

ACIDIFIED FOOD PRODUCTS FACT SHEET

An acidified food is defined as a low-acid food that has been treated in a manner so that all components have attained an equilibrium pH of 4.6 or below by the time thermal processing and cooling is completed (CFIA). Typically, these products are sauces or pickled foods that are packaged in hermetically sealed (airtight) containers.

When acidified food products are produced correctly, they can be safe, shelf-stable products. However, when produced incorrectly, the consumer is at risk for botulism. Botulism is a very serious foodborne illness caused by the toxins produced from the bacterium *Clostridium botulinum* and is most associated with hermetically sealed low-acid food products stored at room temperature. This type of spoilage is especially dangerous as it does not cause any physical changes to the food that would be obvious to the consumer before it is consumed.

How to Prepare Safe Shelf-Stable Acidified Food Products

Acidification

The fundamental basis for safe acidified foods is a final product equilibrated pH of less than 4.6

- pH adjusting agents—such as citric acid, acetic acid and lactic acid—are used to reduce the pH and control bacterial growth as per Health Canada's List of Permitted Food Additives
- Foods that are a mixture of solids and liquids (i.e. pickles) must have a pH lower than 4.6 in all parts of the product

- Special attention should be considered when acidifying larger pieces, tightly packed particles or coatings such as oils or skins that may be more difficult for acid to penetrate
- Ingredients such as fruits and vegetables contain natural buffers that must be overcome in the acidification

Thermal Treatment

- The temperature and time combination must be sufficient to destroy the microorganisms that cause illness or spoilage of the product.
- Most vegetative bacterial cells are quickly destroyed at a temperature of 82°C or higher
- Most yeast and mold cells are destroyed at temperatures between 60°C to 71°C
- The most common processing procedures include thermal treatment of blanching fruit and vegetable ingredients in acid prior to the filling process.
- Note: Bacterial spores are extremely heat resistant and require processing techniques that utilize high-pressure steam, such as retort to be destroyed. Fortunately, as long as these spores cannot germinate, they do not pose any danger to consumers. Spore growth and toxin production are only prevented by acidification below pH 4.6

Filling

There are two methods used for filling product into containers to ensure there is no survival of microorganisms on the surface of the container and lid as well as after the container is sealed.

- 1. Hot Fill and Hold** – this method is more commonly used on acidified products with a pH below 3.8 and involves heating the product to above minimum processing temperatures, usually 90°C and above, to ensure proper heating of the container and closure to destroy any present microorganisms on the inside surfaces. Often, the seal within the cap needs to be softened by heating prior to capping to ensure a proper seal is achieved. Once the cap is on, the best practice is to invert the container to heat treat the lid and headspace too.
- 2. Hot Water Bath** – this method involves filling the preheated product into the finished container and capping. The sealed containers are then transferred into a hot water bath for a recommended time to allow the coldest spot within the container to reach the minimum process temperature. The specific time and temperature combination for this method depend on the product and are established by validated scientific data, such as USDA's Complete Guide to Home Canning.

For both filling methods, appropriate headspace for the container being used is a critical factor to ensure enough space is provided to allow for expansion of product during heating but also to ensure the space is sufficient to form and maintain a vacuum once cooling occurs throughout the expected shelf-life. Additionally, proper seal of the lid is important to ensure that contaminated air or water is not being pulled into the sealed container as it cools and forms a vacuum.

Containers

Thermal treatments for acidified foods are designed to kill vegetative cells of microorganisms, and the sealed containers are intended to prevent contamination of the foods.

Containers must:

- Exclude oxygen to prevent the growth of molds, yeasts and some bacteria, which can grow and cause spoilage, as well as raise the pH to levels above the 4.6 threshold, allowing growth of *Clostridium botulinum* and its toxin.
- The most common containers for acidified foods are glass jars paired with different types of vacuum-type closures. For example, lug-type twist, followed by press-on twist off and continuous thread screw.
- Other containers include metal cans, plastic containers and flexible plastic packaging

Cooling

Certain types of bacteria, defined as thermophiles, are more resistant to higher processing temperatures that are not considered a concern to public health but may cause spoilage. Cooling procedures should ensure the time in the optimal growth range of these types of bacteria (40-75°C) is limited, as they can exponentially grow in this temperature range. Special attention should be paid to products containing tomato ingredients that are more prone to the survival of these bacteria.

Sanitation

Sanitation programs are critically important to the processing of safe foods, including both cleaning and sanitizing, and also proper record keeping and employee training. The selection of cleaners and sanitizers will depend on the processing facility, equipment being utilized as well as the products being produced. All materials being utilized on food contact surfaces need to be approved for use on food surfaces.

Sources

The information provided in this fact sheet was summarized from the following sources:

Acidified Foods Manufacturing School: Operating Supervisor Certification Training Manual

15.4 - Archived - Chapter 15 - Low-Acid and Acidified Low-Acid Foods in Hermetically Sealed Containers (Canned Foods) - Food safety for industry - Canadian Food Inspection Agency (canada.ca)