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UNRAVELLING THE MECHANISMS OF FOOD DIGESTION TO IMPROVE OUR KNOWLEDGE OF THE EFFECT OF FOOD ON HUMAN HEALTH

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Recent findings have demonstrated that the food matrix structure is one of the key drivers to control the fate of food in the digestive tract and, consequently, the kinetics of nutrient release.

As an example, using the pig as a model of human, we have clearly demonstrated that, at identical composition, differences in food macrostructure (milk vs acid and rennet gels) lead to differences in gastric emptying, protein hydrolysis in the gut and amino acid bioavailability. Compared to dairy gels, milk goes more rapidly through the stomach to reach the small intestine where protein will be quickly and extensively degraded. This generates a fast and intense peak of plasma amino acids.

Similarly, the food macrostructure also drives the kinetics of release of hydrophilic and lipophilic vitamins in the bloodstream.

When food composition and macrostructure are identical, microstructure can be a tool to modulate nutrient bioavailability. Three egg white gels were made at different ionic strengths and pH, generating gels with similar macrostructure but different microstructure (porosity, tortuosity). When given to pigs, these gels had different impact of the pH and the diffusion of acid secretion in the stomach, leading to differences in gastric proteolysis.

Controlling the time of residence of food in the stomach by playing on its structure should allow to design products with a fast release of nutrients particularly adapted for elderlies, athletes etc… whereas foods persisting in the stomach should induce satiety and be dedicated to overweight people. Ongoing experiments using biophysical methods will help us to understand the mechanisms of gel particle breakdown in the stomach in order to design foods of new generation perfectly adapted to the nutritional needs of specific populations

Keywords: digestion, food structure, nutrient, bioavailability

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