

Dry heating of β -lactoglobulin generates microparticles: role of pH and lactose

T. Sevrin, E. Schong, S. Pezennec and MH. Famelart
STLO, UMR 1253, INRA, Agrocampus Ouest, 35000 Rennes, France

E-mail contact: marie-helene.famelart@inra.fr

Heat treatment of whey proteins is known to increase the functionality of these high nutritional proteins such as their viscosity or gelling properties [1]. While heating a whey protein solution is a widespread practice, heating them as a powder, or dry heating, is a less known process. We have experimented the dry heating at 100°C of whey proteins with traces of lactose. Dry heating of a whey protein powder at pH 9.5 has been shown to generate microparticles [2,3]. It has been demonstrated that crosslinks of whey proteins in the powder during its dry heating make the powder partially insoluble, leading to microparticles having a shape close to that of the powder. Due to the porous structure of the powder, the microparticles formed by dry heating are able to entrap a huge amount of water (20-40 g water/g microparticle), with a yield of formation > 0.5 g microparticle/g of powder. They could be used as a 100% dairy ingredient in food products to increase their viscosity

With the aim to understand the process of formation of these microparticles, experiments were performed with pure β -lactoglobulin (β -Lg) in solution stored at 4°C with or without lactose, at pH 9.5 or 6.5, then freeze-dried and finally dry heated.

Analyses were performed at 3 steps, during storage of the β -Lg solution before its drying, after its drying and after dry heating of the β -Lg powder. Residual native proteins and secondary structures of proteins, the browning of powders, the yield of conversion of β -Lg into microparticles and their ability to entrap water were measured along the process.

In conclusion, the alkaline pH and the presence of lactose are crucial for the production of microparticles, but these two factors act at different steps of the process. The alkaline pH is only required during the storage of the β -Lg solution before drying and hardly plays a role during dry heating, while the presence of lactose is only crucial during the dry heating and is useless during the storage of β -Lg solution.

These results help understanding the formation of microparticles by dry heating.

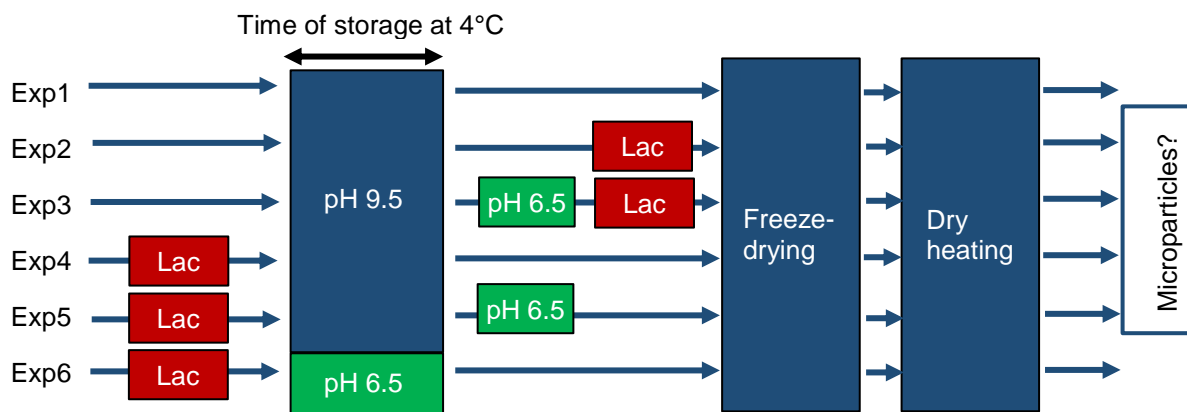


Figure 1: experiment plan

References

- [1] Nicolai T, Britten M, Schmitt C. 2011. β -Lactoglobulin and WPI aggregates: Formation, structure and applications. *Food Hydrocoll.* 25:1945-62.
- [2] Famelart MH, Schong E, Croguennec T. 2018. Dry heating a freeze-dried whey protein powder: Formation of microparticles at pH 9.5. *J Food Eng.* 224:112-20.
- [3] Schong E, Famelart M-H. 2018. Dry heating of whey proteins leads to formation of microspheres with useful functional properties. *Food Res Int.* 113:210-20.