

Deflamin, an edible anti-inflammatory protein isolated from legume seeds

Joana Mota¹, Renata Hartmann², Norma Marroni², Anabela Raymundo¹, Ricardo Ferreira¹, Ana Lima¹

¹ LEAF-Linking Landscape, Environment, Agriculture and Food, Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda, 1349-017 Lisboa (Portugal).

² Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre(Brasil)

Abstract

A subgroup of matrix metalloproteinases (MMPs) called gelatinases (MMP-2 and MMP-9) have been strongly implicated in colorectal cancer and in inflammation. Similarly, to what happens in the oncological disease, MMP-9 inhibitors (MMPIs) have been demonstrated to effectively inhibit colitis and other inflammatory bowel diseases (IBDs). However, finding efficient MMPIs has been hampered by low specificity and overall severe secondary effects. Studies strongly relate MMP-9 inhibition to clinical reduction IBDs and suggest that ingestion of MMPIs can decrease their incidence. Hence, the resource to suitable MMP-9 inhibitor functional foods will have an important social and economic impact for health and inflammatory diseases in near future. Since IBDs are also related to pre-cancer and metastatic stages, this strategy may also be a valid, easy and cost-effective alternative to prevent cancer incidence. However, targeting MMP-9 through food has been difficult, mostly because of lack of specificity and lack of resistance to the digestion process. We have recently identified deflamin, a small protein isolated from the seeds of lupine, with an outstanding MMP-9 inhibitory capacity. Using deflamin, we tested dose-response MMPI activities in HT29 colon cancer cells, using wound healing and cell proliferation assays. We then produced food products (cookies) containing enough bioactive protein to exert the desired beneficial effects in dietary intakes, assessed their digestibility and tested their efficacy in *in vivo* models of inflammatory colitis. In these animal models the expression of several inflammatory and oxidative stress-related biomarkers was evaluated. Our results showed that deflamin significantly reduced cancer cell invasion in a dose-dependent manner and without exerting any apparent cytotoxicity. Furthermore, deflamin and deflamin-containing cookies reduced colitis in *in vivo* models whilst presenting a high anti-inflammatory, antioxidant and MMPI activity which was maintained after baking and after the digestion process. Given the important link between inflammation and cancer particularly in the gastrointestinal tract, our results suggest a strong potential of deflamin to be used as a nutraceutical or as a functional food ingredient in the treatment or prevention of IBDs and colorectal cancer.

Biography:

In this moment, I'm doing my PhD in Instituto Superior de Agronomia, Lisbon. My master's degree was held at the Faculty of Medical Sciences in Biochemistry for Health. My work was based on the discovery of a lupine bioactive protein, deflamin. This protein has been shown to be anti-inflammatory in *in vitro* models with various colon cancer cell lines as well as in *in vivo* models of acute and chronic disease. At this moment, I'm continuing the work done in the Master. I have four published papers in reputed journals.

Speaker Publications:

1. "Gold Nanoparticles Supported on Carbon Derived from Solid Olive Waste for Epoxidation of Cyclooctene"; Asian J. Chem. / 2018 / 30(8) /pp 1731-1735
2. "Adsorption, kinetic and thermodynamic studies of safranin and methylene blue on a novel adsorbent based on phosphorylated sawdust"; Desalination and Water Treatment