

Nonfat Dry Milk Ingredients

Milk is a nutritious food, rich in proteins, minerals, fats, vitamins and enzymes. It is also a functional ingredient found in a variety of food products, ranging from infant formulas to baked goods and confections to salad dressings. Nonfat dry milk is made by removing moisture from pasteurized nonfat milk. The resulting powder contains not more than 1.5% milkfat and is a versatile and important ingredient in many food formulations. Following is a compositional breakdown of several milk ingredients.

Average Composition of Milk Ingredients (%)

Milk Product	Moisture	Fat	Protein	Carbohydrate*	Ash
Milk, whole	88.0	3.5	3.2	4.6	0.7
Sweetened condensed, whole milk	27.0	8.0	7.8	55.2	1.8
Evaporated, whole milk	74.0	7.5	6.5	9.8	1.4
Dry whole milk	2.5	26.7	26.3	38.4	6.1
Nonfat dry milk, noninstantized	3.2	0.8	36.2	52.0	7.9
Nonfat dry milk, instantized	4.0	0.7	35.1	52.2	8.0

*For sweetened condensed milk, the carbohydrate figure includes the sucrose content necessary for product conservation; the carbohydrates for the other milk products are composed of lactose only.

Source: Wong, N.P., Jenness, R., Keeney, M. and Marth, E.H., (1988), and Macrae, R., Robinson, R.K. and Sadler, M.J., (1993).

Nonfat Dry Milk Varieties

Most nonfat dry milk used as an ingredient is spray-dried. Spray-drying requires less intensive heating and creates a product that is more soluble when reconstituted in a cold liquid. Spray-dried nonfat dry milk is available in two general forms, ordinary (non-agglomerated) and instant (agglomerated). Ordinary nonfat dry milk sometimes gathers on a liquid's surface when reconstituted. Agglomerated nonfat dry milk incorporates more air into the particles, improving their solubility during reconstitution.

Heat classification provides a scale for specific nonfat dry milk applications. The amount of heat used during drying affects the level of undenatured whey protein nitrogen, manipulating solubility.

- High-heat nonfat dry milk (processed at 190°F for 30 minutes), with an undenatured whey protein nitrogen content of not more than 1.5mg/g, is the least soluble of the three classifications and is used primarily in baked goods, dry mixes and meat products.
- Medium-heat nonfat dry milk (processed at 160° to 175°F for 20 minutes) has an undenatured whey protein nitrogen content of 1.5 to 5.99mg/g and typically is used in dry mixes, confections and frozen desserts.
- Low-heat nonfat dry milk (processed at not more than 160°F for two minutes), with an undenatured whey protein nitrogen content of not less than 6mg/g or greater, is extremely soluble. This makes it ideal for applications in cottage cheese, cultured skim

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milk, frozen desserts, chocolate dairy drinks and other beverages. Low-heat nonfat dry milk is the most common source of instant nonfat dry milk.

Advanced processing allows the production of specialized formulations such as lactose-reduced or low sodium for athletes, seniors or individuals with special dietary needs.

Beneficial Features

Using dry milk powder instead of fluid milk makes transport and storage easier. In addition, removing moisture from milk inhibits microbial growth and increases shelf life to 12 to 18 months for nonfat dry milk.

Functionality

Beyond concentrated calcium, protein and other important nutrient values, several desirable properties are attained by the addition of nonfat dry milk to food formulations:

Browning/Color—Appealing for applications in baked goods or sauces, dairy proteins react with lactose and other reducing sugars during baking or cooking to produce a desirable browning effect.

Emulsification—Proteins in dry milk act as oil/water interfaces, aiding in the formulation and stabilization of fat emulsions. These properties are particularly useful in soups, baked goods, beverages, sausages and salad dressings.

Flavor—Dairy proteins offer a clean neutral flavor and do not normally contribute off-flavors to formulations. Nonfat dry milk is often used to enhance the dairy flavor of foods.

Foaming—Nonfat dry milk helps diffuse protein to an air/water interface, reducing surface tension and partially unfolding the protein. Encapsulated air bubbles form a stable and elastic film useful for creating frozen desserts and cakes.

Water binding—Nonfat dry milk entraps water in sausages and baked goods. The water-holding capacity of milk proteins is used to create desired textures in viscous food products like soups and custards. For bread dough, this binding capacity helps prolong shelf life.



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