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UNRAVELLING THE BEHAVIOUR OF CURCUMIN NANOEMULSIONS DURING *IN VITRO* DIGESTION: EFFECT OF EMULSIFIER TYPE

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Curcumin is a natural polyphenol that has been shown to exhibit numerous biological and pharmacological activities, such as antioxidant, antitumor and anti-inflammatory properties; however, it exhibits low bioavailability due to its low solubility in water. The encapsulation of curcumin in nanoemulsions may contribute to improve curcumin solubility in water and also to increase its bioavailability during gastro-intestinal passage. Moreover, some emulsifiers can interfere with nanoemulsions digestion due their capacity to modify the ability of lipase to interact with the lipid phase.

The curcumin oil-in-water nanoemulsions were prepared using corn oil and two different emulsifiers, Tween 20 (non-ionic) and Sodium dodecyl sulfate (SDS) (cationic), through high-pressure homogenization. The impact of the emulsifier type on the size, charge and morphology of the curcumin nanoemulsions was evaluated. It was observed that the nanoemulsions with Tween 20 as surfactant exhibit a mean size and a mean charge of 357 nm and -0.6 mV, respectively and the nanoemulsions with SDS as surfactant present a mean size and a mean charge of 139 nm and -99.4 mV, respectively.

The effect of emulsifier type on the digestibility of curcumin nanoemulsions was evaluated using an *in vitro* digestion model being the changes in structure and properties of the curcumin nanoemulsions monitored by transmission electron microscopy and dynamic light scattering. The rate and extent of the nanoemulsions digestion during the gastro-intestinal passage was evaluated measuring the free acids released. For both Tween 20 and SDS curcumin nanoemulsions, it was observed that the digestion was initiated in the stomach due to the action of the gastric lipases, but occurred predominately in the small intestine due to the action of pancreatic lipases. Free fatty acid contents increased after *in vitro* digestion for all curcumin nanoemulsions.

This work will contribute to the development of nanoemulsion-based delivery systems in order to protect and release bioactive lipophilic compounds within the human body, for food and pharmaceutical applications.