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## Controlled satiety and nutrient digestion through a proper design of 3D food architecture

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The worldwide prevalence of diet-related diseases such as obesity is one of the main food related health concerns, which urges innovative solutions. Among the different approaches developed to address this problem, the modification of food structure and/or appearance deserves attention due to its influence in implementing food perception and eating behaviour, as well as biophysical transformation of nutrients in the gastrointestinal tract. The possibility of controlling the satiety perception and the nutrient digestion of food products has been studied by exploring their interrelations with external (shape and dimensions) and internal (voids and solid fractions, pores morphologies, etc.) 3D properties of food products. With this aim, cereal-based snacks having morphological diversities and different level of 3D complexity have been obtained by using 3D food printing technology that is capable to convert any 3D digital model into food structures. The samples were described for the texture properties, in vitro nutrient bioaccessibility and microstructural metrics. Then, three consumer's groups at different age were selected and they were asked to eat the samples while the mastication behaviour was detected by using EMG analysis. Lastly, the panellists were invited to rate their perceived satiety.

This work shows the successful development of food products with diverse structures affecting some food attributes, as well as the nutrient digestion and the oral breakdown. In addition, it was possible to relate food structure with perceived satiety which was different among consumers at different age.

This study contributes to the understanding of how to control nutrient digestion and satiety by means of a proper design of food structures with tremendous consequences on the human health. For instance, it could be possible to realize food products inducing a rapid satiety thus decreasing the intake of calories or some unhealthy nutrients, e.g. sugars, saturated fats, etc. On the contrary, other food structures could generate a delay in the satiety sensation, so causing a higher consumption of food products in persons who have the need to increase the intake of some micronutrients.