# Food Safety & Pasteurization

by Catherine Haug

Many fresh products today are pasteurized. Proponents of pasteurization say it is necessary to protect the safety of our food supply. And indeed, there have been some scary bacterial outbreaks of late, caused by infected foods. But might not there be a better way to ensure food safety?

Another reason for pasteurization is to ensure a longer shelf life for the food, so that it can be warehoused at a distant location for weeks (or months, in some cases) before being delivered to your grocer's shelf. This includes milk, bottled and frozen juices, almonds, and more.

I suggest that buying locally and knowing your farmer (and his practices), along with your own good cleanliness habits, is the best way to ensure food safety. And knowing how to preserve fresh foods eliminates the need for longer shelf life of commercial foods.

## Methods of Pasteurization

### Milk Pasteurization

There are four common types of milk pasteurization that vary with temperature and time the milk is held at that temperature.

- **Vat Pasteurization:** This is the type typically used by farmers for their own consumption, and is the least harmful to the milk's nutrients. The milk is heated to 145° F and held at that temperature for 30 minutes. Such milk is used to prepare milk for culturing (cheese, yogurt, etc), as it is the least destructive to milk's proteins. Average shelf life is 7 - 10 days.
- **High Temperature/Short Time (HTST)**: The milk is heated to 161° F and held at that temperature for 15 seconds. This is the most common method of regular pasteurization used by local dairies, with about the same shelf life as vat process.
- **Ultra-pasteurization (UP)**: The milk is heated to 280° F for 2 seconds. Note this is above boiling, which means that high pressure must be applied to the milk to achieve this temperature, and is destructive to its nutritional quality. This method is used because it extends the refrigerated shelf-life of the milk to 60 - 90 days, and is the method of choice for national or regional milk brands because it allows time for warehousing and shipment of milk.
- **Ultra-High-Temperature (UHT)**: The milk is heated to 280° to 302° F for 1 or 2 seconds followed by packaging in airtight containers. It allows storage without refrigeration for up to 90 days. Again, high pressure is required to reach this high temperature.

## Other Methods (Used for other foods)

- **Flash pasteurization**: used for drink boxes and other liquids that can be stored for long periods of time without refrigeration. This method involves high temperature for 3 to 15 seconds, followed by cooling and packaging. Very similar to UHT treatment of milk (see above).
- **Steam Pasteurization**: used to kill E. coli, Salmonella and Listeria in beef carcasses. This results in surface temperatures of about 200° F.
- **Irradiation Pasteurization**: used on such foods as meats (especially prepared meats, sausages and cold cuts), spices, and produce (such as almonds, etc.). The food is exposed to a type of radiation known as gamma rays.

# Why should you be concerned?

In older times, before the modernization movement of the 1950s, almost all food was produced locally. People raised their own produce in gardens, or bought produce from local growers. Most rural people kept a cow or goats for milk, and chickens for meat and eggs. Convenience foods had not yet been invented.

And in those pre-modern times, widespread cases of food poisoning were unheard of. I don't mean there were no instances of food poisoning, just that such instances were limited to the local area, not spread around an entire region or country as they are today. This is because the infected foods were not shipped out of the area.

**The key to food safety is good practices**, including cleanliness and allowing livestock to free-range. The *E. coli* outbreak traced to infected spinach a few years ago was caused by confined cattle whose manure was infected with an infectious form of *E. coli*. This manure got into the ground water, which was then used to irrigate nearby crops. These crops were then packaged and shipped around the country and consumed by unsuspecting people.

That outbreak could have been avoided if the cows were allowed to eat pasture grasses instead of the grains they are fed in confinement. Cow's stomachs are not designed to digest grain. Their systems become too acidic, which encourages growth of mutant *E. coli* and other bacteria that thrive in the excess acidity, but will not survive in the stomach of grass-fed cows.

That outbreak could also have been avoided if the spinach crops had been properly washed before shipping.

## Living Foods

In recent years, there has been a resurgence of interest in living foods:

- Raw foods are foods in their natural state; neither cooked nor pasteurized. For example, lettuce and carrots fresh from the garden; huckleberries just picked from the wild, just-laid eggs, and fresh milk.
- Cultured foods have been exposed to (and are rich in) beneficial microbes, which increases the nutrient content of the food and also helps to preserve the food. Examples of cultured foods are yeast and sourdough cultures, beer and wine, raw vinegar, yogurt, cheese, chutney, sauerkraut, pickles, and other brined foods, aged meats, sausage, gravlax and other cultured meats.

These living foods are rich in beneficial nutrients and probiotics. They contain enzymes to help you digest your food, and to facilitate other processes in your body. They contain vitamins and cofactors necessary for life; and anti-oxidants that help prevent aging and diseases such as cancer and heart disease.

**Once pasteurized or cooked, living foods die**. They may still have some nutritional value, but much of that value is lost. The higher the temperature, the greater the destruction to the living elements in foods.

## Denaturation of proteins and enzymes

One key component of all living foods is enzymes. These are types of proteins that facilitate chemical reactions in living beings. You are probably most familiar with enzymes involved in digestion, such as amylase for breaking down starches, or protease for breaking down proteins. But enzymes perform many other functions, including the facilitation of (not a complete list):

- energy generation in cells,
- transport of nutrients across cell walls,
- nerve transmission, and
- muscle contraction.

Enzymes are long chains of amino acids, that curl and fold into specific shapes that give the enzymes their particular functionality. These shapes are held together by weak bonds that are easily destroyed by heat. Once these bonds are broken, the enzymes uncurl/unfold to a new shape. While this process does not usually break apart the chains, it destroys the geometry of the structure and hence the effectiveness of the enzyme.

Denaturation begins at temperatures above 120° F and is generally complete at 145° F. Once a protein has been denatured, it cannot be put back to its original state, and it is no longer useful to the organism.

One specific example of denaturation involves one of the casein proteins in milk, which binds calcium in such a way that the mineral is available for absorption (from digestion), and for use in culturing cheese. However, when milk is pasteurized, this protein is

denatured, the binding of the calcium is changed ,and the protein will no longer curd. Your body cannot absorb this calcium, and you cannot make cheese with the milk. (Note, however, the addition of 30% calcium chloride solution at rate of ½ teaspoon per gallon of milk, helps to restore the altered protein so that the milk will curd).

There is significant evidence that consumption of denatured proteins leads to allergies. This is because while the denatured protein is chemically identical to its non-denatured counterpart, it is biologically different because it has a different shape. Your immune system functions by recognizing shapes of substances. When an unknown shape is encountered, your body produces antigens to attack the unknown substance. If this happens frequently, an allergy to that substance is born.

### Destruction of vitamins, cofactors and anti-oxidants

Another effect of pasteurization is that it destroys many vitamins, cofactors and anti-oxidants in the affected food. These important substances are very fragile and sensitive to heat. Heat causes them to be converted into other substances that have less or no biological activity. They may even be converted into substances that can do harm.

### Destruction of probiotics

Probiotics are microbes that "support life," such as acidophilus and bifidus bacteria (lactic-acid forming bacteria), brewers yeast, and bakers yeast. These 'bugs' support your life by living in your gut, helping you to digest foods, produce vitamins. They protect you from harmful microbes by excreting anti-microbial substances; for example, penicillin, the first commercial antibiotic, is made by a specific mold.

All raw foods have at least a few of these microbes on or in them, to protect the food from harmful microbes. Heating of these foods by cooking or pasteurizing destroys these good microbes along with the bad.

## Conclusion

I suggest that pasteurization certainly has its place. But it's widespread use to process most of the foods we consume, simply to improve the bottom line of large corporations (by allowing for long-term warehousing and long-distance shipping of foods, and skimping of proper cleanliness practices), is not only not necessary but harmful to our health.

Buying locally and knowing your farmer (and his practices), along with your own good cleanliness habits, is the best way to ensure food safety.

## Sources:

1. http://infectiousdiseases.about.com/od/prevention/a/pasteurization.htm
2. www.realmilk.com/