



Nonfat Dry Milk (NDM) Standard

Product Definition

Nonfat Dry Milk (NDM) is obtained by the removal of water from pasteurized skim milk. Nonfat Dry Milk contains not more than 1.50% fat and not more than 5.0% total moisture.

Nonfat Dry Milk complies with all provisions of the U.S. Federal Food, Drug, and Cosmetic Act.

See the separate ADPI standard for [Instant Nonfat Dry Milk \(iNDM\)](#) for product that has been produced in such a way as to improve its dispersion and reconstitution properties.

Composition of Extra Grade Nonfat Dry Milk

Extra Grade is so designated to indicate the highest quality of Nonfat Dry Milk. In addition to meeting the established USDA General Grading Requirements, it shall meet the following specifications:

Parameter	Units of Measure	Spray Dried	Atmospheric Roller Dried
		Limits	Limits
Fat	%	1.25 maximum	
Total moisture	%	4.0 maximum	
Scorched particles ¹	mg/25g	15.0 maximum	22.5 maximum
Titratable acidity ¹	%	0.15 maximum	
Solubility index ¹	mL	1.2 maximum ²	15.0 maximum

1 - Scorched particles, titratable acidity, and solubility index requirements ordinarily appear in ADPI Standards in the section defining Other Characteristics, but they are included here because they are integral to the established USDA requirements for Extra Grade.

2 - Except for product designated as "high heat" which shall have a limit of 2.0 maximum.

Other Characteristics of Extra Grade Nonfat Dry Milk

Physico-chemical Properties			
Parameter	Units of Measure	Spray Dried	Atmospheric Roller Dried
		Limits	Limits
Appearance	visual	entirely free from lumps that do not break up under slight pressure	
Flavor	sensory	sweet and desirable flavor; may possess chalky, cooked, feed and flat flavors to a slight degree	same as for spray dried product; a slight scorched flavor is also permitted

Microbiological Analysis			
Parameter	Units of Measure	Spray Dried	Atmospheric Roller Dried
		Limits	Limits
Standard plate count	CFU/g	10,000 maximum	
Coliforms	CFU/g	10 maximum	

Composition of Standard Grade Nonfat Dry Milk

Standard Grade includes Nonfat Dry Milk that fails in one or more particulars to meet the requirements of Extra Grade, but which meets the following specifications:

Parameter	Units of Measure	Spray Dried	Atmospheric Roller Dried
		Limits	Limits
Fat	%	1.50 maximum	
Total moisture	%	5.0 maximum	
Scorched particles ³	mg/25g	22.5 maximum	32.5 maximum
Titratable acidity ³	%	0.17 maximum	
Solubility index ³	mL	2.0 maximum ⁴	15.0 maximum

3 - Scorched particles, titratable acidity, and solubility index requirements ordinarily appear in ADPI Standards in the section defining Other Characteristics, but they are included here because they are integral to the established USDA requirements for Standard Grade.

4 - Except for product designated as "high heat" which shall have a limit of 2.5 maximum.

Other Characteristics of Standard Grade Nonfat Dry Milk

Physico-chemical Properties			
Parameter	Units of Measure	Spray Dried	Atmospheric Roller Dried
		Limits	Limits
Appearance	visual	free from lumps that do not break up under slight pressure	
Flavor	sensory	fairly desirable flavor; may possess bitter, oxidized, stale, storage, utensil, and scorched flavors to a slight degree; and chalky, cooked, feed and flat flavors to a definite degree	same as for spray dried product; a definite scorched flavor is also permitted

Microbiological Analysis			
Parameter	Units of Measure	Spray Dried	Atmospheric Roller Dried
		Limits	Limits
Standard plate count	CFU/g	50,000 maximum	
Coliforms	CFU/g	10 maximum	

Optional Test for Nonfat Dry Milk

Another test which may be made on any Nonfat Dry Milk (not mandatory for grade designation, but, if determined, must comply with the limits as indicated) is:

Parameter	Units of Measure	Spray Dried	Atmospheric Roller Dried
		Limits	Limits
Direct microscopic clump (DMC) count	count/g	100 million maximum	

When it is determined that Nonfat Dry Milk:

- 1) fails to meet the requirements of Standard Grade⁵;
- 2) fails to meet the requirements of the Optional Test, when such test has been made⁵; or
- 3) has a coliform count exceeding 10 CFU/g (equivalent to the limit for either Extra Grade or Standard Grade); or
- 4) has been produced in a plant that is rated ineligible for USDA grading service or is not USDA approved;

then it shall not be assigned a grade.

5 - When tested in accordance with the standardized methods of analysis contained herein

Additional ADPI Specifications

ADPI imposes the following additional requirements on Nonfat Dry Milk:

Microbiological Analysis			
Parameter	Units of Measure	Spray Dried	Atmospheric Roller Dried
		Limits	Limits
Yeast and mold	CFU/g	100 maximum	
<i>Enterobacteriaceae</i> ⁶	CFU/g	10 maximum	
<i>Salmonella</i> genus	CFU/sample ⁷	not detected	
<i>Staphylococcus</i> (coagulase positive)	CFU/g	not detected ⁸	
<i>Listeria</i> genus	CFU/g	not detected	

6 - The food industry is trending toward *Enterobacteriaceae* ("EB") as the most commonly used category of indicator organisms for gauging general process sanitation. For compliance with this Standard, coliforms shall be utilized for compliance with the USDA Grade requirements, while EB may be used at the discretion of the manufacturer.

7 - Typical minimum sample size for *Salmonella* testing is 25 g, but the exact sample size and methodology is left to the discretion of the manufacturer.

8 - Where the effective limit of quantitation for the test is 10 CFU/g (such as when a dilution factor of 10 is applied) then the test result must be not detected in order to comply with this Standard. Where the testing method is capable of quantifying microbial counts below 10 CFU/g, then a compliant result must be a value less than 10 CFU/g.

Heat Treatment Classification

Heat treatment classification is not a grading requirement, but it is of practical importance in indicating the suitability of spray process Nonfat Dry Milk for various end uses. The whey protein nitrogen (WPN) test forms the basis for the following heat treatment classifications.

Higher processing temperatures and/or extended holding times contribute directly to whey protein denaturation. The WPN index is used as a measure of the cumulative heat effects during processing of Nonfat Dry Milk.

Classification	WPN Units of Measure	Spray Dried
		Limits
Low heat	mg/g	6.00 minimum
Medium heat	mg/g	1.51 – 5.99
High heat	mg/g	1.50 maximum

Permissible Additives

Nonfat Dry Milk may not contain, or be derived from:

- Dry buttermilk;
- Dry whey;
- Products other than skim milk.

Added preservatives, neutralizing agents, and other chemicals are not permitted in Nonfat Dry Milk.

Methods of Analysis

Parameter	Reference Method
Fat	AOAC 989.05
Total moisture	AOAC 925.45
Scorched particles	ADPI
Titrateable acidity	AOAC 947.05
Standard plate count	SMEDP
Coliforms	SMEDP
Direct microscopic clump (DMC) count	SMEDP
Yeast and mold	FDA BAM
<i>Enterobacteriaceae</i>	FDA BAM
<i>Salmonella</i>	AOAC
<i>Staphylococcus</i>	AOAC
<i>Listeria</i>	FDA BAM
Whey protein nitrogen	SMEDP

Product Labeling

Recommended identification: Nonfat Dry Milk

where the heat treatment classification should be included (i.e., low heat, medium heat, or high heat)

Typical Applications

Nonfat Dry Milk is typically used for fluid milk fortification, frozen desserts, cheese, yogurt, dairy beverages, bakery products, custards, gravies, sauces, frozen foods, packaged dry mixes, processed meats, soups, infant formulas, snack foods, cosmetics, and others.

The heat treatment classification of Nonfat Dry Milk has bearing on its appropriate end-use applications.

Typical Storage & Shipping

Product should be stored, shipped, and utilized according to the manufacturer's established recommendations. As guidance, product should be stored and shipped in a cool, dry environment with temperature below 80°F and relative humidity below 65%. Stocks should be rotated and utilized in accordance with the manufacturer's established date of expiration or retest.

Typical Packaging

Multiwall kraft bags with polyolefin inner liner, or other suitable closed containers (e.g., totes) are typical.

Revision History

This Standard is a legacy document and has been assigned prior version numbers on an *ex post facto* basis, according to its documented history of modifications, in order to comply with our new document control features and format. Full revision history is on file at ADPI and is available for query via info@adpi.org or by directly contacting the Vice President of Technical Services.

Current version details:

Version	Effective Date	Notes
3.0	07/06/2023	Migrated this Standard to the new modernized format as authorized by the ADPI Standards Committee. No previously established test parameters or limits were materially altered by this update. A reference to related ingredient standard Instant Nonfat Dry Milk was added to the Product Definition section. Prohibited ingredients were stated in the Permissible Additives section that is provided in the modernized format, following the verbiage previously reviewed by the ADPI Standards Committee. Footnotes added in multiple sections, explaining: positioning of the scorched particles out of order as established by the new modernized format; optional nature of EB testing; sample size discretion for <i>Salmonella</i> testing; and the restatement of the limit for coagulase positive <i>Staphylococcus</i> . Added test method references for all parameters not already covered in version 2.0.