

Chapter 13

Milk and Milk Products

How Baking Works

Words, Phrases, and Concepts

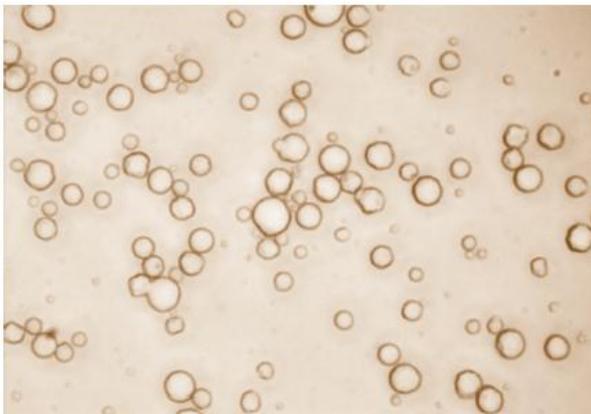
- Pathogenic microorganisms
- Pasteurization
- Homogenization
- Emulsion
- Casein
- Whey
- Lactose intolerance
- Cultured dairy products
- Lactic acid bacteria

Commercial Processes

- Pasteurization.
 - Heat treatment to eliminate pathogenic (disease-causing) microorganisms.
 - Different methods:
 - High-temperature, short-time (HTST); most common means.
 - Ultra-high-temperature (UHT); also called ultrapasteurization.
 - Longer shelf life but slightly different flavor.

Commercial Processes

- Homogenization.
 - Prevents cream from separating and rising to top of milk.
 - Milk forced through small openings:
 - Breaks milk fat into tiny droplets.
 - Forms a stable emulsion.



(a)



(b)

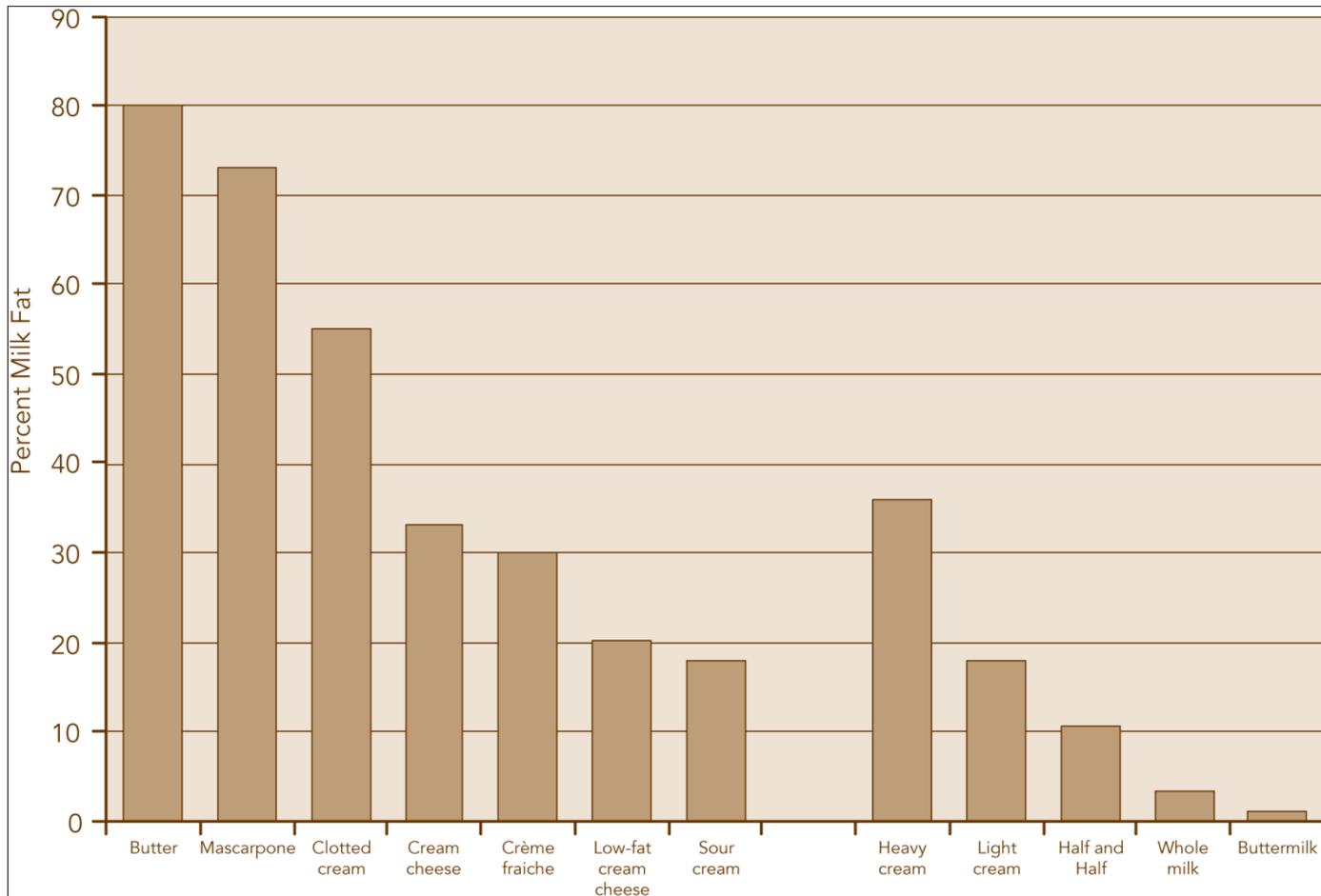
Effect of homogenization on milk fat in whole milk **(a)** unhomogenized, **(b)** homogenized

Commercial Processes

- Separation.
 - Milk is spun fast in a separator; separates cream from milk.
 - Separator is a type of centrifuge; works like a salad spinner.
 - Cream is lighter, less dense; spins off from heavier milk.

Commercial Processes

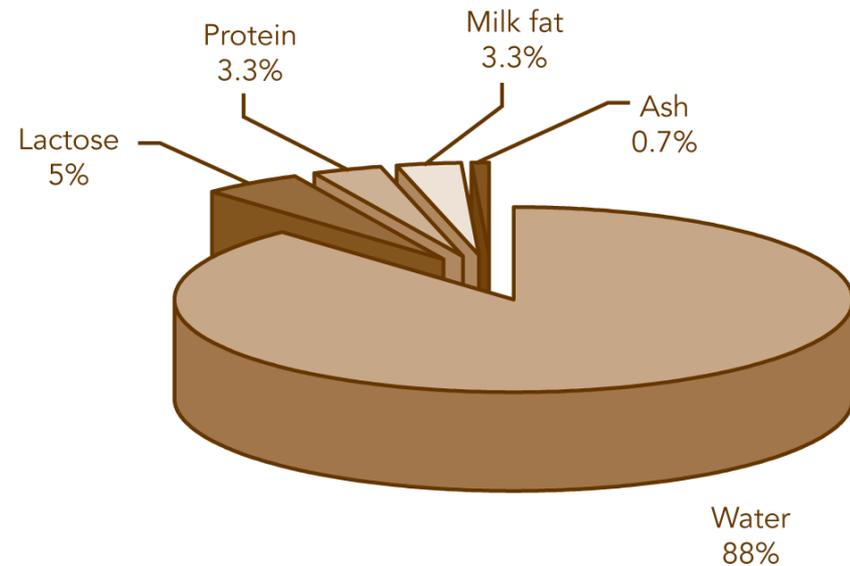
The ability to separate out the fat from milk allows for a range of products with different milk fat contents.



Makeup of Milk

Milk is composed of:

- Mostly water.
- Milk fat and molecules dissolved in it, including:
 - Small amounts of emulsifiers, carotenoid colors, rich dairy flavors.
- Milk solids not fat (MSNF), including:
 - Protein, lactose (milk sugar), ash (minerals).



Makeup of Milk

Two main types of milk proteins:

– Casein proteins:

- Provide opaque whiteness to milk.
- Thicken and gel as they coagulate; easily coagulated with acids or enzymes.
 - Important in the manufacture of cheeses, yogurt, sour cream.

– Whey proteins:

- In clear greenish liquid called whey.
- Form a film along pan bottoms and surface of heated milk; to prevent: add sugar to milk and stir as it heats.

Makeup of Milk

Lactose:

- Milk sugar.
 - Provides slight sweet flavor to milk.
 - A disaccharide; consists of glucose and galactose.
- Lactose intolerance: intestinal discomfort after consuming milk and milk products.
 - Body does not contain enough of the enzyme lactase to break down lactose into glucose and galactose.
- Yeast are lactose intolerant, that is, they cannot ferment lactose.

Milk Products

Fluid Milk

- Classified by its fat content.
 - Whole milk is highest in milk fat: 3.25% or higher.
- Best for freshest dairy flavor.
 - Use in baked custards, cream pies, custard sauce, ice cream, pastry cream.
- Usually heated before added to yeast doughs.

Milk Products

Dry Milk

- Also called DMS: dry milk solids. Two types:
 - High heat DMS; in yeast doughs and other baked goods.
 - Low heat DMS; in ice cream, to increase milk solids.
- Made by removing most of the water from whole or fat-free milk.
 - Fat in whole dry milk oxidizes easily to rancid off-flavor.
 - Fat-free (nonfat) dry milk, NFDM, has a longer shelf life.
- Advantages over fluid milk: takes up less space and needs no refrigeration.
- To use: blend with dry ingredients or cream with butter or shortening.

Milk Products

Cream

- Usually UHT pasteurized, for extended shelf life.
- Richer flavor, thicker consistency than milk.
- Heavy cream (36 – 40% milk fat) forms the most stable whipped cream.
- Light cream can be made by mixing equal parts heavy cream and whole milk.

Milk Products

Cream (cont.)

TABLE 13.1 MINIMUM MILK FAT STANDARDS FOR CREAM PRODUCTS SOLD IN THE UNITED STATES AND CANADA

NAME	U.S. MINIMUM STANDARD	CANADIAN MINIMUM STANDARD
Heavy cream	36%	—
Whipping cream	30%	32%
Cream	—	10%
Light cream	18%	—
Half-and-half	10.5%	—

Milk Products

Evaporated and Sweetened Condensed Milks

- Purchased in cans; shelf stable.
- Low-fat and fat-free versions available.
- Both made by removing water from milk.
 - Evaporated milk contains twice the milk fat and twice the MSNF as whole fluid milk.
 - Sweetened condensed milk has additional water removed and contains added sugar.
- Are not interchangeable.
 - Sweetened condensed is thicker, sweeter, denser; has more caramelized color and flavor. Can be used in Mexican flan.
- Uses: pumpkin pie, smooth fudge, caramel, as a cream substitute.

Milk Products

Cultured Dairy Products

- Are fermented products, made by adding live bacteria “cultures.”
 - Most common bacteria culture: lactic acid bacteria, which ferment lactose into lactic acid.
- Generally tolerated by those with lactose intolerance, because they are low in lactose.
- Includes:
 - Cultured buttermilk.
 - Yogurt.
 - Sour cream.
 - Crème fraîche.
 - Clotted cream.

Milk Products

Cheeses

- Made by forming curds and separating out the liquid whey.
 - Curds consist of coagulated casein proteins, with some liquid whey still trapped inside.
- Most are cultured dairy products; live bacteria produce the acid that coagulates the casein.
- Ripened (aged) or unripened (fresh, not aged).
- Most common in bakeshop: unripened cheeses.
 - Cream cheese, Neufchâtel, baker's cheese.
 - Ricotta.
 - Mascarpone.
 - Quark.

Functions of Milk and Milk Products

Main Functions

- Increasing crust color.
 - From Maillard browning of milk proteins and sugar (lactose).
- Delaying staling.
- Increasing crust softness.
 - Bread made with milk will have soft rather than crisp crust.
- Blending flavors and providing richness in flavor.
- Providing fine, even crumb to baked goods.
- Forming a stable foam.
 - Cream whips into foam, stiffened and stabilized by solid fat crystals.
 - Milk proteins whip into foam; example: cappuccino froth, whipped evaporated milk.

Functions of Milk and Milk Products

Other Functions

- Aiding in the creaming of shortening.
 - Dry milk solids only.
- Absorbing moisture.
 - Adding DMS to doughs requires the addition, ounce for ounce, of additional water.
- Aiding in the coagulation of egg proteins.
 - Custards made with water (or soy, almond milks) are not as firm as those made with milk.
- Providing moisture.
 - Milk is mostly water (about 88% water).
 - Heavy cream is over 50% water.
- Adding nutritional value.

Storage and Handling

All milk products absorb odors; cover properly.

- Fluid milk:
 - Spoilage bacteria can grow and sour milk; discard.
 - Light causes flavor changes, loss of vitamins.
- Cultured dairy products: have longer shelf life.
 - Will become increasingly sour over time.
 - Mold can grow; discard.
- Soft, unripened cheeses
 - High in moisture and highly perishable (will mold).
- Nonfat DMS:
 - Can clump; keep cool and dry, and sift, if necessary.