Protein aggregate oleogels: effect of aggregate properties on oleogel texture.

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Solid fats are essential for the texture of many food types. However, due to their high amount of, saturated fats, their use is discouraged, whereas the use of vegetable oils, higher in health-promoting unsaturated fats, is promoted. However, as oils are liquid, they often cannot provide the needed textural properties. To combine a more healthy composition with solid-like characteristics, oleogels have received attention in recent years. Oleogels consist of a continuous oil phase with a gelling agent. Among those gelling agents are proteins, which have been shown to create a space spanning network by attractive hydrophilic interactions between protein aggregates. To strengthen the network, water can form capillary bridges between the aggregates, increasing the gel strength.

In literature, it has been shown that for model silica particles, the particle properties, such as size, can affect the final gel network. In the case of protein aggregates, also properties as density, porosity, roughness or swelling capacity may be relevant. However, it is not clear how such properties can affect the final oleogel characteristics. To investigate this, whey aggregates where prepared at different pH values, which is known to change particle properties such as density and roughness.

The oleogels created with these protein aggregates (before addition of water) contained different protein concentrations, due to differences in protein interactions during the preparation process. Clear differences in the rheological properties, such as the gel strength and critical strain, were observed, indicating that such properties indeed play an important role. For example, oleogels prepared with protein aggregates created closer to the iso-electric point, being denser and rougher, showed a lower degree of interactions, leading to a higher protein content and a lower critical strain.

When water was added to increase protein interactions, differences in gel strength and critical strain decreased. This emphasizes the large influence of capillary bridges on this type of oleogel.

In this presentation, we will discuss how such protein oleogels can be created, and how specific rheological characteristics depend on the specific protein aggregate characteristics, the interactions, and the particle network formation. These results can be used to create oleogels with tailored characteristics, by altering the properties of the aggregates and the type of gel that is formed. These oleogels can be used to provide healthy alternatives to solid fats with a variety of textures.