

Refinery of milk and side streams of milk applications

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Cow milk is an attractive source of ingredients for a variety of food and functional food applications and is abundantly available. In many applications milk is the main ingredient (yogurt, cheese). In an increasing number of applications, only certain parts of the milk are used to invent new dairy products or upgrade existing dairy products by the addition of, e.g., proteins or fats. The carbohydrate fraction can be used to increase the level of fructooligosaccharides (FOS) and glucooligosaccharides (GOS) that are also present in human milk.

In cheese manufacturing, it is the liquid fraction that still contains a lot of interesting compounds, e.g., proteins, peptides, amino acids, vitamins, carbohydrates. However, before these compounds successfully can be used in its most optimal application, they need to be purified first to determine the properties of the individual components. The refinery of milk or whey needs to be designed according to the expected scale of the application. In food and functional food applications this means cost-effective large scale separation processes.

In the proposed research, the Ph.D. student will work on process optimization (purity, yield, and costs) of refinery processes of milk and whey for the refinery of bulk components (proteins, peptides, amino acids, fats, and carbohydrates). The focus will not be on a single product, but it will be important that development of the refinery process yields multiple products from the same source (milk, whey), e.g. minimizing waste is an important criterium. At small scale, several refinery concepts will be tested to identify beneficial ingredients for different applications. The results from the laboratory concepts are instrumental in the choice of further research. When several attractive compounds in combination with a suitable refinery concept have been designated, the Ph.D. student will conduct a techno-economical analysis using SuperPro to study which combination of products is most appropriate for the development of a large scale refinery concept. In this project it is foreseen that the candidate will design and execute a process at 1000 kg scale (starting material).