

Permeate (Whey)

Permeate is a by product of whey protein concentrate (WPC), whey protein isolate (WPI), milk protein concentrate (MPC) or milk protein isolate (MPI) production. Permeate actually is a term used to cover a family of products that have a minimum of 59% lactose, and a maximum of 10% protein and 27% ash. Manufacturers in the United States use the terms “dairy product solids”, “de-proteinized whey”, “modified whey”, “reduced protein whey” or “permeate” on the label.

Milk and sweet, acid, casein and rennet wheys may be used as starting materials. Composition of permeate will vary somewhat depending on the original material used. Sweet whey and milk are the most common starting materials for permeate production in the United States.

Permeate may contain a maximum of 10% protein according to product definition. Permeate typically has only trace amounts of protein, however, commercial specifications often list protein at 3.5 to 5%. The discrepancy is due to the method used to test for protein. The industry tests for total nitrogen and then multiplies the result by 6.38 to convert the result into a protein value. The nitrogen found by testing often actually is nonprotein nitrogen (NPN) rather than true protein. Examples of NPN compounds typically found in milk and whey include: urea; creatine; creatinine; uric acid; orotic acid; and ammonia. The net result of listing nitrogen as protein rather than NPN is an overestimation of the protein and underestimation of the lactose content of the powder. It should be noted that there are manufacturers of permeate who add protein to permeate to assist with drying.

Dairy Product Solids (ADPI definition) - are modified dairy products (permeates and products derived therefrom) obtained by the removal of protein and/or lactose, and/or minerals from milk or whey. The dry product shall contain at least 59% lactose, 10% protein maximum, and 27% ash maximum. Removal of the dairy constituents is accomplished by separation techniques such as precipitation, membrane filtration or dialysis. Dairy Product Solids can be used as a liquid or as a dry product. The acidity of dairy product solids may be adjusted by the addition of safe and suitable pH-adjusting ingredients.

Dairy permeate (ADPI definition) - produced by the removal of protein and other solids from milk or whey resulting in a product with a high concentration of lactose. Removal of the dairy constituents is accomplished by physical separation techniques such as filtration and diafiltration. The acidity of Dairy Permeate may be adjusted by the addition of safe and suitable pH adjusting ingredients. Dairy Permeate meets the definition of Dairy Product Solids, which is the subject of a GRAS notification to the U.S. Food and Drug Administration and complies with all provisions of the U.S. Federal Food, Drug and Cosmetic Act.

Types

- ◆ Milk
- ◆ Whey

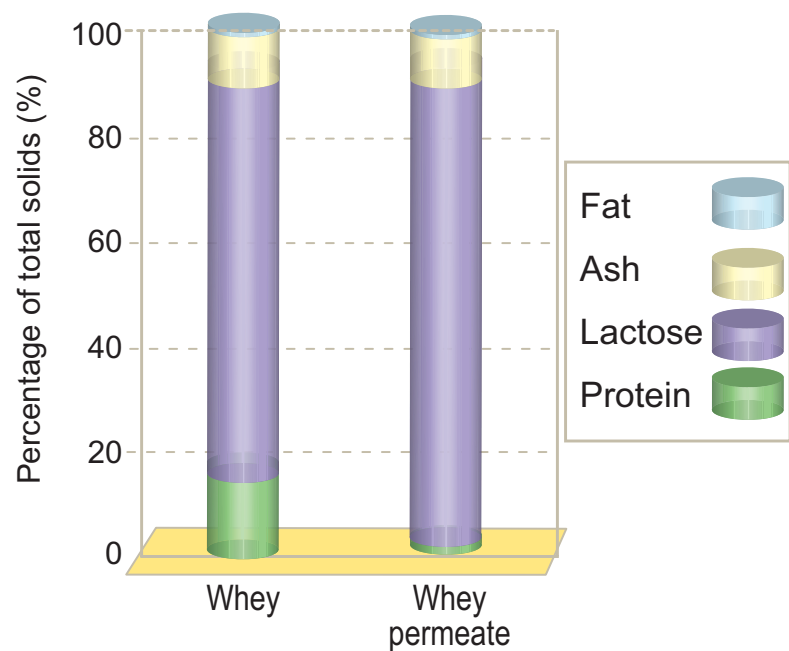
Regulations

- ◆ FDA GRAS Notice No. 37 (2000)
- ◆ FDA GRP 1G0371

ADPI Industry Standard
CODEX Standard CXS 331-2017

Animal Feed Definition (Association of American Feed Control Officials)
Dried (dry) whey solubles - is the product obtained by drying the whey residue after removal of whey protein, with or without partial removal of lactose. Minimum percent of crude protein and lactose and maximum percent ash must be prominently declared on the label.

Permeate composition



General composition of permeate from several sources

Component	Permeate from		
	Milk	Sweet whey	Acid whey
	----- % -----		
Total solids	5.8	5.8	5.8
Lactose	4.9	4.9	4.1
Ash	0.45	0.5	0.7
Crude protein	0.25	0.3	0.4
Lactic acid	—	0.15	0.5
----- mg/100grams -----			
Calcium	28	30	95
Phosphorous	33	40	55

General composition of permeate

Component	Permeate
	----- % -----
Protein*	3
Lactose	84
Ash	9
Fat	nil
Moisture	4

* Non protein nitrogen included in this value. May or may not contain true protein.

FDA specifications for permeate*

Component	Not less than	Not greater than
	----- % -----	
Milkfat	na	na
Protein	-	10
Lactose	59	-
Ash	-	27
Moisture	-	6

* FDA GRAS Notice No. 37 (2000) and FDA GRP No. 1G0371

CODEX standard for permeate

Component	Minimum/ maximum	Dairy permeate	Milk permeate	Whey permeate
		----- % (m/m) -----		
Lactose, anhydrous	minimum	76.0	76.0	76.0
Nitrogen	maximum	1.1	0.8	1.1
Milk fat	maximum	1.5	1.5	1.5
Ash	maximum	14.0	12.0	12.0
Moisture	maximum	5.0	5.0	5.0

Dairy permeate - milk, whey, cream, sweet buttermilk permeates or similar lactose-containing milk products

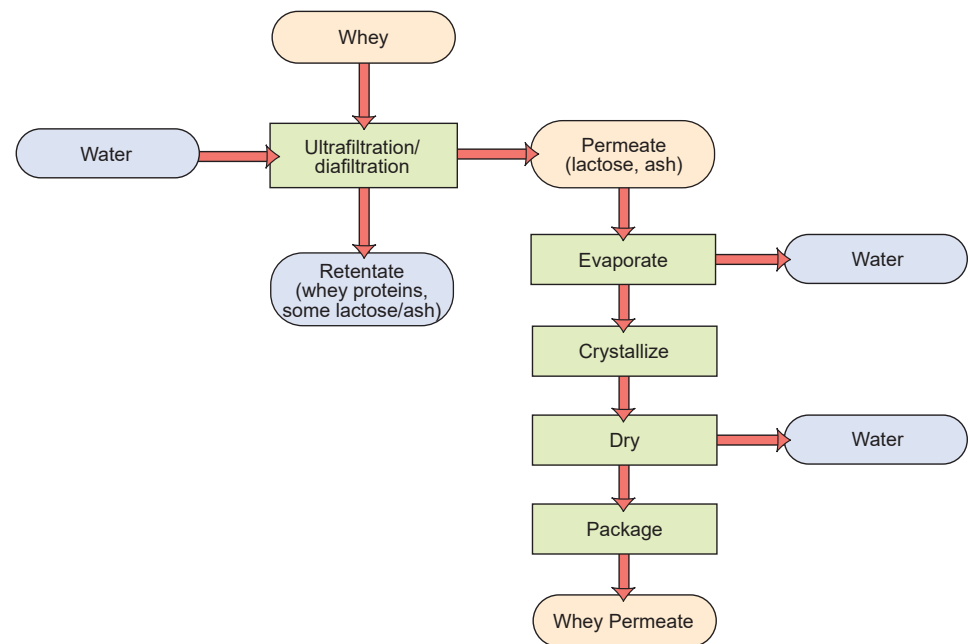
Milk permeate - milk permeate

Whey permeate - whey permeate

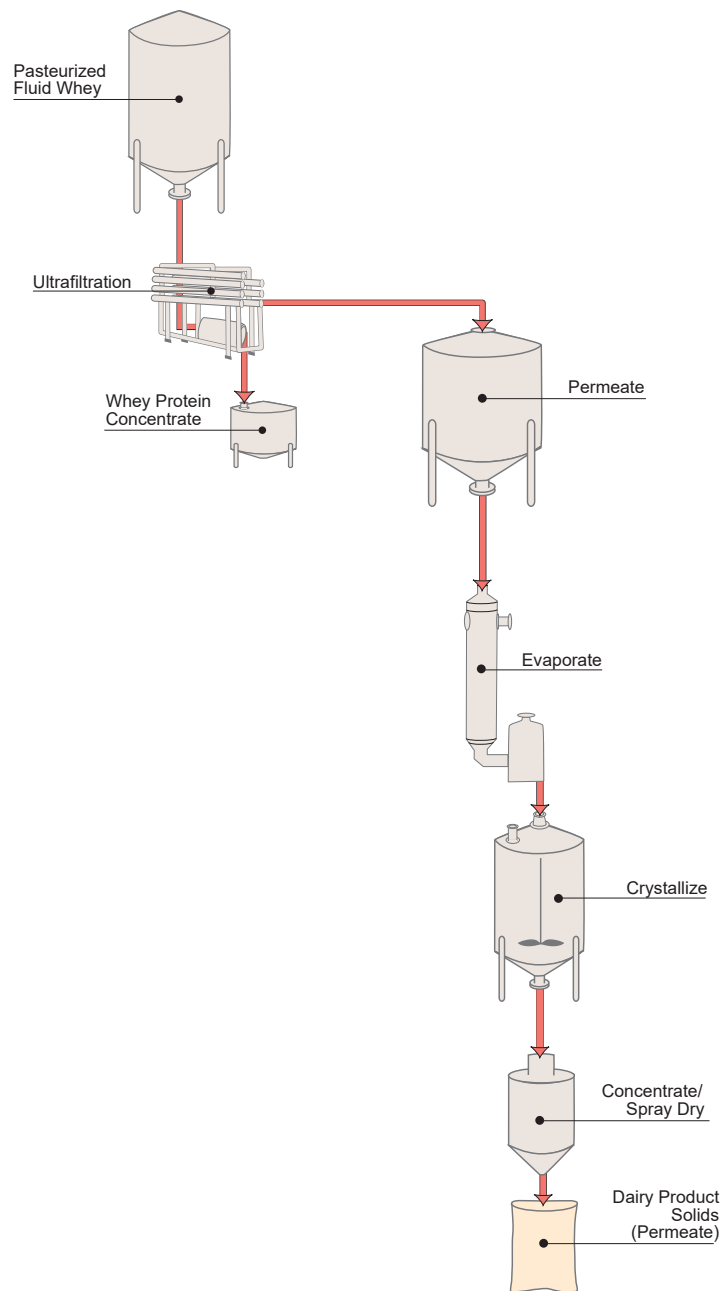
ADPI industry standard for whey permeate

Component	Typical	Minimum	Maximum
	----- % -----		
Protein	2 - 7	-	7
Lactose	76 - 85	76	-
Ash	8 - 11	-	14
Fat	0 - 1.0	-	1.5
Moisture	3 - 4.5	-	5

General Process for the Manufacture of Whey Permeate



Manufacture of Permeate from Whey



Typical composition and characteristics

Permeate

♦ Typical composition		♦ Characteristics
Protein (db)*	3%	Color: white to cream
Moisture	4%	Flavor: bland, clean
Lactose	85%	♦ Storage
Fat	<0.1%	<25 C, <65% rh
Ash	9%	12 months

* Non protein nitrogen included in this value. May or may not contain true protein.

Product Labeling

Product may be identified on the label as "Whey Permeate" or "Dairy Product Solids".

An alternate names could include "Modified Whey", "Deproteinized Whey", "Dried Whey Product" or "Dried Whey Solubles".