**Tribology as a design tool to tailor foods for the elderly population**

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Aging is associated with a loss of muscle mass and strength and if allowed to advance, this condition may proceed to sarcopenia, early loss of independent living, and several comorbidities1. Acute studies have shown promising results for high leucine or leucine-enriched protein sources in terms of stimulating muscle protein synthesis2. Furthermore, protein hydrolysates have been seen to be a promising method to obtain easily digestible proteins. However, increasing protein levels whilst reducing fats as a food formulation strategy for the elderly to address food-linked diseases often affects the taste, flavour, and texture of the foods. The aim of this research was to gain insights on the effect of protein type, oil concentration, and processing condition on the tribological properties of emulsions made with high protein concentration (10 wt%). Oil-in-water emulsions stabilised by whey protein isolate (WPI) or hydrolysed whey protein (HWP), and various oil concentrations (1-20wt%) were produced using two different processing routes, a) emulsifier-rich, b) emulsifier-poor followed by continuous phase enrichment. We characterised the tribological behaviour using soft tribopairs consisting of polydimethylsiloxane (PDMS). Bulk rheology results show that the studied systems presented shear thinning behaviour with apparent viscosity increasing upon oil addition and enrichment of the emulsions with protein. Friction coefficient decreased with increasing oil concentration throughout all tribological regimes for HWP systems unlike WPI systems, where friction coefficient was similar regardless of the oil content. In addition, friction coefficient decreased in the boundary regime with increasing oil concentration for samples made using process b. HWP emulsions presented lower friction coefficient values across all tribological regimes compared to WPI emulsions. Adsorption studies with a quartz crystal microbalance with dissipation (QCM-D) measurements show that HWP forms a less viscous/more elastic film when adsorbed onto the PDMS surface, thus resulting in lower friction coefficients at low speeds for HWP. The knowledge generated here is important for designing foods with high protein concentrations with pleasurable sensory characteristics for the elderly population highlighting the potential use of protein hydrolysates.

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**Reference**

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