Influence of emulsifier type on *in vitro* digestion of curcumin nanoemulsions: lecithin and rhamnolipids

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Curcumin is a polyphenol with several health benefits such as antimicrobial, anti-oxidant, anti-tumoral and anti-inflammatory activities. Although this bioactive compound is present in several food products as spice or colorant, it has poor solubility in aqueous solutions and low bioavailability. Nanoemulsions (NE) are a colloidal delivery system which can improve the bioavailability and stability of lipophilic compounds mainly due to their high encapsulation efficiency, control release capacity and high surface area. Nowadays, the demand for food products with sustainable and "label-friendly" ingredients is growing. Therefore, it is important to develop NE with bio-based ingredients, understand their behavior during the digestion process and assess their safety.

The main objective of this research was to evaluate the influence of two natural emulsifiers, lecithin (LEC) and rhamnolipids (RHAM), in a curcumin-enriched NE formulation when submitted to an *in vitro* digestion. NE were characterized in each step of digestion through size, ζ-potential and morphology. At the end of digestion, free fatty acids released and bioaccessibility and stability of curcumin were determined. Cytotoxicity of both NE was evaluated on Caco-2 cell line through the MTT assay.

Both NE presented an increase in the particle size at the gastric phase, showing some instability from this phase onwards. The release of free fatty acids was similar for both NE, allowing to conclude that the type of emulsifier did not have a high influence in the lipid phase digestibility. Regarding curcumin bioaccessibility and stability, both NE showed similar stability; however, NE-LEC bioaccessibility was 2.7 times higher compared to NE-RHAM. Cytotoxicity results showed that NE-RHAM exhibited toxicity values higher than NE-LEC.

This study contributed to the development of NE with improved curcumin bioavailability using only bio-based ingredients and to their application in the food sector by combining essential data on *in vitro* digestion and safety of different formulations.