

Using a novel soft robotic swallowing setup to adapt food products for specific swallowing disorders

BUGARIN-CASTILLO Y. (1), MATHIEU V. (1), RAMAIOLI M. (1)

1 UniversitParis-Saclay, INRAE, AgroParisTech, UMR SayFood, 91120, Palaiseau, France

Age-related physiological changes can induce swallowing disorders and strongly impact the quality of life. Texture adaptations should ensure safe swallowing but also maintain pleasure during consumption.

Objective: A novel in vitro soft robotic swallowing setup was developed and used to identify promising rheological adaptations of food to meet the specific needs of people with swallowing disorders.

Methods: A range of thick liquid food were adapted to different levels from the International Dysphagia Diet Standardization Initiative (IDDSI) using natural thickeners. Their performance was evaluated using an in vitro swallowing model that simulates the interaction between the tongue and the palate when the bolus is transported during the oral phase of swallowing. Different conditions were mimicked; (i) healthy swallowing and (ii) specific swallowing disorders such as xerostomia, sarcopenia, and uncoordinated swallowing. Food boluses were then evaluated to characterize their shear and extensional viscosities. Moreover, timings of bolus out, and residues remaining after swallowing were assessed in triplicate.

Results: Levels 3 and 4 from IDDSI were achieved by using natural thickeners. Similar levels of shear viscosity could be reached with natural and commercial thickeners. The quantity of residues after swallowing in the in vitro setup increased within the following conditions; uncoordinated swallow > sarcopenia > xerostomia > healthy conditions. Food products with lower levels of shear viscosity exhibited fewer residues but shorter timings of bolus out, which might alter swallowing safety. **Conclusions:** The study shows an interest in imitating swallowing disorders in vitro to improve the assessment of food products for patients with swallowing difficulties.