

Food-Grade Nanoemulsions Formed with Triacylglycerols and Different Biosurfactants as Stabilisers

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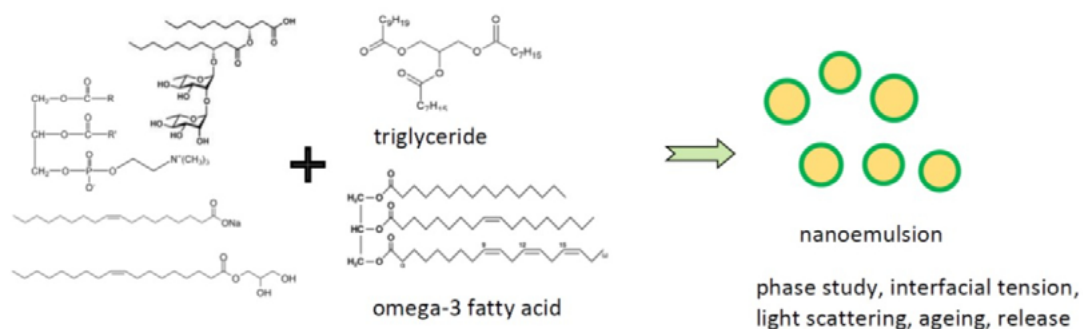
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Oil-in-water emulsions, able to deliver valuable nutrients, e.g. omega-3 fatty acids, are interesting components in food science. However, the formulation of colloiddally stable emulsions of sufficient stability can be a major challenge and this even more so when using food grade oils, such as triacylglycerols. One way to address this challenge can be to employ nanoemulsions. With their small diameter of 50-400 nm they are typically kinetically rather stable and with high surface/volume ratio they often have the advantage of fast release of active ingredients.

In this work, we studied a wider range of amphiphiles, such as soy lecithin, Tween 80, rhamnolipid, glycerine monooleate (GMO), sodium taurate, and sodium oleate with respect to their ability to function as stabilisers for nanoemulsions. Lecithin has a tendency to form bilayers in aqueous solution, while the others form micelles. In our experiments we determined the interfacial tension (IFT), as an important parameter for describing the solubilisation properties, against caprylic/capric triglyceride and paraffine oil as a function of surfactant concentration and also for mixtures of them. In the mixtures marked synergistic effects in reducing the IFT were observed by appropriately mixing the different components, especially for combinations of nonionic and ionic surfactant. Emulsification was done by sonication and vortexing for samples around the minimum IFT values. The formed (nano)emulsions were characterised with respect to their size and ageing behaviour by means of light scattering experiments. The size of stable droplets was in the range of 100 to 150 nm. In general, the droplet sizes are the smaller the lower the IFT, but the colloidal stability of the droplets typically depends selectively on the choice of the surfactants and their mixing ratio. In summary, this means that droplet size and stability of these food-grade emulsions can be tailored by appropriately choosing the composition of the amphiphilic mixture.

Keywords:

nanoemulsions, stability, delivery of omega-3-fatty acid



Scheme of formation and characterisation of omega-3 fatty acid containing triglyceride (nano)emulsions with different surfactants as stabilisers.