Recent Developments on Emulsification Techniques: Formulation of Nanoscale Antioxidant Food Materials

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An overview of the latest developments in emulsification technology towards the production of submicron scale antioxidant food materials will be discussed during the presentation, emphasizing the use high pressure homogenization, emulsification-evaporation, and microchannel emulsification. The consumption of bioactive compounds such as carotenoids and ω-3 polyunsaturated fatty acids (PUFAs) is well known to help preventing various types of cancer and coronary heart diseases. Nevertheless, considering that these compounds are prone to oxidation, the formulation into oil-in-water (O/W) emulsions or microencapsulation should increased their stability, besides promoting their bioavailability. We have evaluated the formulation of nanoemulsions containing antioxidant food materials such as PUFAs from fish oil, or β-carotene, using various techniques such as high pressure homogenization by microfluidizer or nanomizer, along with emulsification-evaporation. We also investigated the performance of various Polyglycerol Esters of Fatty Acid (PGE) in the preparation of β-carotene nanoemulsions, as well as their effect on the physicochemical properties and stability of resulting emulsions, during *in vitro* gastric digestion. The production of monodisperse nanoscale materials (*e.g.* droplets, microparticles, microcapsules, among others) have potential applications, for instance in food (as functional foods), pharmaceutical (as vehicles in Drug Delivery Systems), and cosmetics industries. Moreover, we have investigated the formulation of monodisperse oil-in-water (O/W) monodisperse emulsions, using β-carotene rich-palm oil loaded with poly-unsaturated fatty acids (from fish oil origin), as well as olive oil rich in polyphenols. The stability of those emulsions was also evaluated. The results demonstrated that the droplet size and size distribution play major roles on the physical and chemical stability of the emulsions.