Colloidal aspects of lipid digestion: the physics behind healthier food

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Abstract

An emerging application of colloidal science, due to the growing social and economic consequences of the obesity crisis in the developed world, is the design of healthier foods to control fat uptake in the diet. Consequently molecular mechanisms of digestion and metabolism of lipids are generating renewed scientific interest. Lipase-colipase complexes adsorb onto the surface of lipid droplets to access and hydrolyse fats into a form absorbed by the body (lipolysis). Previous works suggest that processed food emulsions could be designed to slow rates of lipolysis, inducing satiety, and lowering fat intake in the diet. Use of nanoscience methods to visualise bile salt adsorption under in vitro duodenum conditions suggest that interfacial structures of protein stabilised emulsions could be designed rationally to control bile salt adsorption, reducing lipase-colipase adsorption and rates of lipolysis. An important aspect of such design is ensuring that modified interfaces survive digestion conditions in the stomach. ColloDi aims to consolidate and expand these findings into how the process of digestion affects the structure and stability of model emulsions and interfacial layers. This information is obtained by using state-of-the-art colloidal characterisation techniques and theoretical models. The improved understanding of this process could enable the design of food emulsions with specific lipid digestion profiles.