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CHAPTER 37

MICROBIOLOGY OF FROZEN FOODS

Bacteriology of Frozen Foods, Effects of Freezing and Storage on Microorganisms in Foods, Significance of Bacterial Counts, Development of Bacterial Standards, Public Health Aspects, Plant Sanitation

PUBLIC health problems involving frozen foods and the deterioration of such products due to the growth of microorganisms are chiefly associated with the handling.

BACTERIOLOGY OF FROZEN FOODS

Microorganisms do not grow in foods held below 10 to 14 F. At temperatures between 14 and 40 F, psychrophilic bacteria can grow, but food poisoning organisms cannot. Public health problems are chiefly associated with handling prior to either freezing or after defrosting, or both.

Most frozen foods are cooked before they are eaten which is helpful from the standpoint of the destruction of harmful bacteria or bacterial end products. Still, there is no certainty that all harmful materials or microorganisms will be destroyed by cooking.

Although no guarantee can be made that all frozen foods are innocuous, it is now recognized that, compared with other methods of food processing, freezing preservation introduces no special hazard to public health.

The efforts of packers, distributors, retailers and consumers have all contributed to the quality and safety of foods preserved by freezing. Only good quality foods should be frozen. They should be frozen at a rate which will prevent deterioration due to bacterial growth and should be handled under the best sanitary conditions. After freezing, foods should be held at suitable frozen storage temperatures at all points. After defrosting suitable low refrigerated temperatures should be used until consumed.

It is obvious that those who are involved in the commercial handling of frozen foods should do everything possible to assist each other and to assist the consumer in treating frozen foods in such a manner as to provide the best sanitary and edible quality. It should be realized that there is still much to be done in disseminating information to the various groups involved.

EFFECTS OF FREEZING AND STORAGE ON MICROORGANISMS IN FOODS

The bacteria in foods are less readily destroyed by freezing than would be the case were they suspended in water. Bacteria can be protected against freezing damage by the addition of a number of different materials of the type found in foods. For example, sugars, gelatin starches and other colloidal material may protect bacteria against death by freezing. On freezing, considerable numbers of the bacteria present are usually destroyed followed by a slower death rate during storage. Bacteria survive freezing in neutral foods better than in acid foods.

Regardless of the fact that bacteria in frozen foods may be killed during freezing and during frozen storage, the situation is never reached where all the bacteria present are destroyed by this method of processing. Frozen foods upon defrosting are quite subject to bacterial decomposition even though some of the bacteria previously present may have been destroyed. It is considered by some that frozen foods after defrosting are more susceptible to bacterial decomposition. Recent research would indicate that such is not the case. This particular question will require further investigation before a definite answer can be given.

SIGNIFICANCE OF BACTERIAL COUNTS

The methods of making the various types of bacterial counts on frozen foods may be found in standard text books.

It is possible to place too much emphasis on the bacterial count as a means of judging the edible quality of a food.

In one of the few thorough investigations concerning the accuracy and precision of bacterial counts, it was found that:

"It is impossible to avoid the conclusion that the bacterial count is an inaccurate and unreliable method of ascertaining the number of organisms in milk. The final result which even with a standard technique is correct only within limits—estimated at ±90 percent—bears no constant relationship to the total number of bacteria either alive or dead in the sample. As a figure, therefore, it possesses no special significance and its value is purely relative."

This work was done on milk; therefore, the sampling error was probably not nearly so great as it would have been with some other foods.

In other investigations, it has been found that bacterial counts, repeated several times on different samples from the same package of frozen vegetables, show considerable variation and that this variation is much greater with certain vegetables than with others. The variation between any two plate counts made on two samples from the same package of frozen broccoli may be as great as 200 percent, even though an attempt be made to include the same proportion of head and stalk in each sample.

In one experiment, it was found that there was no direct relationship between bacterial count and quality in frozen foods. On the contrary, the work reported indicated that products with the higher bacterial counts were usually of better edible quality. This was believed to be due to the fact that products which were over-mature were processed in small lots while the