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Nutrient bioavailability is reduced in elderly with oral deficiency: interest of combining in vitro mastication and digestive approaches

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The first stage of digestion of solid foods begins with the food oral processing. The way in which the food bolus formation is achieved during mastication will define further digestive steps and consequently nutrient bioavailability.

This work was designed to study the impact of masticatory deficiency, frequently observed in elderly population, combined with aged digestive characteristics on nutrients bioaccessibility after ingestion of a meat model food.

Four combinations of oral and gastric digestive conditions were simulated: in vitro food boluses were obtained after normal or deficient mastication by programming the mastication simulator AM2 and were digested in an in vitro dynamic digester (DIDGI®) mimicking adult or elderly physiological gastric conditions. Physical characterization of food bolus material was obtained with granulometry and rheological measurements. Biochemical characteristics of the liquid phase of the bolus (lipids/proteins oxidation, free-iron/peptides release in liquid phase) were measured for nutrient bioaccessibility assessments. The kinetics of release of lipids, proteins and peptides from the food matrix during gastric digestion were assessed in digesta (collected after 30, 60, 90, 120 and 150min) and analyzed as the area under the curve of nutrient appearance.

Results showed that (1) food bolus after deficient mastication were harder, more cohesive and less disorganized, and with a greater proportion of large particles (2) deficient mastication resulted in a reduced bolus bioaccessibility of free-iron and peptides (3) deficient mastication slightly impacted nutrient bioaccessibility in gastric digesta after adult digestive conditions, probably balanced by the gastric enzyme activity and acidic conditions (4) deficient mastication combined with the elderly digestive conditions delayed the release of nutrients in the gastric compartment and did not reach the threshold obtained during adult digestion.

Obviously for designing specific food for elderly, the oral stage has to be carefully considered to fulfill the specific needs of the elderly population whom increase dramatically.

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