



How Is Pasteurization Used to Process Food?



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Background

Pasteurization is a food processing method where a mild heat treatment is applied to a food to kill harmful bacteria (pathogens) and extend shelf life (Jay, Loessner, and Golden 2005). It is one of the most common food processing methods and has been used for hundreds of years! Pasteurization is typically associated with milk. Since pasteurization of milk has become common practice, tuberculosis infections from milk are extremely rare in the U.S. Currently, pasteurization is also used to process many other foods, including juices, cider, eggs, cheeses, butter, vinegar, sauerkraut, almonds, beer, and acidic canned foods (fig. 1).



Figure 1. Milk and almonds are products that are commonly pasteurized. (Photo courtesy of rawpixel from Pixabay)

How It Works

Pasteurization involves applying heat to a food product. The temperature and time that the food is heated varies and depends on: (1) the type of food and (2) the pathogen being killed. The heat process kills bacteria that are harmful (pathogens) or that can spoil the food, and reduces enzymatic activity that can alter sensory characteristics over time. Therefore, this process can extend the food’s shelf life for several days or weeks (Fellows 2009).

Technology

There are a variety of pasteurization technologies that can be used. Foods can be pasteurized before or after packaging. For example, raw milk or juice can flow through a heat exchanger prior to being packaged in containers (fig. 2), or solid foods can be heated after being placed into jars using a batch pasteurizer or retort (fig. 3; Fellows 2009). These are just two examples; other types of equipment can be used.

Two main processes are commonly used (Jay, Loessner, and Golden 2005).

1. Low temperature, long time (LTLT) – This process uses a lower temperature for a longer period of time. For example, milk is treated at 145 degrees Fahrenheit for 30 minutes.
2. High temperature, short time (HTST) – This process uses a higher temperature for a shorter period of time. For example, milk is treated at 161 degrees Fahrenheit for 15 seconds.

Times and temperatures used for each process vary according to the product.



Figure 2. This is an example of a heat exchanger that a liquid would flow through prior to packaging. (Photo courtesy of Renee Boyer.)



Figure 3. This is an example of a bulk or batch pasteurizer typically used to pasteurize product all at once and/or after being packaged. (Photo courtesy of Markobe from Adobe Stock)

Efficacy

Pasteurization can kill at least 99.999 percent of pathogens (a 5-log reduction); reducing 10,000 bacterial cells to virtually nothing. Pasteurization temperatures can also destroy yeasts, molds, and other organisms. Note that pasteurization does not typically result in shelf stability and may require refrigeration to maintain quality and safety (Jay, Loessner, and Golden 2005).

Benefits

Pasteurization is used because it increases the safety and shelf life of food with minimal effect on nutrition. However, it can alter the taste of some foods. The process also decreases enzymatic activity such as browning or other undesirable color changes. Currently, there is research in food processing technologies (like irradiation) that “pasteurize” foods without using heat (Fellows 2009).

Current Usage

Pasteurization is one of the oldest and most commonly used processing technologies in the food industry. Although newer, less heat-intensive processes are also being used in place of pasteurization, pasteurization is still an effective and relevant method of processing (Fellows 2009).

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