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Process-Structure-Functionality

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Collaborators

Faculté des sciences  
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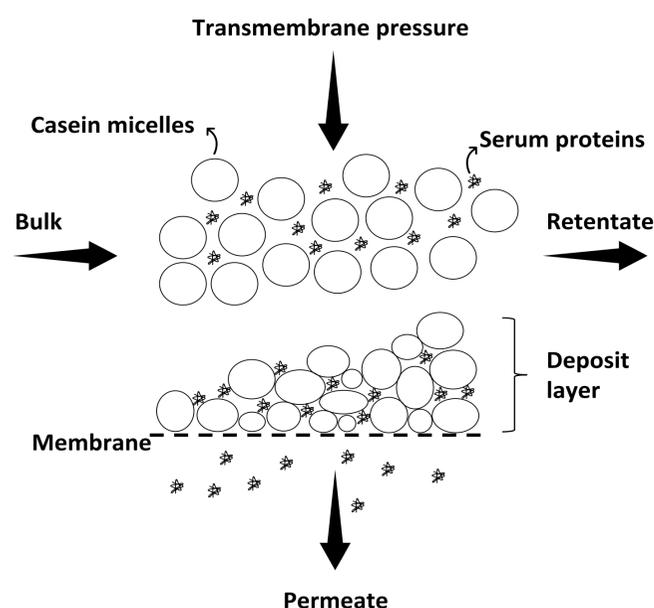
# Modeling of the serum protein transmission during microfiltration of skimmed milk

## Socio-economic context

- The dairy industry is a significant contributor and key driver for the economy of many countries
- Microfiltration of skimmed milk with 0.1  $\mu\text{m}$  pore size membrane (MF 0.1) is used in dairy industry to separate casein micelles and serum proteins
- The great value of both protein fractions leads to an increasing demand for this operation

## Scientific context

- The study of serum protein transmission during microfiltration of skimmed milk is a multidisciplinary problem that involves aspects of food science, biophysics, and engineering
- Membrane fouling by a deposit layer hinders the transmission of serum proteins, reduces the permeate flux and separation efficiency, and necessitates frequent cleaning, and thus results in an increased energy consumption and maintenance expenses
- Modeling of serum protein transmission can help optimizing the microfiltration process and improve the quality, efficiency and sustainability of dairy production



## Research questions

- How to describe the serum protein transport across the deposit layer made of the gel of casein micelle?
- How is the serum protein transport affected by the micelle's gel properties and ionic composition of the dispersion medium?
- How are gel properties affected by the presence of serum proteins?

## Expected results

- To know the properties of mixed dispersions of casein micelles and serum proteins via Small-Angle X-ray Scattering (SAXS), compressibility and rheology
- To model the serum protein transmission across the casein micelle gel
- To understand the influence of ionic composition of mixed dispersions on the serum protein transmission during the cross-flow microfiltration

## Perspectives

The project aims to:

- contribute to a mathematical model that can predict serum protein transmission during microfiltration
- develop more efficient and effective microfiltration processes by knowing the complex interactions between serum proteins and casein micelles
- gain a broader understanding of the properties of mixed dispersions, which can have implications beyond the dairy industry, in areas such as biophysics and colloid science