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Location and reactivity of model ingredients in emulsions: Effect of emulsifier properties and ingredient lipophilicity.

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Functional ingredients (*e.g.*, flavors, vitamins, bioactive peptides, drugs) with various properties (*e.g.*, molecular weight, lipophilicity) are often encapsulated in emulsions to enhance their solubility and stability. The performance of oil-in-water (O/W) emulsions as encapsulation systems is controlled to a large extent by the properties of both the emulsion and the ingredient.
The objective of this work was to investigate the effect of the interface properties, the ingredient properties and the oil physical state on the location and reactivity of model ingredients in emulsions. Spin probes with various molecular structure and lipophilicity were selected as model compounds and incorporated in nanoscale emulsions, prepared by homogenizing n-tetradecane or n-eicosane into emulsifier aqueous solutions. Emulsifiers with various physical properties were chosen, including proteins and ionic surfactants.
The distribution of paramagnetic spin probes between the different phases of emulsions was measured using electron paramagnetic resonance (EPR). The probe molecules partitioned between aqueous, micellar, interfacial and lipid environments, depending on the probe lipophilicity, the fraction of unadsorbed emulsifier and the oil physical state (*i.e.*, liquid or solid). The reactivity of spin probes was measured after addition of water-soluble reagents, and was found to be strongly affected by their location, mobility and by the droplet surface charge. In particular, probe immobilization at the interface resulted in the greatest protection against aqueous reagents.

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