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Control of the whey protein-stabilized emulsion texture in a large range of concentration

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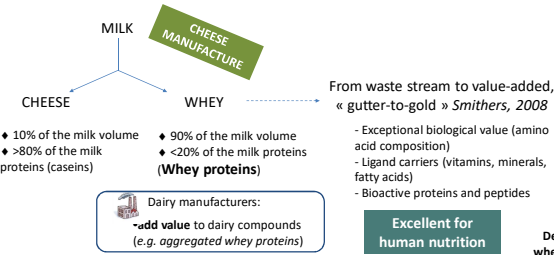
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Context

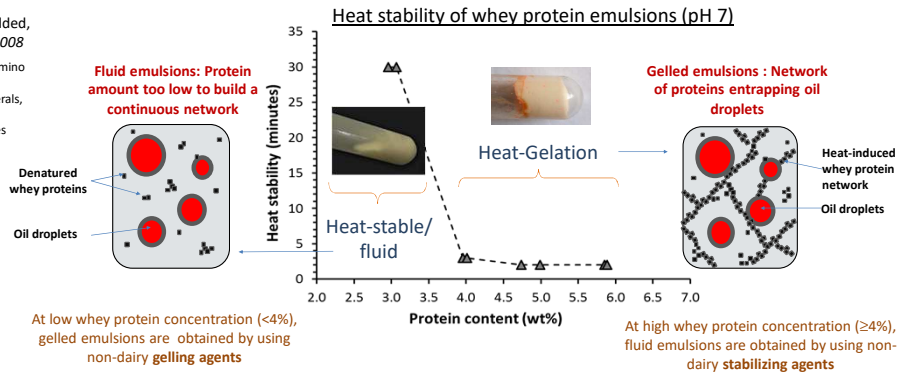
• Whey proteins : Large amount available around the world



• Additives are currently used to control dairy product quality (texture, heat stability, phase separation,...)
• New trends in Europe driven by consumer's expectations

- More natural and healthier food products
- 100% milk products (without non-dairy additives)
- Innovative products (new uses and consumption habits)

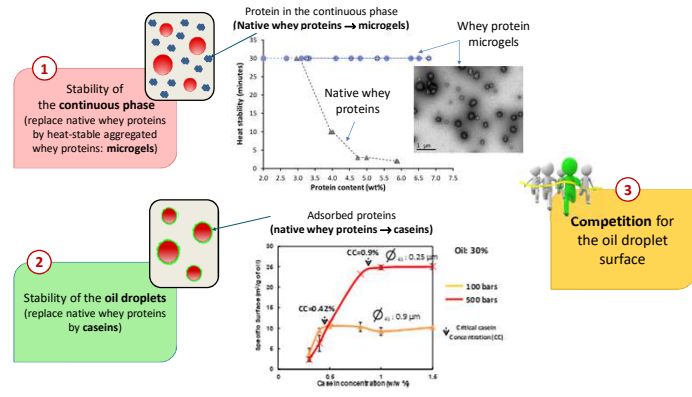
• Whey proteins are - natural emulsifiers (*adsorb to oil/water interface*)
- heat-sensitive proteins (*heat treatments are required to extent food product shelf life*)
→ heat sensitive emulsions
→ texturized (gelled) emulsions



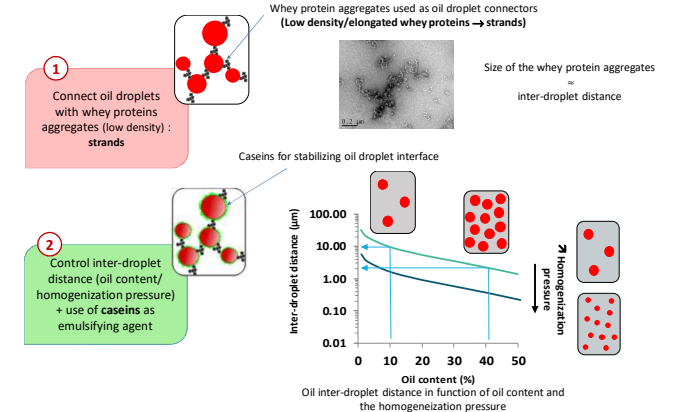
Research Questions

How to control the texture of whey protein emulsions in a large range of protein concentrations without non-dairy additives?

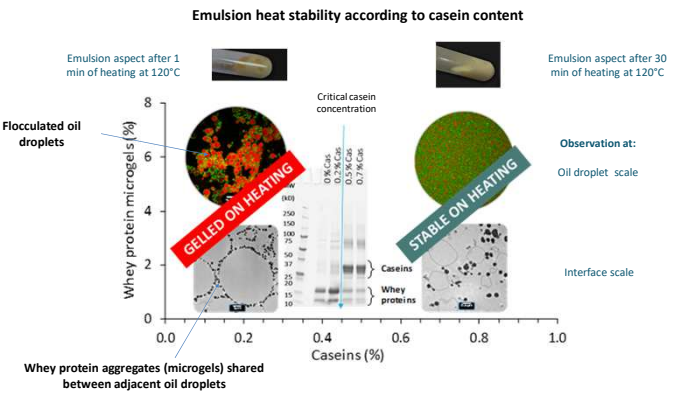
How to design whey protein emulsions at high protein concentrations that are fluid after heating in the absence of non-dairy additives?



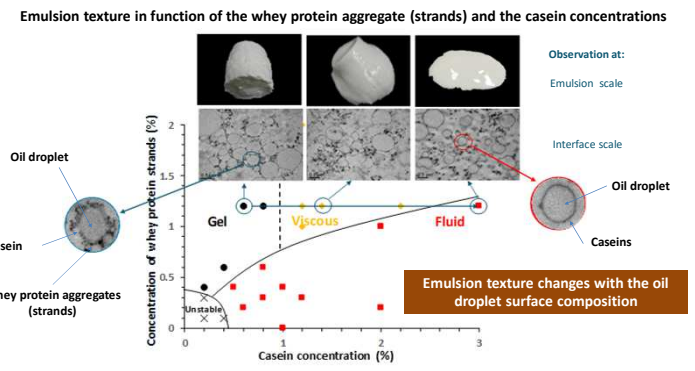
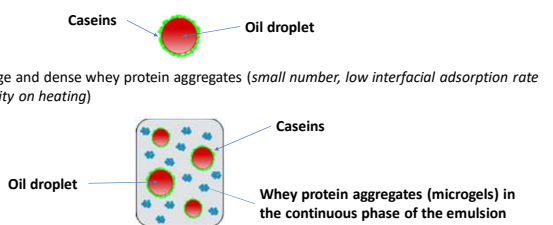
How to obtain texturized (gelled) emulsions at low whey protein concentrations without non-dairy additives ?



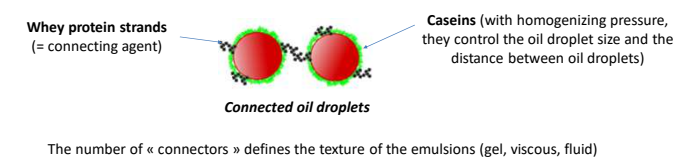
Strategy



Heat stable emulsions are obtained at high whey protein concentration in the absence of stabilizing agent:
- By adding sufficient amount of caseins to cover oil droplets surface (control of the size and stability of the oil droplets)
→ casein content (g) > mass of oil (g) × specific surface (m²/g of oil) × protein interfacial load (g/m²) (protein interfacial load ~ 2mg/m² for caseins)



Texturized emulsions are obtained at low whey protein concentration in the absence of gelling agent:
- By selecting low density/elongated whey protein aggregates
- By using whey protein strands as « connector » at the surface of the oil droplets (size of the aggregates - distance between oil droplets)
- In combination with the homogenization pressure, use caseins as emulsifiers to control the size of the oil droplets (distance between oil droplets)
→ casein content (g) < mass of oil (g) × specific surface (m²/g of oil) × protein interfacial load (g/m²) (protein interfacial load ~ 2mg/m² for caseins)



Results

Conclusion

