

# Seminar on Emerging Dairy and Food Technologies

## — Separation Technologies and Design of Complex Food Systems

Sept. 12-14<sup>th</sup>, 2018

### September 12<sup>th</sup>, 2018

#### Separation Technologies: Recent Topics

- State of the art and current trends in separation technologies
- Process design of membrane plants and criteria for the selection of membranes

#### Efficient Fractionation using Membrane and Centrifugal Systems

- Length effects on filtration performance in spiral-wound membranes: A key to increase filtration efficiency
- In-situ analysis of cake layer formation in hollow fiber membrane systems during milk protein fractionation
- Efficient fractionation of whey proteins by means of continuous centrifugal separation

#### Sustainable Processing by means of Membrane Technologies

- Fouling mitigation and filter life cycle extension by alternating and oscillating tangential flow
- Valorization of processing side streams as diafiltration media - Effects on filtration process and casein functionality
- Physical cleaning by rinsing of spiral wound modules – Increasing sustainability by process optimization

#### Fractionation of Milk Components and their Innovative Applications

- Prevention of human gastro-intestinal infection with functionalized bovine anti-body-enriched ideal whey obtained by microfiltration
- Efficient production of whey protein hydrolysates for special nutritional needs
- Whey concentrates with extended shelf life and high protein functionality as a substitute for whey powder

### September 13<sup>th</sup>, 2018

#### Design of Complex Food Systems: Recent Topics

- Technofunctional properties of animal and plant proteins: Opportunities and challenges
- Handling of complex food systems in practical reality

#### Efficient Processing of Complex Food Systems by Novel Drying Technologies

- Microwave-enhanced drying – Efficient production of foamed fruit snacks

- Novel microwave technology for homogeneous and safe heating and drying of complex food matrices

#### Better Understanding of Complex Food Systems

- Stabilization of emulsions by biogenic particles – A mechanistic approach
- Molecular background for optimizing microfiltration of skim milk at low temperatures
- Identification of mechanisms of multistage structure formation in processed, dispersed protein systems at high concentration

#### Designing Special Food Systems for Innovative Applications

- Innovative application of protein gel systems: Supercritically dried aerogels as transportation vehicles or protective matrix
- Possibilities for the production of cold-renneted, spray dried milk concentrates for application in dairy products

Reception and Networking Event at the Chair of Food and Bioprocess Engineering Pilot Plant Facility

### September 14<sup>th</sup>, 2018

#### Pilot Plant Demonstrations

##### • Separation Techniques

###### Membrane Techniques

- Micro-, Ultra-, Nanofiltration and Reverse osmosis in tangential crossflow mode
- Dynamic crossflow membrane techniques: Rotating membranes, Membranes with oscillating and alternating flow

###### Centrifugal Separation

- Removal of aggregated proteins by decantation centrifugation
- Novel decantation centrifuge for separation of products with special rheological profiles

##### • Thermal Processing Techniques

- Special techniques allowing precise heating profile for reaction kinetic studies
- Direct steam injection and infusion for UHT/ESL-heating of milk and whey protein concentrates

##### • Drying Techniques and Powder Handling

- Spray drying with nozzle and rotating disc systems
- Vacuum drying; Low temperature vacuum drying
- Conventional freeze drying in comparison to microwave enhanced vacuum and freeze drying

##### • Food Structuring and Texturization

###### Microencapsulation Technologies

- Mechanisms for matrix formation by proteins and hydrocolloids
- Aerogel methodology
- Spray drying methods

###### Protein Microparticulation by extrusion cooking technology

###### Emulsification, Foaming and Gel Formation Techniques

- Colloid mill; Toothed disc systems; Homogenizer
- Membrane aeration and emulsification

##### • Bioprocessing Technologies

- Batch and continuous fermentation of microbial cultures
- Hydrolysis of proteins by immobilized enzymes on monolithic chromatographic columns
- Enzymatic crosslinking of proteins

##### Analytical Techniques (Examples)

##### • High Performance Liquid Chromatography (HPLC)

- Novel analytical techniques for precise, simultaneous and quantified whey protein and casein analysis
- Anion and cation analysis in comparison to flame photometry

##### • Gel Electrophoresis (SDS-PAGE)

- Novel rapid electrophoresis techniques without staining agents
- Quantification by fluorescence technique without analytical standard substance

##### • Particle and Surface Characterization

- Contact angle measurement and interfacial tension
- Hydrophobicity of molecules
- Surface charge of particles or droplets (Zeta potential)
- Understanding of interactions between proteins and particles (Multi-angle light scattering)
- Laser diffraction for particle size analysis of powders or emulsion droplets
- Fourier Transformed Infrared Technology (ATR-FTIR) and Calorimetry (DSC)

##### • Rheological Profiling and Texture Characterization