Whey Ingredients

Sweet Whey, Acid Whey, Whey Protein Concentrate (WPC) and Whey Protein Isolate (WPI)

Whey is recognized as a "value-added" ingredient because of its highly functional and nutritional properties. Advancements in processing have enabled researchers to improve the functionality and utilization of whey by identifying more concentrated and specialized forms. With many different whey ingredients now available to product developers, new applications continue to evolve.

Typical Composition of Dry Sweet and Acid Whey, WPC and WPI

Ingredient	Moisture	Fat	Protein	Lactose	Ash
Sweet whey*	3.2	1.1	12.9	74.4	8.4
Acid whey*	3.5	0.5	11.7	70.0	10.8
35% WPC**	4.6	2.1	36.2	46.5	7.8
80% WPC**	4.0	7.2	81.0	3.5	3.1
WPI	3.7	0.5	91.5	0.8	3.7

Source: (*) Posati, L.P. and Orr, M.L. (1976), (**) Glover, F.A.(1985).

Beneficial Features

Whey, the serum or watery portion of milk that remains after cheesemaking, contains lactose, minerals, vitamins, protein and traces of milkfat. The most valuable component of whey is its protein, which delivers both enhanced functionality and nutrition to many formulations. Improved technologies have resulted in whey being consistently processed into customized versions of lactose, whey protein concentrate and whey protein isolate. This customization translates into product distinction and marketable nutritional benefits.

Nutrition

Whey protein's biological value is high compared to other dietary proteins, as is its level of essential amino acids. Whey processors have isolated individual whey proteins such as beta-lactoglobulin, alpha-lactalbumin, lactoferrin and lactoperoxidase for specific nutrient-rich food systems. The individual proteins all have commercial applications. For example, beta-lactoglobulin is used to boost overall protein quality, alpha-lactalbumin is a protein source in many varieties of infant formula and lactoferrin aids infants' iron absorption.

The nonprotein components of whey also add nutrition and functionality to formulations. For example, lactose can increase viscosity and improve the texture of various foods without making them too sweet. It also acts as a balance between carbohydrate and protein in human breast milk substitutes based on cows' milk. New developments with lactose have focused on derivatives like galacto-oligosaccharides and lactitol, which is produced by the chemical hydrogenation of lactose and lactulose. When consumed, both of these derivatives are utilized by beneficial colon bacteria, contributing to the well-being of the digestive tract.

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Functionality

WPI, at greater than 90% protein, and WPC, with protein levels ranging from 34% to 90%, are the most functional of all whey ingredients. Functional properties include emulsification, gelation, water-binding, solubility, whipping/foaming and viscosity development. In general, the higher the protein content, the more functional the whey ingredient.

Whey protein conformation and functionality are interrelated and dictated by changes in structure. Functional properties are affected by several factors within a food application, including concentration, state of the whey protein, pH, ionic environment, preheat and heat treatments, and the presence of lipids.

High solubility over a wide pH range makes WPI and WPC well-suited for sports beverage or meal replacement applications. Water-binding capabilities make them suitable for processed meats, cakes and breads.