



11th Central European Congress on Food and Nutrition

"Food, technology and nutrition for healthy people in a healthy environment"
CEFood 2022 Project day

LAKTIKA, Fractionation and processing of whey proteins for the formation of new functional foods and food supplements

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The Project Team



Univerza v Ljubljani
Biotehniška fakulteta



Univerza v Ljubljani
Fakulteta za farmaco



Univerza v Mariboru
Fakulteta za kemijo
in kemijsko tehnologijo

INŠTITUT ZA PILEKARSTVO IN PROBIOTIKE
INSTITUTE OF DAIRY SCIENCE & PROBIOTICS



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Agenda

- The project team
- The aim and objectives of the project
- Project Focus
- The most important theoretical knowledge to be incorporated into education
- The most important achievement to be incorporated into practice
- Challenges for the future
- Basic project indicators
- Authors and Institutions
- Acknowledgments



<http://laktika.arhel.si/>



<http://lifeforacidwhey.arhel.si/en>



Prepared by: Maja Zupančič Justin and Diana Paveljšek

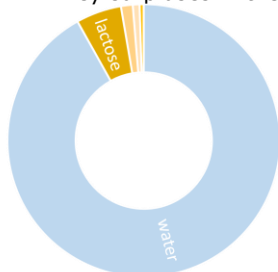
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The Aim and Objectives of the Project

WHY Whey is A CHALLENGE for dairy industry?

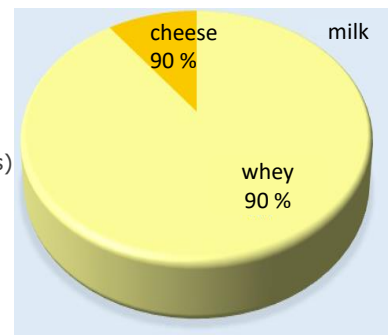
Production of 1 kg of cheese gives 9-10 L of whey!

- Whey represents 85-95 % of dairy wastewater
- Total EU whey production estimated at 40×10^6 t/y
- Whey surpluses in the EU estimated at 13×10^6 t/y



Typical whey composition

- 92 - 94 % water
- 3.2 - 6.6 % lactose (causes 100-time higher pollution potential compared to sewage)
- 0.05 - 0.5 % fats
- 0.5 - 1.4 % whey proteins (20% of milk proteins)
- 0.3 - 0.8 % minerals
- Vitamins, growth factors



Whey has a very high organic load!

- COD 50 - **70** g O₂/L
- BOD₅ 27 - **60** g O₂/L (daily load of 1 person (1 PE = Population equivalent) is **60 g BOD₅**)



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The Aim and Objectives of the Project

Demographic changes and eating habits drive market demand and offer producers new opportunities

Increased demand for:

- Protein fortified food
- Nutritional supplements improving immunity
- Improved Infant formulas
- Fortified cosmetic products
- Pharmaceuticals based on whey proteins



Bovine Lactoferrin market size in 2019 over 546 million \$

→ in 2027 the market is projected to reach nearly 950 million \$




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The Aim and Objectives of the Project

WHEY: THE BASIS OF MANY BIOTECHNOLOGICAL PRODUCTS





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Project Focus

LACTIC ACID BACTERIA AND THEIR METABOLITES





WHEY



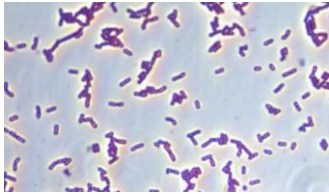
Separation of commercially interesting whey proteins by advanced fractionation methods with high purity and bioactivity of isolates.

FRACTIONATION OF LACTOFERRIN




Increase stability and achieve localized release of lactoferrin using microencapsulation and increase its bioactivity by preparing hydrolysates.

LACTIC ACID BACTERIA AND THEIR METABOLITES




Cultivation of probiotics and production of their metabolites (e.g. bacteriocins, B12) in whey fractions with reduced protein content.

BIOGAS

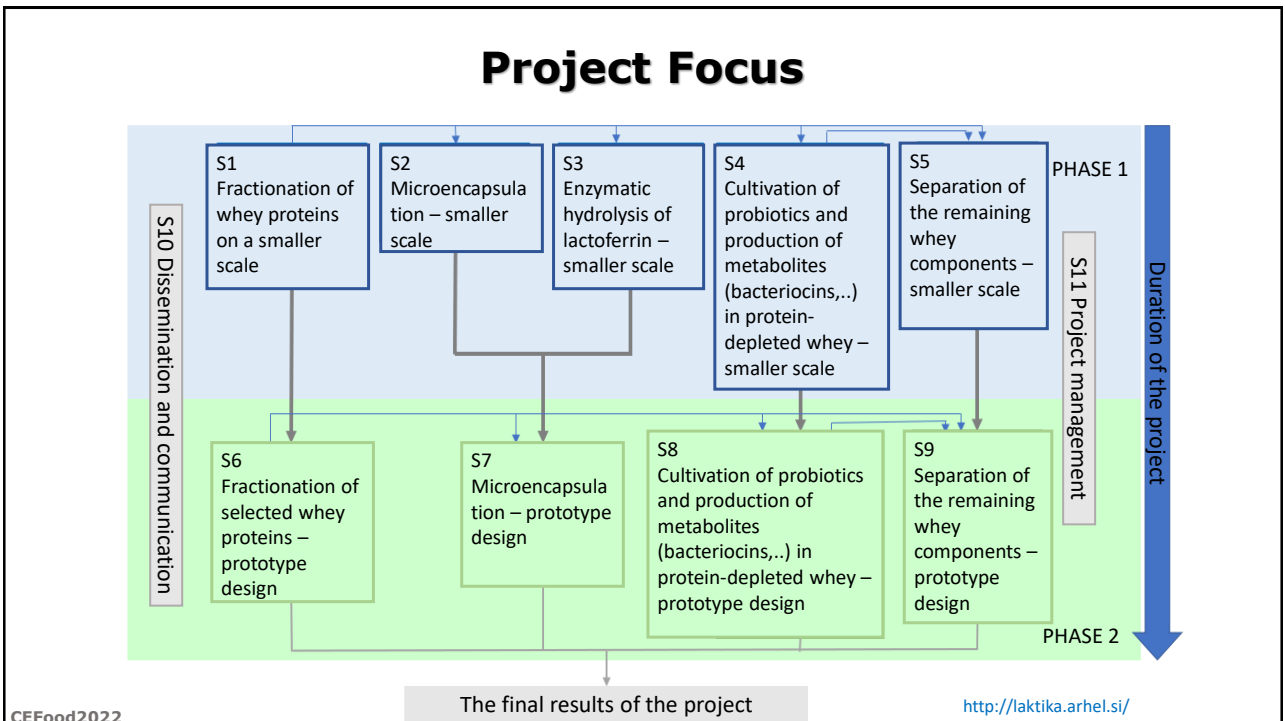


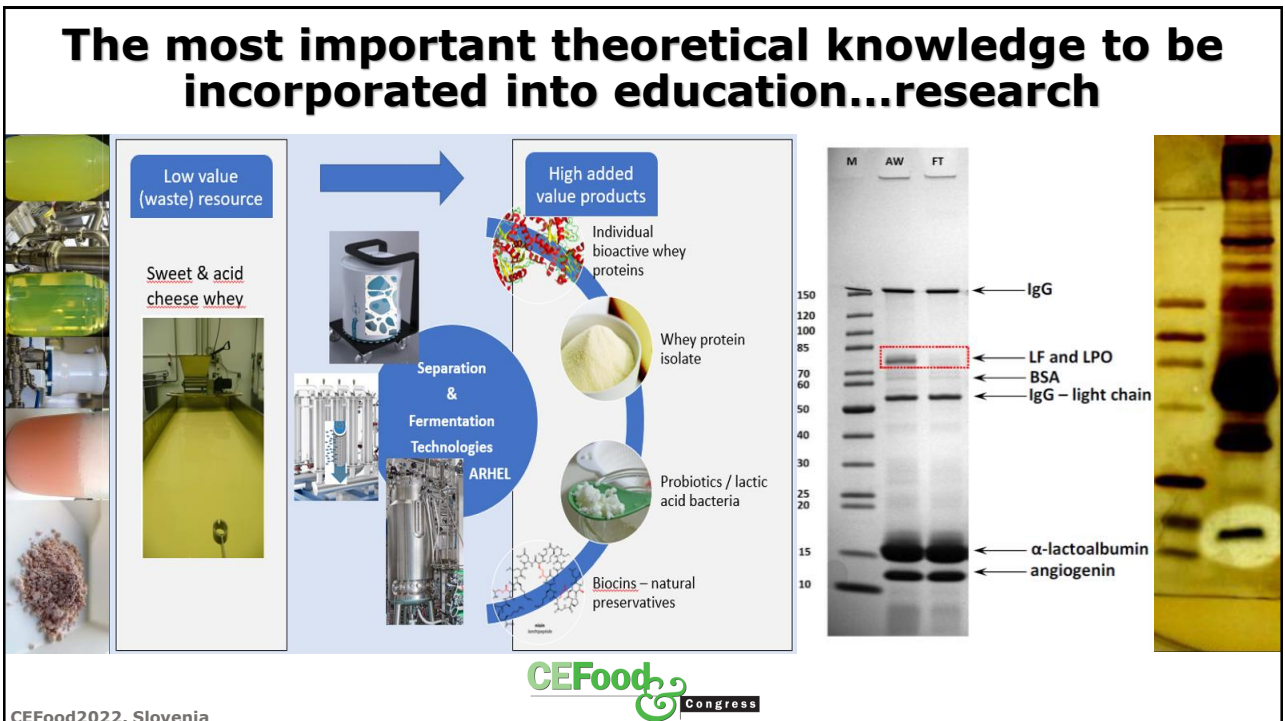
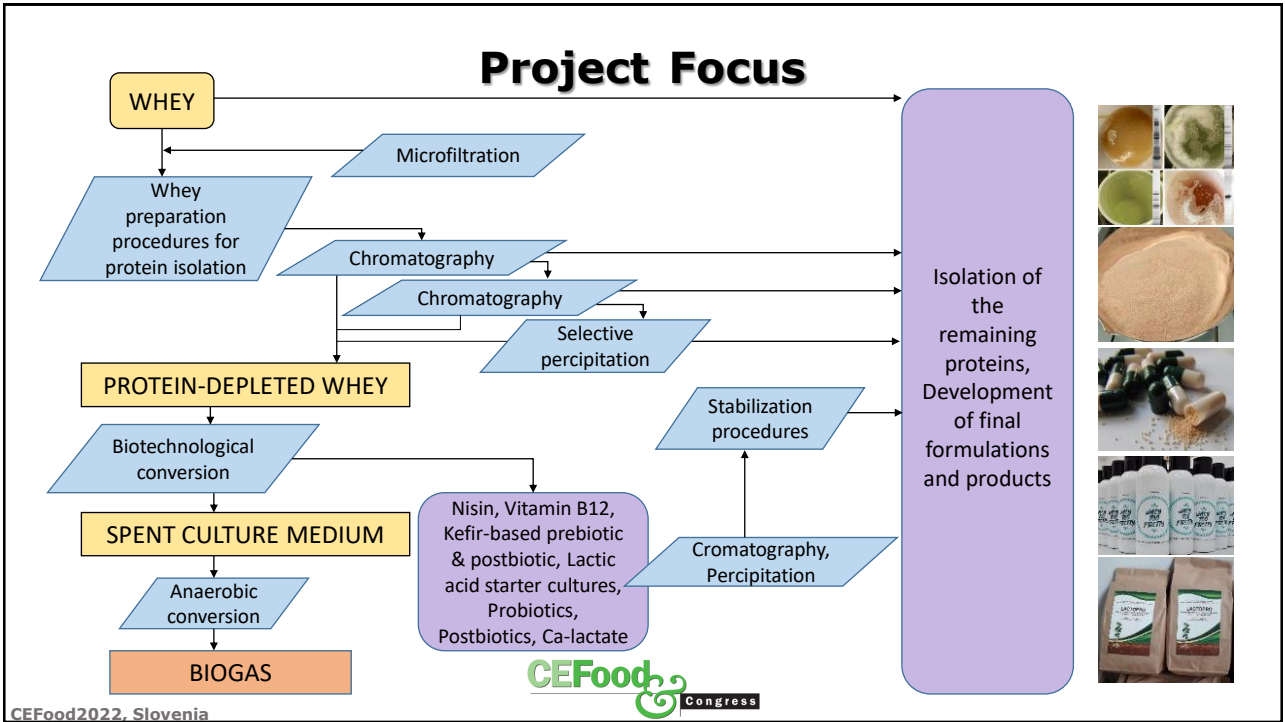
Define the final use of the residual whey according to the "zero waste" principle, e.g. in a biogas plant to produce biogas.

Demonstration and validation on a prototype level.

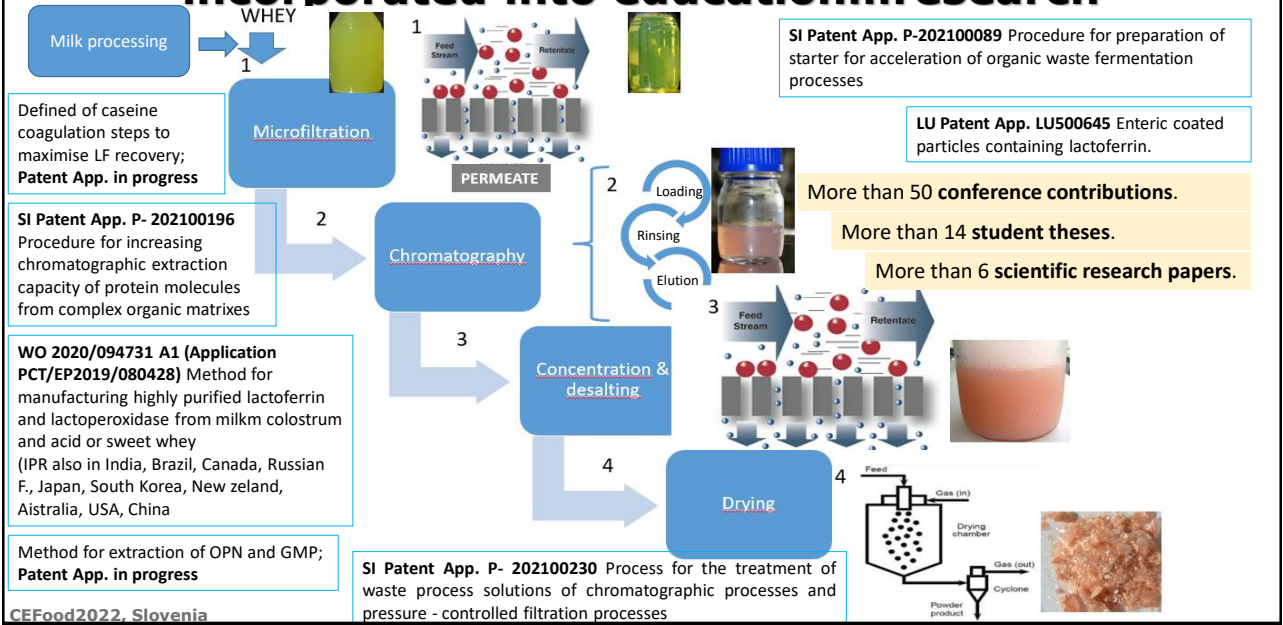


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The most important theoretical knowledge to be incorporated into education...research



The most important achievement to be incorporated into practice



Challenges of new process solutions for the further processing of whey

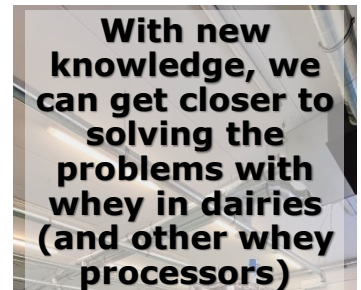
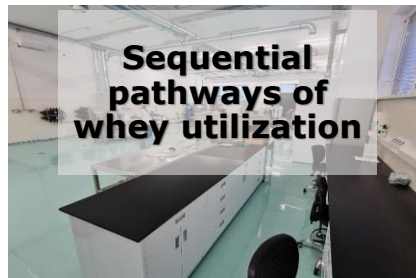
- The challenges of **chromatographic separation** of whey proteins as a new processing solution for the use of **higher value-added** whey:
 - Achieving high product **purity**
 - Preservation of the **(bio)activity** of the protein product
 - Achieving a high product **yield**
 - Achieving a high process **capacity**
 - Management of **environmental** impact (use of process raw materials)
 - **Integration** of the process with other processes for complete utilization of the whey



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Basic project indicators



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Authors and Institutions

Project manager: Marko Gerl

Coordinator of project activities: Maja Zupančič Justin (maja.justin@arhel.si)

Project team in alphabetical order:

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- **Process engineering:** Branko Hamiti, Mario Marinović, Dragan Martinovič, Robert Jagodič, Tomi Kacin, Damjan Adam, Rihard Murn, Tomaž Varlec, Luka Teslić, Jasmin Alibegić, Jožef Šibanc

Project coordinator: Arhel d.o.o.

Project partners: University of Ljubljana, Biotechnical Faculty, Institute of Dairy Science and Probiotics

University of Ljubljana, Biotechnical Faculty, Chair of Biochemistry and Food Chemistry

University of Ljubljana, Faculty of Pharmacy, Chair of Pharmaceutical Technology

University of Ljubljana, Faculty of Pharmacy, Chair of Biopharmaceutics and Pharmacokinetics

University of Maribor, Faculty of Chemistry and Chemical Engineering, Laboratory for Water Biophysics and Membrane Processes



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Acknowledgments



EVROPSKA UNIJA
EVROPSKI SKLAD ZA
REGIONALNI RAZVOJ
NALOŽBA V VAŠO PRIHODNOST

LAKTIKA:

nr. C3330-18-952002

Fractionation and processing of whey proteins for the formation of new functional foods and food supplements

Operational Programme for the
Implementation of the EU Cohesion Policy in
the period 2014-2020
<http://laktika.arhel.si/>



LIFE for Acid Whey:

LIFE16 ENV/SI/000335

Reuse of waste acid whey for the extraction of bioactive proteins with high added value

July 2017 – June 2021

LIFE Environment Program

European Commission

<http://lifeforacidwhey.arhel.si/en>



Thank you for your attention.

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