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Assessing food/saliva interactions according to the rheological properties of artificial boluses

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Rheological properties of artificial boluses of cereal foods enriched with legume proteins

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Partnerships

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Context

The breakdown of food during chewing determines its sensory and nutritional properties. With salivation, it forms a food bolus, which is then swallowed. For cereal-based foods, mechanistic models have shown that interactions with saliva determine the variation in bolus viscosity. These interactions are essential for the palatability of food products enriched with plant proteins.

The aim of this research is therefore to determine an interaction coefficient between saliva and cereal-based foods with different structures and compositions. Four foods, enriched and unenriched with pea flour, belonging to two families of cereal-based products, a sponge cake (soft) and an extruded flat bread (crisp), were studied. To overcome inter-individual variability, artificial boluses were obtained after hydration and grinding.

Results

LThe variations of rheological properties of the boluses with their water content, X in the range of hydration by saliva, were determined by two types of rheometry, oscillatory and capillary rheometry. The results showed that at low strain the boluses behave like a gel and at high strain like a yield stress fluid. Boluses can thus be characterised by two essential rheological properties: the characteristic stress at transition to flow and flow consistency. The decrease of these properties with increasing water content, adjusted with an exponential function, is used to determine a coefficient of interaction of the food with water α ($5 \leq \alpha \leq 30$). These α values, thus calculated, are higher for pea-based extrusions ($\alpha \geq 15$), than for sponge cake ($\alpha \leq 15$). When compared to those found for real boluses, findings suggest that α allows characterisation of the interaction of the food with saliva.

Future outlook

These rheological methods can be applied to other foods, and by determining α, their interaction with saliva can be taken into account to help design specific diets.