



Cold-Fill-Hold Processes for Acidified Foods and Beverages

Some **acidified foods** such as mustards or dessert sauces may lose quality if hot-filled.

Regulations require that acidified canned foods are **commercially sterile**, *vegetative pathogens and spoilage organisms have been destroyed which may grow in the product under normal storage conditions*. Products with certain formulations **may have the spoilage organisms eradicated in a pre-packaging heating step, and the product subsequently cooled and 'cold-filled' into a container and held for a given length of time**. Researchers have identified the product characteristics and hold-times and temperatures necessary to ensure safety for a product that is heated, cooled, and cold-filled.

NOTE: Research supports cold-fill of products that have been pasteurized prior to cooling and packaging. Research is not available that supports mixing of ingredients and filling without some prior heating step. Such products would require a challenge study or other evidence of shelf stability.

For products with an equilibrium pH of 3.3 or below. Holding the product at 50°F (or higher) for 6 days (or longer), OR holding the product at 77°F (or higher) for 35 hours (or longer) will ensure safety.

Steps in the scheduled process for this product might be written as follows:

1. Clean and sanitize containers and closures.
2. Prepare formulation as directed in the Scheduled Process, pasteurize, and cool.
3. Fill prepared sauce into containers, minimum 50°F, setting ¼" headspace. Apply closure.
4. Hold filled containers for 6 days, or longer, at 50°F, or higher in warehouse prior to distribution.

Reference: F. Breidt, J. Hayes, and R. McFeeters. 2007. Determination of 5-log reduction times for food pathogens in acidified cucumbers during storage at 10 and 25°C. Journal of Food Protection 70:2638-2641. Available online: http://foodsafety.wisc.edu/business_food/files/JFP_coldpack.pdf

For acidified products with pH 3.5 or 3.8.

- Product equilibrium pH 3.5:
 - Formulated to include 2.5% acetic acid
 - Hold time of **4 days or longer at 50°F or higher.**
- Produce equilibrium pH of 3.8:
 - Formulated to include 2.5% acetic acid
 - Formulated to include 0.1% benzoic acid
 - Hold time of **3.6 days or longer at 50°F or higher.**

Reference: F. Breidt, K. Kay, J. Cook, J. Osborne, B. Ingham, and F. Arritt. 2013. Determination of 5-log reduction times for *Escherichia coli* O157:H7, *Salmonella enterica*, or *Listeria monocytogenes* in acidified foods with pH 3.5 or 3.8. Journal of Food Protection 76:1245-1249. Available online: http://foodsafety.wisc.edu/business_food/files/Breidt3_5to3_8coldfill.pdf

There is no research currently available in the published literature which supports cold-fill-hold conditions for higher pH foods, for those with different formulations, or for products that are not pasteurized prior to cooling and filling.

Accurate record keeping which identifies, for each lot of product, the hold temperature and the time, is critical for a product that is cold-filled. Likewise, careful record keeping will ensure that formulation standards for pH 3.5-3.8 foods are met as well as other critical factors in the Scheduled Process.