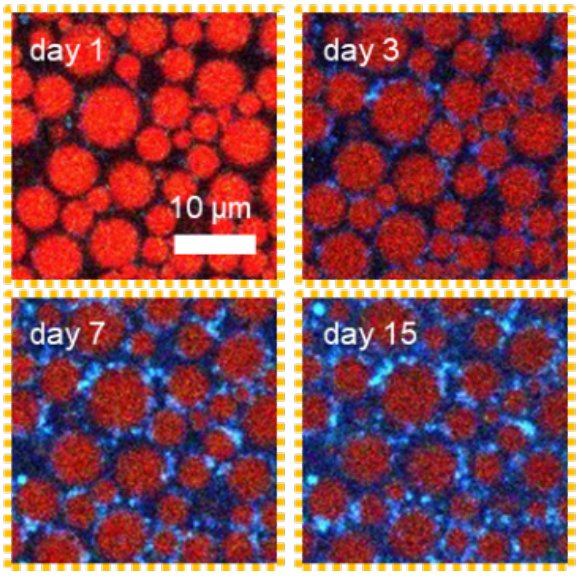
Studying lipid and protein co-oxidation in food emulsions using super-resolution microscopy

Lipid oxidation in **food emulsions** such as mayonnaise originates at the oil-water interface. Furthermore, free lipid radicals at the interface engage in the oxidation of proteins present at droplet interfaces and in the continuous water phase. There is, however, scarce information on the cause-effect relationship of lipid-protein co-oxidation.

To understand lipid-protein co-oxidation in greater detail, you will utilize optical **super-resolution microscopy** which provides access to sub 100 nm resolution and has not been yet applied to study food emulsions. Using a fluorophore specifically designed to trap free radicals, the super-resolved images will allow the precise localization of oxidized proteins with the aim to distinguish heterogeneous protein oxidation from lipid oxidation. In the project, you will start from localizing oxidized protein complexes such as LDL (low density lipoproteins) present in the water-phase of mayonnaise and further extend your experiments to the real mayonnaise food system. Your work will include sample preparation, dSTORM (direct Stochastic Optical Reconstruction Microscopy, https://doi.org/10.1002/anie.200802376) and advanced image analysis.



Images of heterogeneous protein oxidation proteins using a conventional confocal microscope blue: proteins, red: oil droplets. Reference: Yang2020, AntiOxidants, https://doi.org/10.3390/antiox9121278

BSs/MSc-thesis project:

- Establish super-resolution microscopy in the acidic environment of food emulsions and perform localization of protein free radicals in the water-phase of mayonnaise.

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