FOOD HYPOCHOLESTEROLEMIC PROPERTIES: CHEMICAL STRUCTURE-FUNCTION INTERPLAY

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The use of cholesterol lowering ingredients as a strategy to control the development of cardiovascular diseases, namely atherosclerosis has been proposed, although the mechanisms of action are still undisclosed. [1,2] In the current work, several examples of food matrices (e.g. algae, mushrooms and coffee) and by-products (e.g. pine nut skin, non-conform mushrooms, within others) were explored towards their effect on cholesterol bioaccessibility as measure of their potential to lower cholesterol. [3–6] Polysaccharides and lipids present in some of these matrices, were extracted and chemically characterized, and have shown potential to affect solubility of cholesterol, however their mechanisms of action were distinct. Polysaccharides were able to interact with bile salts affecting cholesterol solubility. This was observed for polysaccharides positively charged such as chitooligosaccharides, [5] negatively charged such as fucoidans [6] and non-charged such as galactomannan and arabinogalactan [7] or rhamnogalactans. Moreover, the presence of algae lipids also showed to impact on the bioaccessibility of cholesterol, showing that the prevalence of phytosterols and unsaturated fatty acids affects the solubility of cholesterol in the micelles, leading to its precipitation. This effect is maximized after the hydrolysis of triacylglycerol's, emphasizing the impact of gastrointestinal digestion process. Fermentation of soluble fibers present in coffee, composed mainly by the polysaccharides arabinogalactans and galactomannans, as well as melanoidins which result from Maillard reactions during coffee roasting, also shown to affect metabolism of cholesterol, namely by impacting on the conversion of secondary bile salts and on the ratio of short chain fatty acids. [8] Coffee and melanoidins supplementation to mice (C57BL/6) under a high-fat diet (HFD) led to higher levels of plasma total cholesterol and increase HDL-cholesterol levels. In addition, coffee samples decreased HFD-induced body weight gain and lipid accumulation, and improved insulin resistance. The understanding of the interplay between chemical structure of food ingredients and hypocholesterolemic potential may aid on the development of new cholesterol lowering functional ingredients.

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