



**Cornell University**  
New York State Agricultural Experiment Station

# Acidified (Pickled) Foods

Fact Sheets for the  
Small Scale Food Entrepreneur

*Published by:*

*The Northeast Center for Food Entrepreneurship at the New York State Food Venture Center, Cornell University,  
<http://www.nysaes.cornell.edu/necfe/>*

*This publication is for educational purposes only. 05/06*

## Acidified (Pickled) Foods

Acidified or “pickled” foods is a category of food products that is very popular with food entrepreneurs and farmers interested in value added opportunities. Many products are traditionally processed this way, including pickles (cucumbers) and pickled vegetables, meat and eggs. The variety of products and flavors is limited only by the creativity of food processors as new formulations and presentations continuously debut in food stores to meet consumer’s new expectations and ethnic preferences.

### Definition

It is important to understand the regulatory meaning of an acidified food. From the regulatory point of view, foods are classed as acid, low acid or acidified depending on the natural acidity of each product. A product’s acidity is measured based on a pH scale. If the raw or initial product has a pH above 4.6 it is considered a low acid food. If the pH is below 4.6 then the food is classified as an acid food. Acidified foods are low acid foods to which acid or acid ingredients are added to produce a final equilibrium pH of 4.6 or below. Equilibrium pH means the final pH measured in the acidified food after all the components of the food have achieved the same acidity.

The pH value of 4.6 is important because it is the limiting factor for the growth of an extremely dangerous microorganism called *Clostridium botulinum*, which produces a potent toxin that causes the lethal disease botulism. The regulations concerning acidified foods were established to assure the control and inhibition of the growth of *Clostridium botulinum* by proper acidification and pH control, as this microorganism is very heat resistant and therefore it is not destroyed by pasteurization or cooking temperatures below 212°F.

We all relate to the word pickled as a food item being treated with an acid liquid, typically vinegar or lemon/lime juice. In doing this procedure we extend the shelf-life of the product due to the preservative effect of the acid as well as develop or produce a sour or pickled taste in the product. In a way, we are imitating a traditional fermentation process by directly adding the acid component to the product. Any food grade acid can be used such as vinegar (acetic acid), citric acid, lactic acid, malic acid or phosphoric acid.

### Regulations

If you are seriously interested in making acidified foods, you must become familiar with the acidified foods regulations described in the Code of Federal Regulation Title 21 Part 114 for FDA regulated products and Title 9 Parts 318 and 381 for USDA regulated products. It is also important to review the FDA guidelines for inspection of acidified foods manufacturers available at FDA’s website. In addition, any food manufacturer must obey the Good Manufacturing Practices regulations described in Title 21 Part 110. All documents are available through NECFE for your convenience.

*Published by:*

*The Northeast Center for Food Entrepreneurship at the New York State Food Venture Center, Cornell University,*

*<http://www.nysaes.cornell.edu/necfe/>*

*This publication is for educational purposes only. 05/06*

Strictly speaking, the regulations only cover acidified foods that are shelf-stable, that is, foods that are sold without refrigeration in sealed containers. In reality, any food processor that manufactures acidified or acid foods, refrigerated or not, should follow the safety factors explained in the FDA and USDA regulations.

### **Processing Requirements**

Prior to starting the production of acidified foods, the processor must register the establishment or processing facility with FDA. The specific products and procedures used to manufacture the final products, called “schedule processes” must also be filed with FDA. In addition, the processor must complete a training program called the “Better Process Control School” or equivalent before engaging in commercial production. This program is offered annually in May by Cornell University and at different dates by other schools. Most likely the processor will need the assistance of a “Process Authority” to develop or verify the schedule process and to help with the filing and documentation requirements. NECFE has several Process Authorities that will work with you during this stage.

Acidified foods must be properly acidified to a pH below 4.6, but in practice this value is usually 4.2 or below for safety reasons. The regulations also require a thermal process or heating step to kill all the pathogens and any other spoilage microorganisms that could grow during the shelf-life of the product. To assure quick and proper acidification, the food is normally cooked or heated with the acid before being filled into the final container. The pH is checked, controlled and documented prior to filling and closing. The heating or pasteurization step or process must be done either by hot-filling the product or by the boiling water bath process. The heating temperature and time are critical factors that must be monitored, controlled and documented. The final equilibrium pH is checked and documented after the product has received the heating step. Any other critical safety factors must be monitored, checked and documented as specified by the schedule process.

To measure the pH, the processor must use a pH meter with two decimal places accuracy if the final pH is 4.0 or above. A pH meter is the best method to measure pH and it is recommended for all products and values. If the pH is below 4.0, other methods can be used such as pH paper or a pH meter with one decimal place.

Containers for acidified foods should be such that a hermetic seal is obtained. The best containers are cans and glass jars/bottles with metal caps lined with a compound called plastisol. With these closures, a good vacuum is obtained. Vacuum is a good indicator of a hermetic seal and helps to keep the quality of the product.

### **References:**

Code of Federal Regulations. Title 21 part 114. Office of the Federal Register, National Archives and Records Administration. 2000.

*Published by:*

*The Northeast Center for Food Entrepreneurship at the New York State Food Venture Center, Cornell University,  
<http://www.nysaes.cornell.edu/necfe/>*

*This publication is for educational purposes only. 05/06*