



LIFE16 ENV/SI/000335

LIFE for Acid Whey

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



BACKGROUND

Whey is a liquid remaining after the precipitation and removal of milk casein during cheese-making or other coagulated dairy products. If not processed or treated properly, it represents an enormous environmental burden due to its high level of chemical oxygen demand (COD) – the potential to deplete oxygen levels in water during its degradation. Since whey represents about 85-95% of the milk volume and retains 55% of nutrients such as lactose, proteins, lipids and minerals, further use of whey ingredients is essential.



Milk prepared for processing



Curdling of milk



Fresh cheese



Whey

PROJECT OBJECTIVES

While there are several commercial uses of sweet whey, acid whey (remaining after the production of curd or cottage cheese) is often discharged to the sewage system. The primary project objective is therefore to demonstrate a new technology for the extraction of high added-value proteins from acid whey, such as lactoferrin, in an economically-viable way applying monolithic ion-exchange chromatography columns.

After the extraction of proteins, whey will be further processed with an aim to completely reduce its environmental burden or to produce other highly valuable products.

Extraction of individual whey components.

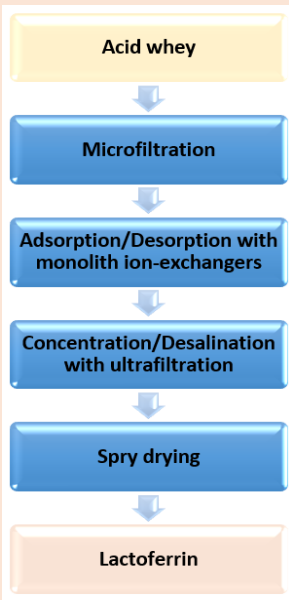
Use of lactose for the production of sweeteners, prebiotics and organic acids.

Use of whey for the production of dairy starter cultures, probiotics and their metabolites (bacteriocins).

Use of whey for the production of substances such as vitamins, carotenoids, bio-polymers, bio-surfactants, single cell proteins.

Use of whey for the production of energy sources such as bioethanol, biodiesel, hydrogen, biogas.

Lactoferrin extraction procedure



Further whey processing options

Whey protein extraction column



EXPECTED PROJECT OUTCOMES

- Construction of demonstration plant and establishment of the conditions to process 24 m³ of whey and produce 1.8 kg of lactoferrin per day.
Optimisation of the production process to fractionate lactoperoxidase and immunoglobulins from acid whey.
Reduction of the acid whey's COD by 95% during further anaerobic digestion.
Demonstration of other whey processing options at a pilot scale (including production of dairy starter cultures, dry whey proteins, etc.).



Extracted and dried lactoferrin

CONTACTS

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## LIFE for Acid Whey

### Ponovna uporaba odpadne kisle sirotke za ekstrakcijo bioaktivnih proteinov z visoko dodano vrednostjo



#### OZADJE PROJEKTA

Sirotka je tekočina, ki ostane po precipitaciji in odstranitvi kazeina v procesu izdelave sira ali drugega koaguliranega produkta iz mleka. Sirotka lahko predstavlja veliko okoljsko obremenitev, če je ne predelamo ali drugače primerno obravnavamo, zaradi visoke kemijske potrebe o kisiku (KPK) – porabe kisika v vodi v času njene razgradnje. Ker predstavlja kar 85-95% volumna mleka in se v njej zadrži kar 55% hranil (laktoza, sirotkini proteini, maščobe in minerali) je nujna nadaljnja uporaba sirotkinih sestavin.



Mleko pripravljeno za predelavo



Faza sirjenja



Skuta



Sirotka



#### CILJI PROJEKTA

Medtem ko obstaja več komercialnih načinov izrabe sladke sirotke, kisko sirotko (ostanek proizvodnje skute) pogosto odvajajo v kanalizacijo. Glavni cilj projekta je tako demonstrirati novo in ekonomsko sprejemljivo tehnologijo ekstrakcije visoko vrednih proteinov iz kisle sirotke, kot je laktoferin, z uporabo monolitnih ionsko-izmenjevalnih kromatografskih kolon.

Po ekstrakciji proteinov bomo sirotko nadalje procesirali s ciljem popolnega zmanjšanja njene okoljske obremenitve ali pridobivanja drugih visoko vrednih produktov.

Ekstrakcija posameznih sirotkinih komponent

Uporaba laktoze za pridobivanje sladil, prebiotikov in organskih kislin.

Uporaba sirotke za pridobivanje mlekarskih starterskih kultur, probiotikov in njihovih metabolitov (bakteriocini).

Uporaba sirotke za pridobivanje spojin kot so vitamini, karotenoidi, bio-polimeri, bio-surfaktanti, kvasni (enocelični) proteini.

Uporaba sirotke za pridobivanje energentov (bioetanol, biodizel, vodik, bioplín).

Nadaljnje možnosti procesiranja sirotke



Kolona za ekstrakcijo sirotkinih proteinov

#### PRIČAKOVANI REZULTATI

- Izgradnja demonstracijske naprave in vzpostavitev pogojev za procesiranje 24 m<sup>3</sup> sirotke in pridobivanja 1,8 kg laktoferina dnevno.
- Optimizacija proizvodnega procesa za izolacijo laktoperoksidaze in imunoglobulinov iz kisle sirotke.
- Zmanjšanje KPK kisle sirotke za 95% v času nadaljnje anaerobne obdelave.
- Demonstracija drugih načinov procesiranja sirotke na pilotnem nivoju (pridobivanje mlekarskih starterskih kultur, suhih sirotkinih proteinov, itd).



Ekstrahiran in posušen laktoferin

#### KONTAKT

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