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Clustering of oil droplets in o/w emulsions enhances sensory perception of oil related attributes

Philipp Fuhrmann *(Wageningen University & Research, Physics and Physical Chemistry of Foods), Guido Sala (Wageningen University & Research, Physics and Physical Chemistry of Foods), Elke Scholten (Wageningen University & Research, Physics and Physical Chemistry of Foods), Markus Stieger (Wageningen University & Research, Division of Human Nutrition)*

The clustering of oil droplets in o/w emulsions has been shown to greatly influence the rheological properties and the effective volume fraction of the dispersed oil phase in emulsions. Most studies so far investigated methodologies to create clusters, limited knowledge however is available on how those systems are perceived.

The aim of this study was to research the effect of controlled oil droplet clustering by hetero-aggregation on sensory perception and to relate the observations to physical properties of emulsions. Clusters ranging from 1-50 µm diameter were prepared by hetero-aggregation, by combining emulsions stabilized with positive (gelatine) or negative (whey protein, DATEM) charged emulsifiers. The interaction strength within a cluster was altered by changing emulsifiers (whey or DATEM), and was determined by measuring the critical strain.

A sensory study was performed using the RATA methodology with untrained subjects (n=80). Creaminess and thickness intensities of clustered o/w emulsions were significantly higher than those of homogenous emulsions, and increased with cluster size. While clusters with higher cluster strength were perceived as gritty, clusters of the same size but lesser interaction strength were perceived as smooth.

Rheological properties, such as consistency and flow index, were strongly correlated to thickness and creaminess perception. When mimicking changes during oral processing by incorporating saliva into emulsions, tribology was shown to be correlated to both grainy and fatty perception.

We conclude that clustering of oil droplets in emulsions provides an effective method to structure and redesign foods. Controlled structuring of oil droplets in liquids allows to tune both rheological properties and sensory perception of o/w emulsions. This approach may enable to design low-fat emulsions without thickeners while maintaining sensory perception of the full-fat version.