ous or spongy.

Generally the ready-to-serve dips were assigned higher hedonic scores than the reconstituted dips on the basis of flavor, body and texture. Only 12 of the 59 ready-to-serve samples were criticized for flavor defects. Usually the criticism was stale ingredients. Twenty of these samples were criticized for body and texture defects with weakness being the most common criticism.

Components

The components of the commercial dehydrated chip-dip bases and the ready-to-serve chip-dips are indicated in Table 4. Tabulations were made from the information provided on the label of the various products. Obviously not all of the constituents listed are to be found in any one base or dip.

SUMMARY AND CONCLUSION

Dehydrated chip-dip bases and ready-to-serve chip-dips were examined chemically and microbiologically. Additional appropriate tests for physical and chemical properties were applied to the above types of dips and to reconstituted dips.

Chip-dips flavored with vegetables or spices usually had much higher total, coliform and mold counts than samples flavored with cheese. The fat content of dehydrated chip-dips varied from 0.4 to 34.3%, whereas the fat content of the ready-to-serve samples varied from 13.0 to 54.0%. Both groups included samples which contained (a) milk fat only, (b) vegetable fat only and (c) blends of both fats.

The moisture content of the dehydrated bases varied from 1.3 to 8.2% and in the ready-to-serve samples the variation ranged from 34.7 to 74.4%. The ready-to-serve chip-dips were more acceptable organoleptically than those reconstituted from dehydrated bases.

The high populations of organisms in some of the samples of chip-dips and the variations in composition indicate that consideration should be given to the establishment of regulatory standards.

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ROLE OF SANITATION IN DEHYDRATION OF FOODS

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This is an age of movement. From week-end picnics to outer space we are a nation on the move. This concept of movement has also become a part of the doctrine of military planning and make up. In order to move fast and far one must be properly equipped and unburdened with weighty and bulky materials. Since food is an important part of the supplies of men in the Armed Forces, it has become necessary to pay considerable attention to the make up, form and weight of this food.

Over the years food has been processed in cans and has proven very satisfactory with regard to stability, utility and handling. This is still true, and canned foods offer no problems where large numbers of men are in training or fairly stationary. However, for the striking force of rapidly moving men believed necessary for any future action such types of food supplies present a problem. Food in round cans is difficult to carry on the person; it is heavy and bulky and does not fit into the weight...
limit of supplies for such a soldier. It has become necessary, therefore, to develop new types of food, new packaging for it, and a new food service concept to meet this need.

The most productive result of years of research and development in this area has been a family of dehydrated food items, packaged in flexible containers and containerized to provide a complete meal, even to the preparation and serving equipment. For example, in the Quick-Serve Meal now under development, one box of approximately 9 pounds in weight, will contain a complete menu of food for 6 men. It will supply 1200 calories per man. It will contain serving trays and eating equipment, a container for heating water, and an accessory package of comfort items. This box and 5 quarts of water is all that is needed to feed 6 men.

The development of this type of meal was made possible through the development of new food processing techniques and equipment and the development of new packaging materials and package design. This work has also given impetus to the growth of a new food industry. There have been many problems concerned with dehydration characteristics of certain foods, the storage stability, the rehydration within time limits dictated by the schedules of soldiers on the move. Constant striving to meet these challenges has resulted in the development of several meat items that can be rehydrated in less than one-half minute and have very high palatability and acceptance.

In these food developments there are several items and certain concepts that should be of great interest to you as Sanitarians. This is why I am appearing on your program today. As these new food products come on the market problems will be developed of concern to the sanitarians in the plants where the processing takes place and to the public health workers in the area of distribution and serving of the food. These are concerned in part with the fact that these non-sterile foods will be eaten essentially as they are prepared and packaged. There will be no cooking involved. Hot water will be added to the food and the product eaten in a matter of minutes. In many cases only cold water is added.

Let us look at the areas of dehydrated foods and see what fields require attention from the public health standpoint. There are many air dried items on the market today such as dry soup mixes, potatoes, onions, etc. These require cooking to varying degrees and the product is heated to or near the boiling point of water in the preparation. Freeze-dehydrated uncooked products are those dehydrated in the raw or blanched state to a low moisture content by dehydration under vacuum in the frozen state. Since these items need to be cooked to prepare them as finished food items, the temperature must of necessity be raised to boiling or above. The area that should receive considerable attention in my estimation is that of the pre-cooked or pre-prepared items that require only the addition of water before consuming. We need to research this area to determine just where the problems are and what is needed to solve them. The recommendation is for the addition of 180°F water. However, this may not always be attained and in cool weather the temperature drop would be very rapid. Such conditions would result in very little killing of bacteria that might be present.

The practice of sanitation has become a way of life with us in this country. We practice it in the preparation of our own food and various agencies devote great effort in supervising food production and providing assurance of safety and wholesomeness. It would seem that the industrial sanitarian is obligated to place emphasis on quality and cleanliness in the preparation since the consumer feels entitled to a guarantee of sanitary preparation and wholesomeness of the food he buys. The problems are magnified in the pre-cooked dehydrated food area because of the manner of final preparation for eating.

Most of the pre-cooked type of food should be rendered free of pathogens and organisms of sanitary significance by the manner of their preparation for drying. However, considerable handling and manipulation is necessary in preparing for the dehydration step and in the packaging step. Any chance contamination at these points will result in the contamination being carried through to the consumption of the item with little if any change during the final preparation. For example, roast beef must be sliced and handled after it is thoroughly cooked, chicken meat is prepared by deboning, by hand, after cooking and with such items strict attention must be paid to the sanitation with which they are handled. Long delay in handling the cooked product must be avoided, the temperature at which held is very important in preventing rapid bacterial multiplication, and the personal habits of the workers who handle the products must be closely controlled.

The preparation of certain raw items also present problems. For example, dehydrated raw salad items, such as cabbage slaw, are never heated. The raw product is washed, shredded, dehydrated, rehydrated in the field and served as a crisp salad material. Opportunity for chance contamination lurks at every stage of the process and with little chance of correction at any stage since the product is never heated. Several dessert items are prepared by merely stirring with cold water.

With procurement practices going more and more
to end item inspection and evaluation closer sanitary controls within the plant must be exercised by the management. This is necessary to meet the end item requirements under which the procurement is made. For example, the military must place certain end item requirements for quality and condition on the final product as delivered. These requirements are based upon reasonable and attainable values and not on an arbitrary figure. It has been found through experience that the keeping quality often depends upon the type of raw material, the final moisture content, the elimination of oxygen, etc. Likewise, bacterial requirements can be met only when attention is paid to the quality of the raw material, the rapidity of handling, proper temperature control and the manual handling of product closely supervised. If there is slippage in the sanitary program of the plant it is generally evidenced in the final product. Experience has shown that abnormal bacterial counts or types generally can be accounted for by a thorough sanitary survey of the plant operation. At some point a condition will be found that can account for the failure to meet the requirement. In one product the high coliform content of the product was traced to the floor, the customary place of repose for a strainer used to remove product from the cooking vessels. With provision for hanging the strainer up, the problem disappeared.

In the future the dehydrated products that have been described will without doubt fill an important need in the feeding of men of the Armed Services. Such foods only can be procured from industry and much of it produced with equipment that is just now in the design stage. In my opinion, the sanitarians of industry will play an important role in the development of that industry and in the delivery of satisfactory products. Let me emphasize that this applies not only to products that may be prepared for the military, but also for that of the civilian commercial trade. The success of any such product will be gained through the satisfaction and confidence of the consumer. Quality control and good sanitary procedures will play major roles in that success.

THE IMPORTANCE OF FOOD ADDITIVES AND GOVERNMENT REGULATION OF THEM

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In the discussion below the definition of food additives which has been developed by the Food Protection Committee, a part of the Food and Nutrition Board of the National Academy of Sciences is used. This definition states that a food additive is a substance or a mixture of substances, other than a basic foodstuff, which is present in a food as a result of any aspect of production, processing, storage, or packaging. The term does not include chance contaminants.

The food additive activity of the Manufacturing Chemists' Association began in 1950 with the formation of our Food Additives Committee. This Committee is composed of toxicologists, chemists, doctors, labeling experts and lawyers. Since 1950 this Committee has worked diligently to aid the Federal Government in the development of the Food Additives Law and in the effective administration of the law. These efforts culminated in passage of the Food Additives Amendment of 1958. The law had the strong support of our Association which represents 193 chemical companies in the United States and Canada. The United States segment represents over 90% of the productive capacity of the chemical industry.

Some preliminary comments concerning food additives are in order at this point. As all of you are aware all components of foods are chemicals. The great bulk of foods is comprised of chemicals classified as carbohydrates, fats, proteins, minerals and water. In addition to the natural chemical composition of foodstuffs, chemicals may be incorporated, either directly or indirectly, during the growing, storage, or processing of foods. Such chemicals may be either intentional additives or incidental additives.

Intentional food additives serve one or more of these purposes: improve nutritional value, enhance quality or consumer acceptability, improve the keep-