In vitro digestion of dairy milk and cream, and of their vegetal analogs

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Plant-based analogs are currently developed to mimic animal-based foods on the eve of the protein transition. Although their structural and textural characteristics are usually close to the original foods, their nutritional composition and quality are still not satisfactory. Notably, it is unclear how vegetal analogs to milk products behave in the human gastrointestinal tract, and how their nutrients are released. To address these questions, we conducted a study to compare the behaviors of commercial food emulsions, namely cow milk products and some soy-based analogs, in gastrointestinal conditions. Seven products were selected, of which the droplet size distribution and nutrient contents were characterized. One milk and one soy-based analog (both fortified with vitamin D) and one cream and one soy-based cream with close characteristics were then studied during in vitro gastrointestinal digestion. Oil droplet interactions were monitored throughout digestion using optical microscopy, laser diffraction analysis, and electrophoretic mobility. Lipid digestibility was quantified using HPLC-ELSD and pH-stat methods, and protein digestibility was quantified using the OPA spectrophotometric method. The intestinal bioacccessibility of lipolysis products and of vitamin D in bile micelles was measured using GC-FID and spectrophotometry, respectively. When comparing cow milk and soy-based products, despite having different compositions in fatty acids and amino acids, similar structural changes as well as similar lipolysis and proteolysis behaviors were observed during gastrointestinal digestion. Vitamin D stability and bioacccessibility were also close. These findings suggest that the main features controlling digestibility in these products are their physicochemical properties, including their physicochemical stability in gastrointestinal fluids.

Keywords:
emulsion, milk, cream, plant-based analog, digestion