

THE ELECTROPHYSICAL PROCESSING FOR OBTAINING SAFE AND HEALTHY PRODUCTS

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Whey is considered an extraordinary healthy dietetic food product of the latest generation, which can be used in treating many different diseases and as a food additive. In its liquid form, whey contains proteins, vitamins, minerals, and in very small quantities - lipids. Whey proteins make up 20% of the total milk proteins (80 % are of caseins), being extremely valuable from the biological point of view.

Various methods are used in the valorization of whey (non lipid substances from milk), that apply principles of concentration, fractionation (filtration and chromatography), chemical reaction and microbiological processes. Standard processes and methods of whey processing can be classified into the following groups: thermal; chemical; physico-chemical (reverse osmosis, diafiltration, microfiltration, ultrafiltration, nanofiltration, dialysis, ion exchange chromatography); biotechnological (biosynthesis of lactulose, manufacturing drinks on the base of the fermented whey); electrophysical (electrodialysis, electroactivation). Each of these methods, technologies, processing modes has its advantages and disadvantages.

The electro-physical processing of whey reduce usage of chemical reagents and diminish their emission in solution, improving in this way the quality of final products.

In our researches it was demonstrated that electrophysical processing allows the fractionation of whey into its most valuable components, isolating whey proteins and bi-valent minerals in protein-mineral concentrates (PMC), on the one hand, and on the other – deproteinized whey with major content of sugars already transformed and monovalent minerals.

The degree of proteins recovery in PMC after electrophysical processing of whey can reach about 60–65%; minerals – about 50–60% and lactose 5–10%.

SDS-PAGE of whey proteins from PMC revealed four groups:

- high weight proteins (HWP), in which 2–5 fractions were identified with variations of the molecular weight (MW) from 54 to 249 kDa, which contain the BSA with a MW of 66 kDa, lactoperoxidase with a MW of 70 kDa and lactoferrin with a MW of 80 kDa as well as protein complexes with a MW of about 200–249 kDa;
- caseins (CSN), in which 2–3 fractions - α -CSN, β CSN and κ -CSN were identified, with a MW of 37, 33 and 46 kDa, respectively;
- β -lactoglobulins whose isolation is significant in all of the collected samples, even during the first 5 minutes of processing;
- α -lactalbumins that are isolated, practically, uniformly during the entire processing.

Thus, electrophysical processing of whey represent a non-waste technology for processing of dairy products for extracting protein-mineral concentrates with predetermined protein composition and simultaneous isomerization of lactose into lactulose in order to produce healthy food additives without using chemical reagents. It should be noted that the U.S. Food and Drug Administration (FDA) designate both whey proteins as Generally Recognized As Safe (GRAS).

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