precipitation of complexes, etc.) as a function of tannin structure. The fate of assemblies during in vitro gastrointestinal digestion will be studied: structure and proteolysis. Finally, the digestates will be applied to a mixed cell model of the Caco2-HT29MTX intestinal mucosa (including enterocytes and mucin-secreting goblet cells) to specifically characterize the impact of digestates on the intestinal mucus.

The thesis will be carried out within two teams (Bioactivity and Nutrition in the STLO unit and Polyphenols, Reactivity, Processes in the BIA unit) with complementary expertise. The techniques used are varied, covering the different aspects of the program: analysis of polyphenols and tannins: spectrophotometric assays, UPLC-MS; protein interactions: electrophoresis, UV, ITC; in vitro digestion (INFOGEST protocol); cell culture; confocal microscopy.

All analytical and imaging equipment and methods are available in either unit. The mixed cell model Caco2-HT29MTX is used at STLO, and original developments in image analysis are being developed with the FAIIA (Facility for Artificial Intelligence and Image Analysis) platform at the University of Rennes. The student will benefit from the support of technical staff who are experts in their field.

Starting date : october 2024

Requirements :

Initial training in chemistry and/or biochemistry is required. Experience in one or more of the methods used (polyphenol analysis, in vitro digestion, cell culture, etc.) will be appreciated, as well as experience in statistical data processing and/or knowledge of R software.

To apply, contact Martine Morzel, STLO (martine.morzel@inrae.fr), Sylvain Guyot, BIA (sylvain.guyot@inrae.fr) and Kevin Billet, BIA (kevin.billet@inrae.fr)

Deadline : 31st May 2024