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THE USE OF WHEY FOR OTHER PRODUCTS

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HASALLIU R. , BYTYCI P., MESTANI M., SULA (MARKU) K.,

Agricultural University of Tirana, Faculty of Biotechnology and Food[1]University of Biotechnology and Business, Prishtina, Kosovo

E-mail:rhasalliu@ubt.edu.al

Abstract

Whey is produced as a by-product of cheese and casein manufacture and for many years was regarded as a nuisance, low value material requiring disposal at least cost. Whey is rich in proteins, lactose, and minerals. Using new technologies like membrane separation, has revolutionized the processing of whey into many highly valued products. There are many possible products and manufacturing processes like separation, concentration, fractionation, ultrafiltration, concentration for production of whey protein, mineral powder and lactose (Robinson, R., 2002).

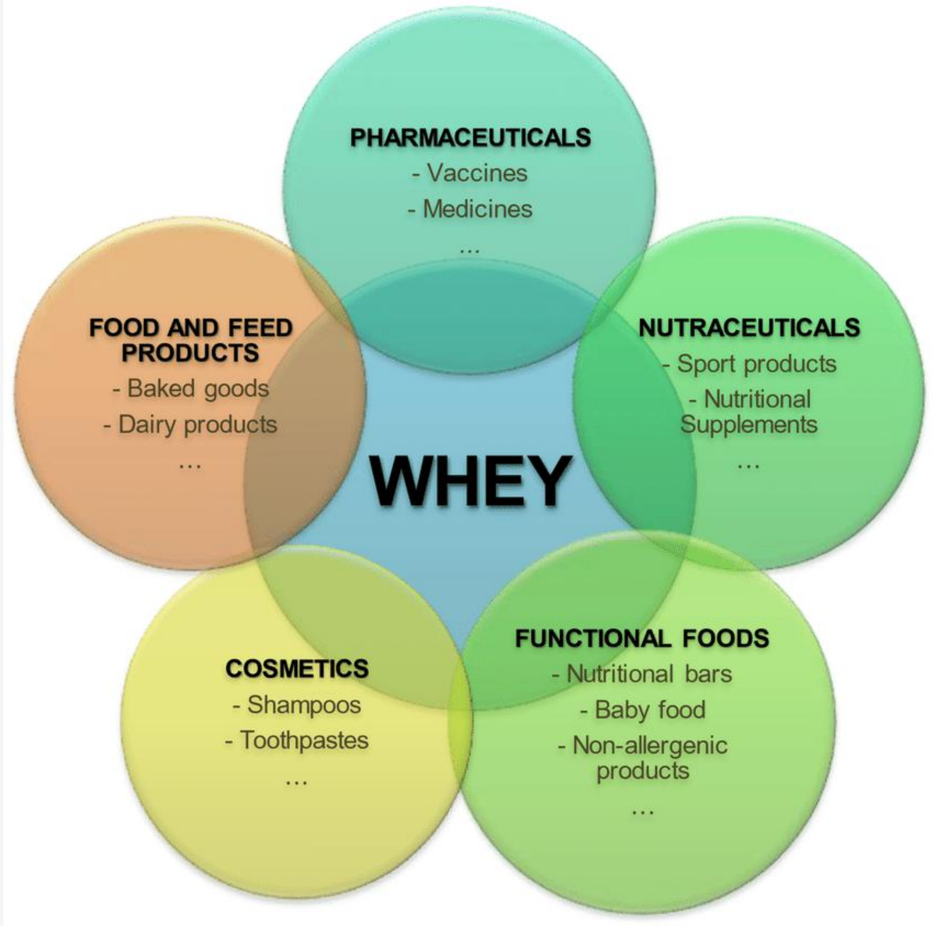
Using yeast like *Saccharomyces cerevisiae* and *Saccharomyces bayannus* for alcohol fermentation, the whey from cheese production may be used for production of alcoholic beverages.

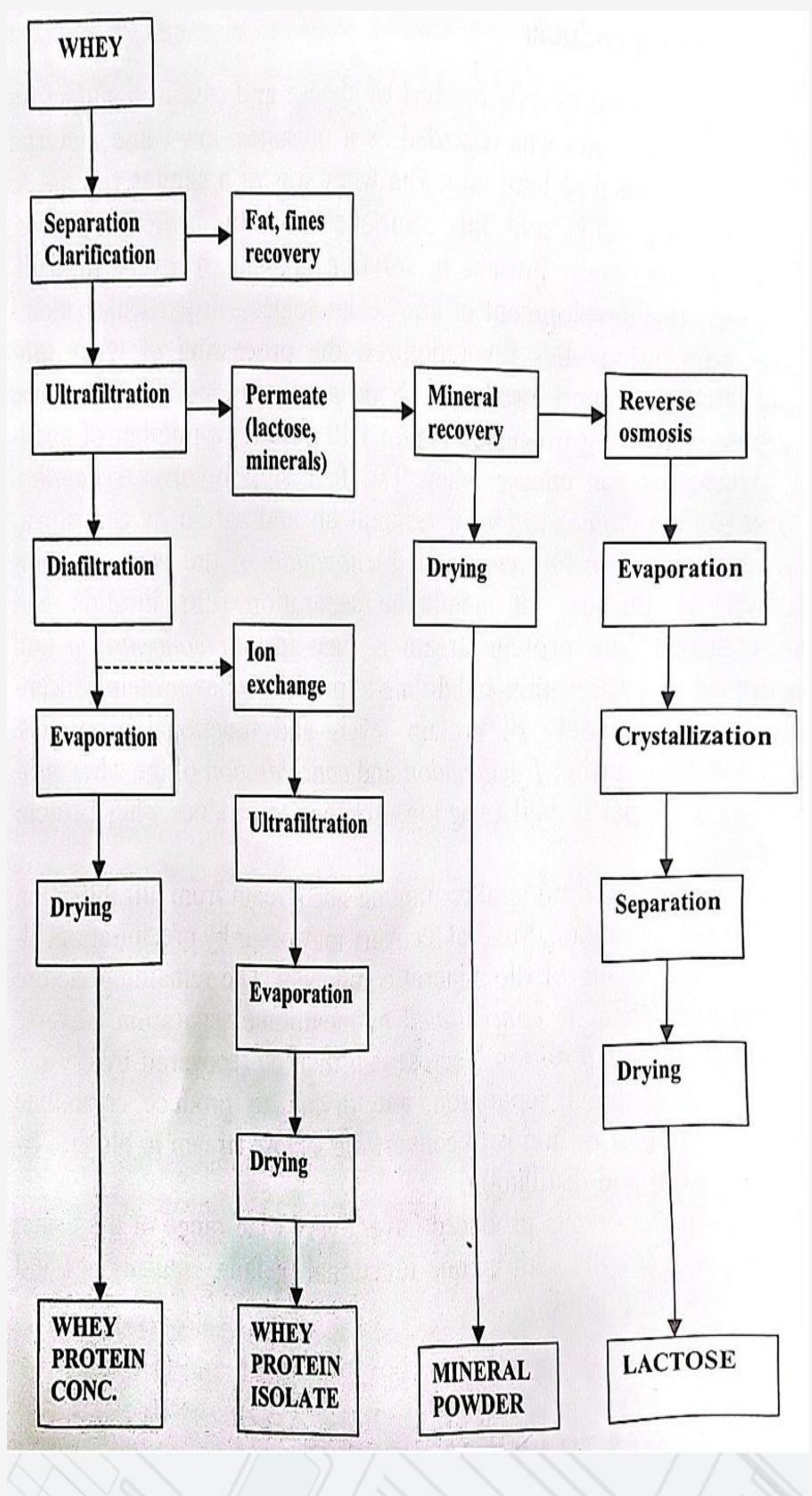
Review

Whey is produced as a by-product of cheese and casein manufacture and for many years was regarded as a nuisance, low-value material requiring disposal at least cost. The whey was of a similar volume to the incoming milk; and the components-whey proteins, lactose, and minerals were present in solution, making recovery difficult. However, the development of new technologies-in particular, mem- brane separation has revolutionized the processing of whey into many highly valued products. There are many possible products and manufacturing processes. Figure 1.10 outlines a number of possi- ble processes for cheese whey. The first step involves separation and selective concentration of residual fat and casein by centrifuga- tion. Selective concentration and fractionation of the whey proteins follows by the use of membrane separation (ultrafiltration and diafiltration). The protein stream is then further concentrated and preserved by evaporation and drying to produce whey protein concentrate, with a variety of protein levels and functional properties. Alternatively, further fractionation and concentration of the whey pro- teins may be performed using ion exchange to produce whey protein isolates.

The lactose- and mineral-containing side stream from ultrafiltration is known as permeate. Mineral recovery may occur by precipitation, filtration, and drying of the mineral component. The remaining lactose stream may then be concentrated by membrane separation (reverse osmosis) and evaporation. Lactose can then be recovered by crystalization, centrifugal separation, and drying, to produce crystalline lactose. Another option is to convert the lactose stream to alcohol by fermentation and distillation.

The whey products produced have a very wide range of uses, such as food ingredients with unique functional (gelling, emulsifying) and nutritional properties.





The highly charged flexible "hairs" physically prevent the approach and interactions of hydrophobic regions of the casein mole cules. Removal of the hairs by cleavage with rennet or their collapse in ethanol destroys the stabilization effect of x-casein, allowing micelle to interact and aggregate.

1.2.2.2 Whey Proteins. The principal whey protein fractions ar B-lactoglobulin, bovine serum albumin (BSA), a-lactalbumin an immunoglobulins. Major reviews covering the structures and proper ties of the whey proteins have been published (e.g., Swaisgood, 1987 Whitney, 1988; Kinsella and Whitehead, 1989; Hambling et al., 1992). E Lactoglobulin is the most abundant whey protein and represents abou 50% of the total whey protein in bovine milk. There are eight know genetic variants of B-lactoglobulin: A, B, C, D, E, F, G, and Dr. The and B genetic variants are the most common and exist at almost th same frequency. B-Lactoglobulin has a molecular weight of 18,000 D and contains two internal disulfide bonds and a single free thiol group which is of great importance for changes occurring in milk durin heating.

a-Lactalbumin accounts for about 20% of the whey proteins and has three known genetic variants. It has a molecular weight of 14,000 D and contains four interchain disulfide bonds, a-Lactalbumin binds two atoms of calcium very strongly, and it is rendered susceptible to denaturation when these atoms are removed.

Serum albumin is identical to the serum albumin found in the blo and represents about 5% of the total whey proteins. The protein is synthesized in the liver and gains entrance to milk through the secrete cells. It has one free thiol and 17 disulfide linkages, which hold t protein in a multiloop structure. Serum albumin appears to function a carrier of small molecules, such as fatty acids, but any specific r that it may play is unknown.

Immunoglobulins are antibodies synthesized in response to stimulation by macromolecular antigens foreign to the animal. They account for up to 10% of the whey proteins and are polymers of two kinds

Polypeptide chain: light (L) of molecular weight 22,400 Da and heavy (H) of molecular weight 50,000-60,000 Da. Four types of immunoglobulins have been found in bovine milk: IgM, IgA, IgE, and IgG.

Several other proteins are found in small quantities in whey; these include B-microglobulin, lactoferrin, and transferrin, both of which

CS Scae iron-binding proteins, proteose peptones, and a group of acyl glycoproteins..

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Conclusions

Using new technologies like membrane separation, has revolutionized the processing of whey into many highly valued products. There are many possible products and manufacturing processes like separation, concentration, fractionation, ultrafiltration, concentration for production of whey protein, mineral powder and lactose (Robinson, R., 2002).

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