Department of Food Science

Food Processing

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Extended Shelf-Life Refrigerated Foods

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Refrigeration has, over the years, been a mainstay of food preservation. The process lends itself to maintaining "freshness" for raw to partially processed foods, as well as for maintaining the quality of processed foods after packages have been opened. Packaged refrigerated foods have been characterized by high quality and wholesomeness. Traditional refrigerated foods, with minor exceptions, exhibit a very good safety record.

Recently, certain pathogens such as *Clostridium botulinum* Type E, *Yersinina enterocolitica, Listeria monocyogenes*, and other organisms have been associated with foodborne illness outbreaks. In an often quoted paper presented at a USDA workshop, Palumbo (1987) questioned the adequacy of refrigeration in preserving the safety of refrigerated foods. He expressed concern that the above organisms could grow at temperatures below 5^{o}C. Furthermore, considerable numbers of these pathogenic organisms could develop when the foods are temperature abused.

Coinciding with the concern associated with psychotropic pathogens, new refrigerated foods have gained in consumer acceptance and popularity.

Extended shelf life refrigerated foods are now appearing in the marketplace. Many of these foods are packaged in reduced oxygen packaging. Traditional spoilage organisms compete with pathogens. They also can provide spoilage clues to the consumer. The growth of these organisms might be eliminated in this altered environment.

If these foods were mishandled, they could pose a serious public health threat to the consumer, especially to those groups considered vulnerable such as infants, the infirm, the aged and immunocompromised individuals. Since these populations are at risk, it is imperative that retailers, distributors, and the food service industry, as well as consumers, are in a position to make informed and responsible decisions related to maintaining the safety of these foods. It is necessary to train retail food handlers in procedures that minimize microbial hazards and maintain the quality of traditional and newer extended shelf life refrigerated foods.

Control of temperature is the most critical stability factor of these foods. The Association of Food & Drug Officials (AFDOS, undated) and other professional organizations (NFPA, 1989) have recommended that there be secondary safety barriers for foods that are packaged in a reduced oxygen atmosphere and offered at retail.

Recommendations include:

A) water activity a_w, < 0.91,
B) pH (acidity) pH < 4.6,
C) high levels of nonpathogenic competing organisms present to inhibit the growth of pathogenic organisms
D) meat or poultry products processed under USDA supervision which have a nitrite level of at least 120 ppm [initially] and a minimum brine concentration of 3.5%,
E) frozen foods be maintained frozen during and after packaging. (AFDOS, undated)

In addition, it has been recommended that raw or processed fish and fisheries products not be sold at retail packaged in reduced oxygen atmospheres unless held frozen before, during and after packaging. The Food and Drug Administration is in the process of developing refrigerated foods regulations at the present time. Due to the large number of retail stores and the high degree of employee turnover, it is important that supervisors be trained so they can train their own employees. Through the training of supervisory personnel, more food handlers can be educated in recommended food handling practices thus minimizing opportunities for foodborne illness outbreaks associated with food stores.

References

Palumbo, S.A., 1987. Can Refrigeration Keep Our Foods Safe? Dairy and Food Sanitation 7:2 p. 56-60.

AFDOS (undated) Retail guidelines, Refrigerated Foods in reduced oxygen packages. Association of Food and Drug Officials, York, PA.

NFPA, 1989. Guidelines for the development, production & handling of refrigerated foods. National Food Processor's Association, Washington, DC.

Extended shelf life refrigerated foods fit generally into the following categories:

Cook-Chill- The cooked food is packaged hot, sealed into moisture/oxygen barrier packages and blast or tumble chilled. These foods are usually stored at temperatures between 28° and 32°F. Centralized institutional commissaries have been particularly interested in utilizing this technology.

Vacuum Packaging- Air is mechanically removed from the package prior to sealing. Many retail stores have developed processing procedures for these products on the premises. Most state regulatory agencies have moved to block this activity without guidance from FDA.

Sous Vide- Prepared raw ingredients are vacuum packaged and sealed in a container, partially cooked, and rapidly chilled to below 32°F. The heating process is not sufficient to make the food shelf stable so it must be held under refrigerated temperatures. Current markets tend to be foodservice and major retail markets.

Modified Atmosphere Packaging (MAP) - The package is gas flushed and then sealed. Active or passive means may be employed to alter the internal atmosphere of the package.