K11 - Dynamic gastrointestinal system as a tool to evaluate the behaviour of carbohydrates after ingestion: from macro to nano scale

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In the recent years, much effort has been dedicated to the development of *in vitro* gastrointestinal systems that closely mimic the physiological processes occurring during human digestion, i.e., systems that provide accurate results in short time, serving as a tool for rapid screening of foods or delivery systems with different compositions and structures [1]. Static gastrointestinal systems are extensively used, however, most of the times, their simplified gastrointestinal conditions do not accurately simulate the complex physicochemical and physiological processes that occur within the human gastrointestinal tract.

A dynamic gastrointestinal system, composed of stomach, duodenum, jejunum and ileum and that simulates the main events that occur during human digestion has been used by our group to evaluate the behaviour of food structures (from macro to nano scale) under digestion.

This dynamic gastrointestinal system can be used for example to predict the glycemic index of food (e.g., rice), predicting the blood glucose response after their ingestion and allowing the selection of the appropriate diet for people that suffer from glucose intolerance. Also, the knowledge of the behaviour of nanostructures (e.g., carbohydrate-based nanostructures) as well as the fate of the bioactive compounds encapsulated within them in the gastrointestinal tract is of utmost importance for optimizing the bioactivity of encapsulated compounds and to ensure that these structures are safe for human consumption. In fact, the development of novel delivery systems for food applications through the use of nanotechnology has been extensively explored [2]. Although the encapsulation of bioactive compounds in bio-based nanostructures have been reported as promising mean of protecting the valuable bioactive compounds and providing new functionalities (e.g. increase of bioavailability), the use of very small particle sizes may alter the biological fate of the ingested materials and bioactive compounds, which could potentially have adverse effects on human health [3].

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