Plenary 4: Gut Physiology: Gut Function and Nutrition

The impact of gastric structuring on the digestion of lipid emulsions

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The challenge of delivering nutritionally enhanced foods with proven benefits, and the need to address the ongoing obesity issue are cited as important consumer and industry drivers within the foods sector. As a consequence of these particular trends there is an increasing scientific interest in how food systems behave during the digestive process. A particular aspect of this is to develop understanding of how the material properties of foods can be controlled under physiological conditions. Through such understanding food microstructures can be designed capable of delivering enhanced in-body functionality, such as the optimised release and uptake of micronutrients, or the ability to regulate satiety.

Research undertaken at Food Science Australia and CSIRO Human Nutrition has sought to investigate the relationship between emulsion structure design and the gastro-intestinal processes associated with the digestion of fat, with a view to engineering foods with the ability to enhance satiety. Based on an understanding of gastro-intestinal physiology, food emulsion systems with controlled in-body material properties have been designed and characterised. Coupled with development of an appropriate *in-vitro* model we have been able to study how emulsion gastric and pancreatic lipolysis is influenced by the structural characteristics of a particular emulsion system under simulated in-body conditions.

Findings from in-vitro studies will show that the lipolysis rate of iso-caloric oil-in-water emulsions is affected by a number of structuring parameters including: specific interfacial design and composition, changes in relative fat surface area (through controlled emulsion stabilisation and destabilisation under gastric conditions), and relative solid fat content at in-body temperatures. For samples where significant differences in lipolysis behaviour have been observed, additional *in-vivo* triglyceride-plasma trials will demonstrate how the microstructural design of foods post-consumption can be used to achieve a specific, controlled physiological response during digestion.