FREEZE-DRYING — PRESENT AND FUTURE

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Basically, freeze-drying is changing frozen foods (cooked or uncooked) to dried food by sublimation. This means ice is removed directly from the frozen state to the gaseous state, by-passing the liquid phase. The sublimation process takes place in a vacuum chamber, at low pressure and controlled input of heat. Since only distilled water leaves the food, the resulting product has a definite advantage over other drying techniques in that the oils and other flavor-carrying liquids remain; the flavors also stay in the food. Moisture content of the finished food is reduced to 2 percent or less.

When the product is properly prepared and controlled throughout the freeze-drying process, the quality and trueness of flavor of the reconstituted food is said to equal that of frozen foods. Yet there is no need for refrigeration in handling, transportation, and storage. The shelf life is longer than for frozen foods. In addition, there is a weight reduction exceeding that of other dried foods. For example, 100 pounds of cooked beef reduces in weight to 42 pounds; 100 pounds of mushrooms has a dried weight of 10 pounds.

The United States Department of Agriculture has finished a taste test of freeze-dry products now on the market.

Chicken, turkey and ham appear to have the greatest future among the meats. Several shell fish, such as shrimp and crab, have already been market-tested and are assured success. Among the vegetables, asparagus and a few members of the cabbage family, for example broccoli, have potential. Mushrooms will be freeze-dried in large quantities. Among the fruits, blueberries, strawberries, raspberries, pineapple, apples, apricots, and others appear economically feasible. Specialty foods that appear promising are seasonings, spices, coffee and fruit powders. A manufacturer of freeze-dry equipment has worked out, in its own laboratory, an efficient processing cycle for more than 50 foods.

Foods with a high protein or starch content usually freeze-dry easily. When foods have high water content and loose structural characteristics, as for example watermelon, tomatoes, and cucumbers, it is quite easy to freeze-dry them, but virtually impossible to reconstitute them to their original form.

Another way of assessing the potential of the industry is to examine possible markets for the products. These would include:

1. Institutional sales: Mass feeding used in restaurants, schools, hospitals and other away-from-home eating places.
2. Secondary processing: Freeze-dry ingredients added to soup, preserves, desserts, and bakery products.
3. Convenience foods: Camp packs, dip mixes and unique confectioneries.
4. Armed Forces: Probably the largest single buyer of freeze-dried products is the Quartermaster Corps.
5. Retail: People in the field agree this market is still several years in the future.
6. Specialty items: It is quite possible that within this area, freeze-drying may have its greatest impact. As an example, instant coffee dehydrated by this method is said to yield a product with trueness to flavor unequalled by any other drying method. A prominent food company is now installing freeze-dry cabinets in their coffee plant.

The future of the freeze-dry industry depends largely on two factors, quality of the products and the cost of processing.

A custom freeze-dry plant has a rate of 10 cents per pound of raw product. This would be equivalent to 11 to 14 cents per pound of water removed. A well-known consultant to the food industry uses 7 cents per pound of water removed as a rule-of-thumb cost. Automatic programming of the drying cycle in conjunction with accurately sequenced operation, is an important factor in the economics of freeze-drying. Batch freeze-drying, with several chambers, probably will always prove the most profitable method for processors who freeze-dry a variety of products, but the continuous method can be more profitable for a single product at a high production rate.

Practically all management men of the major food firms have an interest in freeze-drying. Many have investigated the possibilities of freeze-drying as it might apply to their businesses. Almost every one of them feels that there is a future for this industry. They are testing products, calculating costs, watching developments and waiting.

In taste testing, some of the freeze-dried products showed up well. Others leave something to be desired. All products are not uniformly good.

Costs are high. Currently, they are much higher than other drying and processing methods. However,
we must consider costs other than processing ones. It is quite possible that transportation, handling or storage costs may be enough lower in freeze-dry products that they could more than offset the higher processing costs involved.

The freeze-drying industry is already here. There are some 30 odd products now on the market. Eight companies are in commercial production, and at least three of these are presently enlarging or modernizing their plants. Four plants are now being built in this country and two in Canada. Six equipment companies are engaged in designing, building and installing equipment in this country and three are active in Europe.

It is estimated that the dollar volume of the freeze-drying industry in 1970 will be about one billion dollars annually. In seven years this is a potential of about one percent of total food sales.

Experts do not know and have not expressed their ideas to what extent freeze-drying might cut into the frozen food or canning industries. On the basis of taste tests and cost studies, one should not be overly worried about the immediate future if he were a frozen food processor or canner.

Freeze-dried foods must comply with provisions of the Indiana Food, Drug, and Cosmetic Act in respect to labeling, adulteration and contamination.

Laboratory analysis of investigational samples of various freeze-dried foods has revealed some to contain heavy bacterial contamination. For example, the standard plate count of one freeze-dried product was 91,000,000/gm.

The Quartermaster Food and Container Institute’s Industry Advisory Committee is of the opinion that bacteriological standards must be established for precooked freeze-dried foods. The suggested standard is 5,000 (standard plate count) per gram, with staphylococci and probably E. coli absent in a 0.1 gram dilution.

The control of heavy bacterial contamination becomes increasingly important as consumer demands turn to the use of convenience foods that are served in the home without cooking or heating or after short periods of cooking at relatively low temperatures.

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A DECADE OF PROGRESS

LUTHER L. TERRY
Surgeon General, Public Health Service,

It is an honor to participate with you in this Ninth National Conference on Interstate Milk Shipments. The occasion gives me great pleasure since I know that this group, which has the respect of both the dairy industry and the public health and agricultural agencies, is performing an important service for the American people.

Rapid increase during the past decade in the number of communities and dairies which have joined in protecting the sanitary quality of interstate shipments of fluid milk and milk products bodes well for the future of your interstate certification program and for your activities here this week.

You are meeting at a time in history when no one any longer questions the need for proper sanitary protection of milk. Indeed, it is hard to realize that some sixty years ago health workers were struggling to set up the first milk-heating stations in New York to dispense milk which would be safe for babies to drink. Milk was suspected as the carrier of illness, which, near the turn of the century, brought death to 241 of every thousand babies in New York before they completed a full year of life.

This kind of situation led W. T. Sedgwick, one of the early public health leaders, to write in 1901: "Among all vehicles of infectious disease there is perhaps none more dangerous than milk. This fact is the more remarkable because milk has always been one of the most trusted of human foods. Clothed in a veil of white, associated with the innocence of infancy, of high repute for easy digestibility, believed to represent perfection as a natural dietary, popular and cheap, milk has always deservedly held a high place in public esteem."

Because of milk sanitation and other health measures, milk has been restored to its high place in public esteem. Infant mortality has been reduced 90% in the past 100 years. There has been such widespread acceptance of the merits of milk sanitation that today more than 96% of the market milk consumed by our Nation’s urban population is pasteurized—a phenomenal accomplishment in a relatively short period of years.

Many groups have contributed to this achievement. Public health and agricultural agencies, the