

Processing Acid and Acidified Foods

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ACIDITY AND pH

Food scientists measure the acidity of a food based on its **pH value**. The pH scale ranges from 0 to 14 with pH 7 being neutral. The lower the pH value, the higher the level of acidity. In order to preserve foods with acid, the regulations require the equilibrium pH of the finished product to be **4.6 or below**. At these levels, toxins formed by the deadly organism causing botulism are inhibited. Because all products and processes exhibit normal variation, the pH must be measured using a pH meter. For products with a pH below 4.0, pH test strips may be used for monitoring purposes. Records of pH monitoring must be maintained for all products classified as **acid** or **acidified**.

CLASSIFICATION

We refer to foods with a pH greater than 4.6 as **low-acid foods**. For foods with a pH below 4.6 that are preserved with acid, there are two classifications. The distinction between these two categories is important.

Acid Foods: Foods, such as tomatoes, which have a natural pH of 4.6 or below are considered to be acid foods. Some foods which contain small amounts of low-acid foods in a predominantly acid food, such as herbal vinegars, are also in this category. If the finished equilibrium pH does not vary significantly from the pH of the predominant acid foods, the food is considered to be an acid food.

Acidified foods are low-acid foods to which acids or acid foods have been added to produce a pH of 4.6 or below. The Food and Drug Administration (FDA) has additional requirements for the processing of acidified foods. These can be found in the Code of Federal Regulations (21CFR114). In the absence of information to the contrary, foods preserved with acid are considered to be acidified foods.

The manufacturer of acidified foods **must register their establishment and file a scheduled process** established by a competent process authority. In addition, the operation must be under the **supervision of an individual who has successfully completed an FDA approved course on processing acidified foods**. The regulation addresses other important aspects of manufacturing such as monitoring and

record keeping. These regulations do not apply to naturally fermented foods or jams, jellies and carbonated beverages. Visit online: [Instructions for Establishment Registration and Processing Filing for Acidified Foods](#).

CONTROLLING SPOILAGE

Low pH cannot take the place of proper sanitation and care in manufacturing. Good Manufacturing Practices (GMPs) were designed and instituted by the federal government to assure that foods are manufactured and handled in a safe and sanitary manner to prevent adulteration. The conditions set forth in the regulation (21CFR110) must be met to operate your business.

Typically acid and acidified foods are heat treated in one of two ways:

- 1. Hot fill and hold** - The product is filled at a temperature of 180°F or above and the heated closure is applied by a steam capper or alternately, the closed container is inverted. The increased temperature above the minimum process temperature is necessary to heat the container and closure to destroy the microorganisms on inside surfaces.
- 2. Water bath or steam process** - The preheated product is filled into the container and the closure is applied. The container is subjected to hot water and steam until the coldest spot in the container reaches the minimum process temperature. The minimum process temperature typically used is 165°F for 15 seconds or the equivalent.

Post processing contamination and preservatives

The thermal process destroys vegetative cells in the product and the hermetic seal protects the product from recontamination while it is intact. Once the seal integrity is compromised by leakage, lack of vacuum, or simply by the consumer opening the container, microorganisms may reenter the product and cause contamination. For this reason, preservatives should be used in acid and acidified foods, especially when the consumer is likely to open and re-close the container. Sodium benzoate and potassium sorbate are often chosen for this purpose. They are typically used together at a rate of 0.1% each by weight, to take

advantage of their combined effects. They are especially effective against yeasts and molds.

PLASTIC CONTAINERS AND PRODUCTS WHICH CAN NOT BE HEATED

Most plastic containers will not withstand the high temperatures of “hot fill and hold” or “water bath” processes. However, under certain conditions, alternative processing can be used for acid or acidified foods. If the product is classified as an acidified food, a process authority would need to approve any alternative processing methods.

1. First - Destroy the vegetative cells in the product

a). At low pH, pathogens may not grow, but they can still survive and cause foodborne illness. One method of destroying these cells would be to heat the product to 180°F or above, then be cooled sufficiently prior to filling plastic containers.

b). If the product does not allow for a heat treatment, an alternative process would be to adjust the pH to below 3.3, prior to filling. When a product with a pH this low is stored for 24 hours at 75°F, research shows that the vegetative cells of common foodborne pathogens are destroyed.

An adequate sanitation program should be in place and documented to ensure that containers and the processing environment will not contribute to the contamination of the product.

2. Second - Prevent the growth of other organisms, specifically yeasts and molds

a). Use preservatives such as sodium benzoate and potassium sorbate to prevent the growth of yeast, molds and other organisms. Certain microorganisms that re-contaminate the product from the environment may grow in the product and cause spoilage. One concern is that molds might actually grow and consume acids, thereby increasing the pH

CHALLENGE STUDIES

There is a possibility that some products contain inhibitory properties that will prevent the growth of microorganisms

of public health significance without using the standard treatments mentioned above.

The “Hurdle Concept”

The “hurdle concept” refers to the combined effect of various factors such as salt, water activity, pH and temperature on the inhibition of bacterial growth. This technique is often used by larger food companies who are able to exert high levels of technical control over the process and the product. Challenge studies would be needed to validate the use of this method. These studies are expensive and time-consuming. They require very careful design to validate safety. Anyone who wishes to pursue the hurdle concept and challenge studies is directed to private outside laboratories.

LABELING THE FOOD

Regulations dealing with the food label are extensive and complicated. Before purchasing any labels, it would be wise to consult with regulatory authorities. The North Carolina Department of Agriculture and Consumer Services, NCDA&CS (919-733-7366) will review your label for compliance at no charge. The FDA also has an excellent resource: [Food Labeling Guide](#)

OTHER RESOURCES

The Code of Federal Regulations (CFR), referenced above, is the published rules of the federal government. It is divided into 50 chapters. Chapter 21 deals with food and drugs. The searchable documents can be accessed online at: [Code of Federal Regulations](#)

Acid and acidified foods are regulated by the [NCDA&CS](#), phone 919-733-7366. Contact them for the appropriate regulatory guidance concerning facility inspection, GMPs (Good Manufacturing Practices) and labeling.

In addition to the establishment registration for those facilities processing acidified foods, all facilities that manufacture, process, pack, or hold food for human or animal consumption in the United States must register with the FDA under the Bioterrorism Act. There is no fee and registration can be completed on-line at:

[Food Facility Registration](#)

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