# Fermentology • Book

# A Brief History of Cheese [Essay]

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Let's begin with a little bit of history. Cheese is one of the oldest foods we humans have produced, possibly dating from the beginning of sheep and cattle herding 10,000 years ago. That said, the discovery of cheese making was probably accidental. It's likely that the curdling action of rennet was discovered when a herdsman poured milk into a sack or pouch made of an animal's stomach, and this may have happened independently in Europe, the Middle East, or Central Asia. The Ancient Sumerians and Egyptians certainly made cheese, and Homer speaks of cheese in both the *Illiad* and the *Odyssey*. The oldest archaelogical example of solid cheese was found in an Ancient Egyptian tomb dating to around 3,200 years ago. However, the earliest archaeological evidence of cheese making dates back to 7,700-9,000 years ago in Mongolia where residues of cheese making products were found in ceramics pots\(\frac{1}{2}\).

Cheese was a staple food in both Classical Greece and Rome, although it is not clear that the either civilization was responsible for expanding awareness of cheese, as most places they traded or conquered were already making cheese in some manner or another. Nevertheless, it was in Europe, more than elsewhere, that cheese became so wildly diverse both in production methods and the final product. Cheese was a staple product throughout the Middle Ages, and such were the differences in European cheeses that in 1477 a Savoyard polymath named Pantaleone da Cofienza published a book, *Summa Lacticiniorum* ( "A Compendium of Milk Products" ), that was devoted almost entirely to a discussion of European cheeses [1].

As Cofienza was aware, cheese is most commonly made from cow, sheep, goat, and water buffalo milk, although other types of milk, such as mare's milk, reindeer milk, and camel milk, are also used. Cheese styles, textures, and flavors depend on the origin of the milk (including the animal's diet), whether the milk has been pasteurized, the amount of milkfat, bacteria and mold, processing, and aging. Sometimes herbs, spices, or wood smoke are used for flavoring, and other cheeses are internally or externally flavored with chives, garlic, or fruit. Cheese ranges in color from off-white and pale yellow (most common), to light-brown or dark-brown, to full of blue or green veins, to orange. Orange color does not occur naturally in cheese, but is generally created by adding annatto, an orange-red dye made from the nuts of the achiote tree. This was originally done to make winter milk or industrially produced cheese look richer in flavor, but it soon became standard practice for some types of cheese such as Red Leicester, a mild and crumbly English cheese, and Mimolette, a hard and slightly nutty cheese from the north of France. In the United States, orange colored cheese, whatever the name, is especially popular.

What da Cofienza did not say but seems to have intuited, is that cheese is a nutritional super food because it concentrates most of the nourishment of the milk, and makes the milk last much longer. The solids extracted from the milk in order to make cheese contain almost all of the milk fat (assuming the milk has not been skimmed) and fat-soluble vitamins, most of the proteins, and some of the minerals. What's left behind, the whey, is also nutritious, as it contains sugar, small amounts of protein, and the water-soluble vitamins and minerals. Whey can be drunk as a beverage, dried to make protein powder, or cooked and concentrated to make whey cheeses, such as Ricotta, which is light textured, creamy, and slightly sweet. Most whey, however, is simply discarded.

Historically, soft cheeses were made for relatively quick consumption and thus eaten in or near the area where they were made, whereas harder cheeses were aged for many months, and could be exported great distances. Since the mid-nineteenth century and the invention of refrigerated transport, soft and semi-soft-cheeses can be exported to all parts of the globe, although they should still be eaten sooner than hard cheeses, as they are likely to be invaded by other bacteria (i.e. to rot) long before hard cheeses are. Put another way, your cheese is always alive, but you don't necessarily want it be alive in all ways.

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In order to learn more about specific cheeses that you might find in the store, it's helpful to understand how cheese is made. All cheese making begins by "ripening" the milk, that is, by causing lactobacillales (lactic acid bacteria) to sour the milk. This is why cheese is a fermented food, and it is these bacteria that begin to give cheese its particular flavors. In early cheese making, the bacteria were probably left to chance. For most modern cheese, however, bacterial cultures are added by the cheese-maker. These bacterial cultures produce not only lactic acid, which gives cheese its sharp taste, but also diacetyl, which has a buttery taste. Some cheeses such as Emmentaler (a.k.a. "Swiss Cheese") also use propionic bacteria, which consume lactic acid and produce a round, almost hazel-nut taste, as well as carbon dioxide bubbles. It is these bubbles that give Emmental its characteristic holes.

During cheese making, the milk is always kept warm or even slightly heated in order to encourage bacterial growth. This can be done by adding hot water to the curd, or by heating the walls or "jacket" of the cheese vat with hot water. Once the milk has soured, the next step is to separate the curd (milk solids) from the whey (mostly water).

"Curdling" is usually done by adding rennet to the soured milk. Rennet is loaded with enzymes and is traditionally extracted from the fourth stomach of an unweaned calf.

However, vegetable-based rennets have long existed, and some dairies rely on them uniquely, although most cheese is made with and most rennet is now made recombinantly and comes in liquid or powder form. Some cheeses such as Pecorino Romano, a hard, salty, tangy, ewe's milk cheese are always curdled with lamb's rennet, others are curdled with vinegar or even lemon juice. But whatever is used to curdle the milk, the proteins in the milk coagulate and shrink, trapping the fat globules and forcing out more of the watery whey. Once the rennet has been carefully stirred into the milk, the curd is allowed to set, that is, to form a moist gel.

It's at this point that the difference between hard and soft cheeses begins to occur. For most soft cheeses, the set curd is simply scooped out with a perforated ladle, and placed into a perforated mold or form (which gives us the Italian word *formaggio* and the French words *fromage*). This allows the curd to continue to drain off whey by gravity alone. For fresh goat's milk cheeses that's pretty much the entire process, but for two of my favorite soft cheeses, Camembert and Brie de Meaux, the curd is poured into shallow, round molds and then sprayed with the other kind of mold (i.e. a fungus), in this case *Penicillium candidum*, which promotes the growth of an edible, off-white rind. Thus, Camembert and Brie begin as insipid, semi-soft cheeses, but as they age the proteolytic enzymes released by the mold break down the protein chains in the cheese, producing an ever-creamier, and ultimately almost liquid cheese, with a strong odor but mild taste.

However, to make a harder cheeses the set curd is cut with a multiple-bladed "breaker" to promote more whey extraction. Once the curd has been cut it is allowed to set a second time, but this time it is firmer, almost rubbery. Having reset, the cut curd is often "cooked" (i.e. heated to a higher temperature, usually around 40 c. or 105 f., and never hotter than 60 c. or 140 f.), which promotes greater whey expulsion and creates a smoother and more even-textured end product. Some of the bacteria are killed in the cooking process, but hardly all, so that even a "cooked" cheese remains very much alive with micro-organisms.

Cutting and then cooking the curd helps to create protein and fat globules, now curds (plural), anywhere from pea to walnut size, from which still more whey is drained off. Cottage cheese, perhaps the mildest of all cheeses, is simply sliced and rinsed curd that is never pressed. But for hard cheeses, the curds are salted and put into a mold, or else they are formed into loaves and allowed to reset. These curd loaves are then sliced or run through a mill to produce even smaller, almost rubbery "grains." The more the curd is cut, the more whey it drains, and depending on the kind or quality of cheese being made, the cheese-maker carefully monitors both water content and pH level throughout the

cheese-making process. If a low acidity (i.e. not sharp) hard cheese such as Colby, Monterey Jack, or Gouda, is desired, the curds are rinsed in pure water before being drained and pressed.

In the case of Cheddar, the world's most popular cheese—although it varies greatly in quality, texture and taste—the loaves of curd are sliced into 3 cm. (1.5-2 inch) thick slabs the size of notebook paper, which are then stacked four to eight high, and turned over ever ten minutes or so for roughly an hour. This stacking and turning encourages yet more whey-extraction, the formation of more protein chains, and greater acidity, and it is known as "cheddaring." While some other hard cheeses use the cheddaring technique, traditionally this is what made cheddar cheese unique. After an hour or so, the stacked slabs of curd are then sliced and run through a mill, which further reduces the size of the curd. As with other hard cheeses, these "grains" are salted, stirred, and then put into a mold and compressed. Of course many readers will note that much American cheddar is actually a fairly mild, moist cheese, and this is because the curd is rinsed and not cut so fine, thus reducing acidity and allowing for greater moisture retention. It has nothing like the sharpness or earthy flavor and slightly crumbly texture of high-quality cheddar.

For most cheeses, salt is added to the cut curd both for reasons of taste and preservation. Of course too much salt would kill all the bacteria in a cheese, but a judicious amount slows down bacterial growth and allows the cheese to age without rotting. And whether salted or not, the cut curds are now put into the molds that determine their final shape. Since there is still some whey in the curd, most molds allow for drainage while the curds are being pressed. For example, Manchego, a slightly tangy, hard sheep's milk cheese from Spain, was traditionally pressed in molds made of plaited straw, which left a distinctive pattern on the outside of the cheese. Today, that same pattern is created by metal molds.

Once a cheese is hard enough to be removed from its form, it is salted if it has not already been so. In fact, a "pickled" cheese like Feta, made from sheep's milk, is removed from its mold and aged in a brine made of salt water and whey up to the point of consumption, while mozzarella curd is stretched by hand or machine during the cooking process, formed into balls, and then placed in a very mild brine. The best, and fattiest mozzarellas are made from Italian water buffalo milk. Hard cheeses such as Gouda, Gruyère and Comté, all buttery-nutty in flavor, are soaked in brine for a few days or weeks to allow the salt to penetrate into the cheese and to help form a bacteria resistant rind. Beaufort cheese from the French Alps, quite similar to Gruyère in flavor, is both brined and externally salted with a daily salt rub, and the highest-quality cheddar is both

internally and externally salted before being bound in cheesecloth, which is then rubbed with whey butter.

Broadly speaking, a warmer environment speeds cheese ripening, whereas a cooler environment slows it down. Likewise, a relatively dry environment is necessary for cheeses to harden properly, so that cheeses destined for long ageing such as Parmesano-Reggiano, which is both salty, sweet, and nutty all at once, need a relatively dry and cool environment. A moist environment is better for soft cheeses as it prevents desiccation and promotes the growth of desired molds. Semi-soft cheeses such as Limburger, Munster, and Époisse, are surface ripened with bacteria, which give them their famously smelly odors, although the inside of these cheeses is generally mild. Some other cheeses are covered in leaves, ash, or soot, or washed in alcohol as a way to slow or prevent surface bacterial growth and impart subtle flavors. Emmental receives no surface treatment at all other than being cleaned and waxed. Lastly, blue cheeses are inoculated with a culture of blue mold, either at the forming stage, as with Roquefort from France, or once the cheese has been formed, as with Stilton from England, Cashel Blue from Ireland, and Maytag Blue from Iowa. In all cases, one can see the injection marks. Roquefort is the saltiest and most pungent of the blue cheeses and is made from sheep's milk; most blue cheeses are made from cow's milk, and some, like Cambozola from Germany, are mild and creamy with only a hint of mold flavor.

This very brief survey of how most cheeses are made has focused upon the cheeses you are most likely to find in the store, but be aware that the number of artisanal cheesemakers in America is growing by the year, and many stores are increasing the number of foreign cheeses they sell as well. Consequently, you may be able to find very similar cheeses to the one's just described, but with names with which you are not familiar. Your general knowledge of cheese styles should help you to determine what the cheese might taste like, but if you can, ask the cheese-monger for a comparison. Better yet, ask for a sample! When you do purchase a cheese, my advice is to rescue it from the ignominy of cellophane, if that's what it came in, and store it in wax paper, or else leave it unwrapped but put it in a Tupperware container in the refrigerator. For harder cheeses that you want to keep around for a long time, store them in a sealable sandwich bag. The goal is to let your cheese breathe, but not to give it so much air that it dries out or allows for the growth of unwanted bacteria or mold.

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Did I mention that I love cheese? A few years ago a fellow cheese-fanatic friend in London sent me what he thought was an explanation for my cheese love. According to

scientists at the University of Michigan cheese is addictive! Well, it turns out that that's not what the scientists actually said. In fact, the study was about food cravings, and the food that was most often craved was pizza [2]. Certain readers extrapolated from this that pizza's allegedly addictive quality came from casomorphins, the tiny protein crystals that result from the breakdown of casein, the primary protein of milkfat. True, casomorphins can activate the human opioid system, just as drugs like morphine do, but the degree is negligible and in most cases of cheese eating doesn't occur at all. More importantly, our brain registers with delight when it senses protein, fat, and salt, which most cheeses contain to some degree. But the real reason for pizza's position atop the "craveability" index is the combination of carbohydrates and sugar (in the dough and tomato sauce). In other words, pizza has a massive glycemic load, and causes our blood sugar to spike. We humans like that. But fear not, there is nothing addictive about cheese. You may, however, fall in love with it.

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### **Footnotes**

1. For more on this, visit <u>Jessica Hendy's enriched talk.</u> <u>←</u>

## **Citations**

1. Paul Freedman, ed., *Food: The History of Taste* (Berkeley, 2007)

2. https://www.sciencenews.org/blog/scicurious/no-cheese-not-just-crack ←