

Dairy for Global Nutrition

NONFAT DRY MILK (NFDM), SKIM MILK POWDER (SMP)

Basic guidelines for composition, physical and chemical aspects

Product Definition

Nonfat dry milk (as defined by FDA/CFR) is obtained by removing water from pasteurized skim milk. It contains 5% or less moisture (by weight) and 1.5% or less milkfat (by weight). By removing moisture to the greatest extent possible, microbial growth is prevented. Nonfat dry milk is classified for use as an ingredient according to the heat treatment used in its manufacture. There are three main classifications: high heat (least soluble), medium heat, and low heat (most soluble).

Extra grade nonfat dry milk powders are available in roller dried and spray dried form, the latter being the most common. Nonfat dry milk powders are available in two forms: ordinary or non-agglomerated (non-instant) and agglomerated (instant).

The Codex Alimentarius, in its standard 207-1999, describes milk powders and cream powder as milk products which can be obtained by the partial removal of water from milk or cream. The fat and/or protein content of the milk or cream may have been adjusted to comply with the compositional requirements of the standard, but the addition and/or withdrawal of milk constituents in such a way as not to alter the whey protein to casein ratio of the milk being adjusted. Milk retentate, milk permeate and lactose are allowed for protein adjustment purposes. The Codex Alimentarius standard sets compositional criteria for skimmed milk powder which are: maximum milk fat: 1.5% m/m, maximum water: 5% m/m, and minimum protein in milk solids non fat: 34% m/m. the standard also makes provision for the use of additives: stabilizers (sodium and potassium citrates, no more than 5 g/kg), firming agents (potassium chloride and calcium chloride, limited by GMP), acidity regulators (5 g/kg), emulsifiers, anti-caking agents and antioxidants. Milk powders should also comply with the maximum limits established by the Codex Alimentarius Commission. In it Annex, the standard references additional quality factors and methods of analysis recommended by the International Dairy Federation.

Storage

Ship and store in a cool, dry environment at temperatures less than 27°C and relative humidity less than 65%. The shelf life of non-instant skim milk powder is 12-18 months, instant is 6-12 months. Note that storage life is very dependent on storage conditions and this figure is only a guide. Under ideal conditions, non-instant skim milk powder can retain its physical and functional properties for at least two years; however quality will be impaired if temperatures and humidity are too high and storage is extended.

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Typical Composition

Protein	34.0-37.0%
Lactose	49.5-52.0%
Fat	0.6-1.25%
Ash	8.2-8.6%
Moisture (non-instant)	3.0-4.0%
(instant)	3.5-4.5%

Physical and Chemical Aspects

Typical Microbiological Analysis	
Standard Plate Count	<10,000 cfu/g*
Coliform	10/g (maximum)
E. coli	Negative
Salmonella	Negative
Listeria	Negative
Coagulase-positive Staphylococci	Negative
Other Characteristics	
Scorched particle content (spray dried)	7.5-15.0 mg
(roller dried)	22.5 mg
Titrateable acidity	0.14-0.15 mg
Solubility index (instant)	1.0 ml
(spray dried, low heat)	1.2 ml
(high heat)	2.0 ml
(roller dried)	15.0 ml
Color	White to light cream color
Flavor	Clean, pleasing dairy flavor

*Extra grade

Nonfat Dry Milk – Typical Nutritional Composition

	Per 100 g Nonfat Dry Milk, with added Vitamin A	Per 100 g Nonfat Dry Milk, Instant
Nutrient		
Water	3.16	3.96
Energy	362 Kcal, 1516 KJ	358 Kcal, 1498 KJ
Protein	36.16 g	35.10 g
Lipid	0.77 g	0.72 g
Carbohydrate (by difference)	51.98 g	52.19 g
Fiber, total dietary	0.0 g	0.0 g
Ash	7.93 g	8.03 g
Minerals		

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Calcium	1257 mg	1231 mg
Iron	0.32 mg	0.31 mg
Magnesium	110 mg	117 mg
Phosphorus	968 mg	985 mg
Potassium	1794 mg	1705 mg
Sodium	535 mg	549 mg
Zinc	4.08 mg	4.41 mg
Copper	0.041 mg	0.041 mg
Manganese	0.020 mg	0.020 mg
Selenium	27.3 µg	27.3 µg
Vitamins		
Ascorbic acid	6.8 mg	5.6 mg
Thiamin	0.415 mg	0.41 mg
Riboflavin	1.550 mg	1.74 mg
Niacin	0.951 mg	0.89 mg
Pantothenic acid	3.568 mg	3.23 mg
Vitamin B6	0.361 mg	0.34 mg
Folate	50 µg	50 µg
Vitamin B12	4.03 µg	3.99 µg
Vitamin A, IU	2179	4
Vitamin A, RE	653 µg	4 µg
Vitamin E, alpha-tocopherol	0.00 mg	0.019 mg
Lipids		
Saturated, total	0.49 g	0.47 g
Monounsaturated, total	0.20 g	0.19 g
Polyunsaturated, total	0.03 g	0.03 g
Cholesterol	20 mg	18 mg
Amino Acids		
Tryptophan	0.51 g	0.49 g
Threonine	1.63 g	1.58 g
Isoleucine	2.18 g	2.21 g
Leucine	3.54 g	3.43 g
Lysine	2.86 g	2.78 g
Methionine	0.99 g	0.88 g
Cystine	0.33 g	0.32 g
Phenylalanine	1.74 g	1.69 g
Tyrosine	1.74 g	1.69 g
Valine	2.42 g	2.34 g
Arginine	1.30 g	1.27 g
Histidine	0.98 g	0.95 g
Alanine	1.24 g	1.21 g
Aspartic acid	2.74 g	2.66 g
Glutamic acid	7.57 g	7.35 g
Glycine	0.76 g	0.74 g
Proline	3.50 g	3.40 g
Serine	1.96 g	1.90 g

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Source: *Reference Manual for U.S. Milk Powders*. Arlington, VA: U.S. Dairy Export Council, 2005. p32-34.

This product has been inspected by the United States Department of Agriculture (USDA) and meets all applicable quality standards for food grade products according to USDA and U.S. Food and Drug Administration provisions.

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