CODE OF HYGIENIC PRACTICE FOR DEHYDRATED FRUITS AND VEGETABLES INCLUDING EDIBLE FUNGI (CXC 5-1971)

SECTION I - SCOPE

This code of practice applies to fruits and vegetables which are artificially dehydrated (including freeze-dried), either from the succulent stage or in combination with sun-drying, and covers the products commonly associated with the phrase "dehydrated food".

Such fruits and vegetables are relatively low in moisture and generally unpalatable in dehydrated form and can be held under normal conditions without significant decay due to mould, enzymatic, or bacterial action.

The fruit or vegetable may be sliced, cubed, diced, granulated, or in other sub-divided form, or left whole prior to dehydratation.

Fruits covered by this code include, but are not limited to, apples, bananas, cranberries, cherries, bilberries.

Vegetables covered by this Code include, but are not limited to: artichokes, asparagus, green beans, cabbage, cauliflower, celery, sweet corn, eggplant, onions, green peas, potatoes, squash, sweet potatoes, tomatoes, edible cultivated mushrooms, and whole and sliced dried wild fungi according to the list of acceptable varieties established by the competent authority of the consuming country.

Exclusion: tree nuts and the relatively high moisture content "dried fruits" of commerce, which are edible in the dry state; other dried products such as cereal grains, pulses and legumes including dried ripened beans, dried peas other than green peas, dried spices, and other dry food products which only on occasion require an artificial drying or conditioning treatment prior to storage.

SECTION II - DEFINITIONS

Dehydratation is the removal of moisture by artificial means and in some cases in combination with sun-drying.

SECTION III - RAW MATERIAL REQUIREMENTS

A. Environmental Sanitation in Growing and Food Production Areas

(1) **Sanitary disposal of human and animal wastes**. Adequate precautions should be taken to ensure that human and animal wastes are disposed of in such a manner as not to constitute a public or hygienic hazard, and extreme care should be taken to protect the product from contamination with these wastes.

(2) **Sanitary quality of irrigation water**. Water used for irrigation should not constitute a public health hazard to the consumer through the product.

(3) **Animal, plant pest and disease control**. Where control measures are undertaken, treatment with chemical, biological or physical agents should be done only in accordance with the recommendations of the appropriate official agency, by or under the direct supervision of personnel with a thorough understanding of the hazards involved, including the possibility of toxic residues being retained by the crop.

B. **Sanitary Harvesting and Food Production**

(1) **Equipment and product containers**. Equipment and product containers should not constitute a hazard to health. Containers which are reused should be of such material and construction as will facilitate thorough cleaning, and should be so cleaned and maintained as not to constitute a source of contamination to the product.

(2) **Sanitary techniques**. Harvesting and production operations, methods and procedures should be clean and sanitary.

(3) **Removal of obviously unfit materials**. Unfit products should be segregated during harvesting and production to the fullest extent practicable and should be disposed of in such a place and in such a manner that they cannot result in contamination of the food and water supplies or other crops.

(4) **Protection of product from contamination**. Suitable precautions should be taken to protect the raw product from being contaminated by animals, insects, vermin, birds, chemical or microbiological contaminants or other objectionable substances during handling and storage. The nature of the product and the method of harvesting will indicate the type and degree of protection required.

C. **Transportation**

(1) **Facilities**. Conveyances for transporting the harvested crop or raw product from the production area, place of harvest or storage should be adequate for the purpose intended and should be of such material and construction as will permit thorough cleaning and so be so cleaned and maintained as not to constitute a source of contamination to the product.

(2) **Handling procedures**. All handling procedures should be such as will prevent the product from being contaminated. Extreme care should be taken in transporting perishable products to prevent spoilage or deterioration. Special equipment - such as refrigeration equipment - should be used if the nature of the product or distances involved so indicate. If ice is used in contact with the product, it should be of sanitary quality as required in Section IV - A. (2c).

SECTION IV - PLANT FACILITIES AND OPERATING REQUIREMENTS

A. Plant Construction and Layout

(1) **Location, size and sanitary design**. The building and surrounding area should be such as can be kept reasonably free of objectionable odours, smoke, dust, or other contaminants; should be of sufficient size for the purpose intended without crowding of equipment or personnel; should be of sound construction and kept in good repair; should be of such construction as to protect against the entrance or harbouring of insects or birds or vermin; and should be so designed as to permit easy and adequate cleaning. In areas experiencing high concentrations of air-borne pollutants, equipment should be used to remove pollutants from the air blown across or through the product.

(2) **Sanitary facilities and controls**

(a) ***Separation of processes***. Areas where raw materials are received or stored should be so separated from areas in which final product preparation or packaging is conducted as to preclude contamination in the finished product. Areas and compartments used for storage, manufacture or handling of edible products should be separate and distinct from those used for inedible materials. The food handling area should be completely separated from any part of the premises used as living quarters.

(b) ***Water supply***. An ample supply of hot and cold water should be available. The water supply should be of potable quality. Standards of potability shall not be less than those contained in the "International Standards for Drinking Water", World Health Organization, 1971.

(c) ***Ice***. Ice should be made from water of potable quality and should be manufactured, handled, stored and used, so as to protect it from contamination.

(d) ***Auxiliary water supply***. Where non-potable water is used - for such purposes as fire control - it must be carried in completely separate lines, identified preferably by colour and with no cross-connection or back-siphonage with the lines carrying potable water.

(e) ***Plumbing and waste disposal***. All plumbing and waste disposal lines (including sewer systems) must be large enough to carry peak loads. All lines must be water-tight and have adequate traps and vents. The plumbing and the manner of waste disposal should be approved by the official agency having jurisdiction.

Removal of solid or semi-solid wastes from the product preparation, processing, canning and packing areas should be on a continuous or near continuous basis, using water and/or appropriate equipment so that these areas are kept clean and there is no danger of contaminating the product.

Waste material should be disposed of in a place and in such a manner that it cannot be used for human food and cannot contaminate food and water supplies and cannot offer harbourage or be a breeding place for rodents, insects, or other vermin.

(f) ***Lighting and ventilation***. Premises should be well lit and ventilated. Special attention should be given to the venting of areas and equipment producing excessive heat, steam, obnoxious fumes or vapours, or contaminating aerosols. Good ventilation is important to prevent both condensation

(which may drip into the product) and mould growth in overhead structures - which growth may fall into the food. Light bulbs and fixtures suspended over food in any step of preparation should be of the safety type or otherwise protected to prevent food contamination in the case of breakage.

(g) ***Toilet-rooms and facilities***. Adequate and convenient toilets should be provided and toilet areas should be equipped with self-closing doors. Toilet rooms should be well lit and ventilated and should not open directly into a food handling area. They should be kept in a sanitary condition at all times. There should be associated hand-washing facilities within the toilet area and the notices should be posted requiring personnel to wash their hands after using the toilet.

(h) ***Hand-washing facilities***. Adequate and convenient facilities for employees to wash and dry their hands should be provided wherever the process demands. They should be in full view of the processing floor. Single-use towels are recommended, where practicable, but otherwise the method of drying should be approved by the official agency having jurisdiction. The facilities should be kept in a sanitary condition at all times.

B. **Equipment and Utensils**

(1) **Materials**. All food contact surfaces should be smooth; free from pits, crevices and loose scale; non-toxic; unaffected by food products; and capable of withstanding repeated exposure to normal cleaning; and non-absorbent unless the nature of a particular and otherwise acceptable process renders the use of a surface, such as wood necessary.

(2) **Sanitary design, construction and installation**. Equipment and utensils should be so designed and constructed as will prevent hygienic hazards and permit easy and thorough cleaning. Stationary equipment should be installed in such a manner as will permit easy and thorough cleaning.

(3) **Equipment and Utensils**. Equipment and utensils used for inedible or contaminating materials should be so identified and should not be used for handling edible products.

(4) **Construction of drying equipment**. Equipment used for drying should be so constructed and operated that the product cannot be adversely affected by the drying medium.

C. **Hygienic Operating Requirements**

(1) **Sanitary maintenance of plant, facilities and premises**. The building, equipment, utensils and all other physical facilities of the plant should be kept in good repair and should be kept clean and maintained in an orderly, sanitary condition. Waste materials should be frequently removed from the working area during plant operation and adequate waste receptacles should be provided. Detergents and disinfectants employed should be appropriate to the purpose and should be so used as to present no hazard to public health.

(2) **Vermin Control**. Effective measures should be taken to protect against the entrance into the premises and the harbourage on the premises of insects, rodents, birds or other vermin.

(3) **Exclusion of domestic animals**. Dogs, cats and other domestic animals, should be excluded from areas where food is processed or stored.

(4) **Personnel health**. Plant management should advise personnel that any person afflicted with infected wounds, sores, or any illness, notably diarrhoea, should immediately report to management. Management should take care to ensure that no person, while known to be affected with a disease capable of being transmitted through food, or known to be a carrier of such disease microorganisms, or while afflicted with infected wounds, sores, or any illness, is permitted to work in any area of a food plant in a capacity in which there is a likelihood of such person contaminating food or food contact surfaces with pathogenic organisms.

(5) **Toxic substances**. All rodenticides, fumigants, insecticides or other toxic substances should be stored in separate locked rooms or cabinets and handled only by properly trained personnel. They should be used only by or under the direct supervision of personnel with a thorough understanding of the hazards involved, including the possibility of contamination of the product.

(6) **Personnel hygiene and food handling practices**

(a) All persons working in a food plant should maintain a high degree of personal cleanliness while on duty. Clothing including suitable headdress should be appropriate to the duties being performed and should be kept clean.

(b) Hands should be washed as often as necessary to conform to hygienic operating practices.

(c) Spitting, eating and the use of tobacco or chewing gum should be prohibited in food handling areas.

(d) All necessary precautions should be taken to prevent the contamination of the food product or ingredients with any foreign substance.

(e) Minor cuts and abrasions on the hands should be appropriately treated and covered with a suitable waterproof dressing. Adequate first-aid facilities should be provided to meet these contingencies so that there is no contamination of the food.

(f) Gloves used in food handling should be maintained in a sound, clean and sanitary condition; gloves should be made of an impermeable material except where their usage would be inappropriate or incompatible with the work involved.

D. **Operating Practices and Production Requirements**

(1) **Raw material handling**

(a) ***Acceptance criteria***. The raw material should not be accepted by the plant if known to contain decomposed, toxic or extraneous substances which will not be removed to acceptable levels by normal plant procedures of sorting or preparation.

(b) ***Storage***. Raw materials stored on the plant premises should be maintained under conditions that will protect against contamination and infestation and minimize deterioration.

(c) ***Water***. Water used for conveying raw materials into the plant should be from such a source or suitably treated as not to constitute a public health hazard and should be used only by permission of the official agency having jurisdiction.

(2) **Inspection and sorting**. Prior to introduction into the processing line, or at a convenient point within it, raw materials should be inspected, sorted or culled as required to remove unfit materials. Such operations should be carried out in a clean and sanitary manner. Only clean, sound materials should be used in further processing.

(3) **Washing or other preparation**. Raw materials should be washed as needed to remove soil or other contamination. Water used for such purposes should not be recirculated unless suitably treated to maintain it in a condition as will not constitute a public health hazard. Water used for washing, rinsing, or conveying final food products should be of potable quality.

(4) **Preparation and processing**. Preparatory operations leading to the finished product and the packaging operations should be so timed as to permit expeditious handling of consecutive units in production under conditions which would prevent contamination, deterioration, spoilage, or the development of infectious or toxigenic microorganisms.

(5) **Packaging of finished product**

(a) ***Materials***. Packaging materials should be stored in a clean and sanitary manner and should not transmit to the product objectionable substances beyond limits acceptable to the official agency having jurisdiction and should provide appropriate protection from contamination.

(b) ***Techniques***. Packaging should be done under conditions that preclude the introduction of contamination into the product.

(6) **Preservation of finished product**. Methods of preservation or treatment of the finished product should be such as to kill any insects or mites remaining after processing and to result in protection against contamination, deterioration, or development of a public health hazard. The finished product should be of such moisture content that it can be held in the localities of origin and distribution under any normally foreseeable conditions for those localities without significant deterioration by decay, mould, enzymatic changes, or other causes.

In addition to appropriate drying, the finished product may be:

(a) treated with chemical preservatives (including fumigants) approved by the Codex Alimentarius Commission, provided the residue levels resulting from such treatment do not exceed the tolerances, as referenced in the commodity standards; and/or

(b) heat processed; and/or

(c) packed in hermetically sealed containers so that the product will remain safe and will not spoil under normal non-refrigerated storage conditions.

(7) **Storage and transport of finished products**. The finished products should be stored and transported under such conditions as will preclude the contamination with or development of pathogenic or toxigenic microorganisms and protect against rodent and insect infestation and deterioration of the product or of the container.

(a) The product should be stored under suitable conditions of time, temperature, humidity, and atmosphere, to prevent significant deterioration. Humidity control is of primary importance for this product.

(b) Where dehydrated products are stored under conditions in which they may become infested by insects and mites, appropriate methods of protection should be used regularly.

The dehydrated products should be stored in such a manner that they can be fumigated *in situ* or so stored that they can be removed elsewhere for fumigation in special facilities (e.g. fumigation chambers, steel, barges, etc.).

Cold storage can be used, either to prevent infestation in localities where insects are likely to be present in ordinary storage or to prevent insects damaging the product.

E. **Sanitation Control Programme**

It is desirable that each plant in its own interest designate a single individual, whose duties are preferably divorced from production, to be held responsible for the cleanliness of the plant. His staff should be a permanent part of the organization and should be well trained in the use of special cleaning tools, methods of disassembling equipment for cleaning, and in the significance of contamination and the hazards involved. Critical areas, equipment and materials should be designated for specific attention as part of a permanent sanitation schedule.

F. **Laboratory Control Procedures**

In addition to any control by the official agency having jurisdiction, it is desirable that each plant in its own interest should have access to laboratory control of the sanitary quality of the products processed. The amount and type of such control will vary with the food product as well as the needs of management. Such control should reject all foods that are unfit for human consumption. Analytical procedures used should follow recognized or standard methods in order that the results may be readily interpreted.

SECTION V - END PRODUCT SPECIFICATIONS

Appropriate methods should be used for sampling, analysis, and determination to meet the following specifications.

A. To the extent possible in good manufacturing practice the products should be free from objectionable matter.

B. The products should not contain any pathogenic microorganisms or any toxic substance originating from microorganisms.

C. The products should comply with the requirements set forth by the Codex Committees on Pesticide Residues and Food Additives as referenced in the commodity standards.