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PROPOSED DRAFT REVISION OF THE CODE OF HYGIENIC PRACTICE FOR SPICES AND
DRIED AROMATIC PLANTS (CAC/RCP 42-1995)

(At Step 3)

Prepared by the Electronic Working Group led by the United States of America

Governments and interested international organizations are invited to submit comments on the attached Proposed Draft revision (*see* Appendix I) and should do so in writing in conformity with the Uniform Procedure for the Elaboration of Codex Standards and Related Texts (*see Procedural Manual of the Codex Alimentarius Commission*) to: Ms Barbara McNiff, US Department of Agriculture, Food Safety and Inspection Service, US Codex Office, 1400 Independence Avenue, SW, Washington, D.C. 20250, USA, email Barbara.McNiff@fsis.usda.gov with a copy to: The Secretariat, Codex Alimentarius Commission, Joint WHO/FAO Food Standards Programme, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy, by email codex@fao.org by **10 October 2012**.

Format for submitting comments: In order to facilitate the compilation of comments and prepare a more useful comments document, Members and Observers, which are not yet doing so, are requested to provide their comments in the format outlined in the Annex to this document.

BACKGROUND

1. At the 43rd Session of the Codex Committee on Food Hygiene (Miami, United States of America, 5 – 9 December 2011), the Committee agreed to begin new work to revise the *Code of Hygienic Practice for Spices and Dried Aromatic Plants* (CAC/RCP 42-1995) and agreed to establish an electronic working group (EWG), led by the United States. In order to follow a more horizontal approach in the development of Codex documents, this document may become an annex to a general code on low moisture foods at a later stage.
2. The objective of the EWG was to prepare a Draft Revision of the *Code of Hygienic Practice for Spices and Dried Aromatic Plants* (CAC/RCP 42-1995) for consideration by the Codex Committee on Food Hygiene (CCFH) at its 44th Session.

ELECTRONIC WORKING GROUP

3. The EWG considered an initial proposed draft and a second version was prepared with input from Argentina, Australia, Benin, Brazil, Canada, Germany, Japan, Thailand, the United States of America and IOSTA. The current version of the document is the result of comments on the second version from Australia, Canada, the European Union, Japan, Spain, Thailand, the United States of America and IOSTA.
4. The draft code was organized to be consistent with the *Codex Recommended International Code of Practice - General Principles of Food Hygiene* (CAC/RCP 1-1969) and *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).
5. The draft code was developed with the recognition that a wide diversity of practices are used in spice production, processing, and packaging throughout the world.

6. Added text addressed or emphasized the following areas:

- Moisture control
- Pest control
- Additional practices that limit growth of mycotoxin-producing mold and contamination by pathogens such as *Salmonella*
- Supplier control
- Microbial reduction treatments

RECOMMENDATIONS

7. The 44th Session of the CCFH is invited to consider the Proposed Draft Revision of the Code of Hygienic Practice for [Dried] Spices and Dried Aromatic Plants, which is in Appendix I.

8. The EWG recommends the Committee consider the following list of issues, where the relevant draft text has been identified by being placed within square brackets:

- Whether to use the term “dried spices” or “spices” throughout the document (First appearance in the Code title. For simplicity, only the text in the title has been put in brackets, but it is the intention of the EWG to revise this phrase throughout the document according to the Committee’s recommendation.)
- Whether to include teas, including herbal teas, and dried vegetables used as seasonings in the scope (section 2.1, paragraph 6)
- Whether to include a provision for the protection of source plants when domestic animals are used during the growth or harvest stages of production (section 3.1.2, paragraph 17)
- Whether to include the recommendations to avoid sprinkler irrigation and flood irrigation in production (section 3.2.1.1, paragraph 21)
- Whether to include a provision to deter entry of casual visitors and, to the extent possible, children to the harvest area (section 3.2.3, paragraph 25)
- Whether to include the specifications listed in paragraph 71 (section 5.2.3)
- Decide on the specific wording to be used with respect to verification activities such as microbiological testing of product and the environment (section 5.2.3, paragraphs 73 and 74)
- Whether to include the recommendations regarding record keeping (section 5.7, paragraph 89)
- Whether to include the microbiological criterion for *Salmonella* for dried spices and dried aromatic plants and, if so, what the value of n should be (Annex I, paragraphs 104-107).

9. In addition, some WG members have questioned whether all recommendations in the document can be applied by small scale producers in developing countries. The Committee is invited to discuss the issue of how to provide practical recommendations for small scale producers (e.g., are there alternative recommendations that could be used without compromising the safety of the products they produce).

Appendix I**PROPOSED DRAFT REVISION OF THE CODE OF HYGIENIC PRACTICE FOR [DRIED]
SPICES AND DRIED AROMATIC PLANTS (CAC/RCP 42 – 1995)****(AT STEP 3)****INTRODUCTION**

1. Dried, fragrant, aromatic or pungent, edible vegetable or plant substances, in the whole, broken or ground or blended form, e.g., dried spices and dried aromatic plants, impart flavor when added to food. Dried spices and dried aromatic plants may include many parts of the plant, such as berries, flowers, leaves, roots, and seeds. Dried product processing generally involves cleaning (e.g., culling and sorting to remove debris), sorting, sometimes soaking, slicing, drying, and on occasion grinding/cracking. Drying may be performed in mechanical dryers for rapid drying or under the sun for several days. Some dried spices and dried aromatic plants are also treated to inactivate the non-sporeformers, typically by gas treatment (e.g., ethylene oxide), irradiation or steam treatment.

2. Sporeforming bacteria, including pathogens such as *Bacillus cereus*, *Clostridium perfringens*, and *Clostridium botulinum*, as well as non-sporeforming vegetative cells such as *Escherichia coli* and *Salmonella* have been found in dried spices and dried aromatic plants. The safety of dried spices and dried aromatic plant products depends on maintaining good hygienic practices along the food chain during primary production, processing, packing, retail, and at the point of consumption. There have been a number of outbreaks of illness associated with spice and seasoning consumption, with most being caused by *Salmonella* spp. that have raised concerns regarding the safety of dried spices and dried aromatic plants. The complex supply chain for dried spices and dried aromatic plants makes it difficult to identify the point in the food chain where contamination occurs, but evidence has demonstrated that contamination can occur throughout the food chain if proper practices are not followed.

3. The safety of dried spices and dried aromatic plants can also be affected by mycotoxin-producing mold (e.g., those producing aflatoxin and ochratoxin) throughout the entire food chain. Chemical hazards such as heavy metals and pesticides, as well as physical contaminants such as stones, glass, wire, stems, and sticks, may also be present in dried spices and dried aromatic plants.

4. The production, processing, and packing of dried spices and dried aromatic plants is very complex. For example, source plants for dried spices and dried aromatic plants are grown in a wide range of countries and on many types of farms, e.g., from very small farms (less than two acres) to large farms spanning hundreds of acres. Agricultural practices for growing source plants for dried spices and dried aromatic plants also vary tremendously from virtually no mechanization to highly mechanized practices. The distribution and processing chain for dried spices and dried aromatic plants is also highly complex and can span long periods of time and include a wide range of establishments. For example, dried spices and dried aromatic plants grown on small farms may pass through multiple stages of collection and consolidation before reaching a spice processor and packer or a food manufacturer. Processing and packing/repacking may also take place in multiple locations across long periods of time, since dried spices and dried aromatic plants are prepared for different purposes.

SECTION I - OBJECTIVES

5. This Code of Hygienic Practice addresses Good Agricultural Practices (GAPs) and Good Manufacturing Practices (GMPs) that will help minimize contamination, including microbial, chemical and physical hazards, associated with all stages of the production of dried spices and dried aromatic plants from primary production to consumer use. Particular attention is given to minimizing microbial hazards.

SECTION II - SCOPE, USE AND DEFINITION**2.1 Scope**

6. This Code applies to dried spices and dried aromatic plants - whole, broken, ground or blended. Dried spices and dried aromatic plants may include the dried aril (e.g., mace of nutmeg), bark (e.g., cinnamon), berries (e.g., black pepper), buds (e.g., clove), bulbs (e.g., garlic), leaves (e.g., basil), rhizomes

(e.g., ginger), roots (e.g., horseradish), seeds (e.g., mustard), stigmas and styles (e.g., saffron), pods (e.g., vanilla), resins (e.g., asafoetida), fruits (e.g., chili) or plant tops (e.g., chives). [This Code includes teas, including herbal teas, and dried vegetables used as seasonings (e.g., dehydrated onion, broccoli powder).] It covers the minimum requirements of hygiene for growing, harvesting, post-harvest technology and practices (e.g., curing, bleaching, cutting, drying, cleaning, grading, packing, transportation and storage, including disinfestation) processing establishment, processing technology and practices (e.g., grinding, blending, freezing and freeze drying, microbial reduction treatments) packaging and storage of processed products.

2.2 Use

7. This Code follows the format of the Codex *Recommended International Code of Practice - General Principles of Food Hygiene* (CAC/RCP 1-1969) (Referred to in this document as *General Principles of Food Hygiene*) and should be used in conjunction with it and other applicable codes such as the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

2.3 Definitions

8. Refer to definitions in the *General Principles of Food Hygiene* and the *Code of Hygienic Practice for Fresh Fruits and Vegetables*. In addition, the following expressions have the meaning stated:

9. **Dried Spices and Dried Aromatic Plants** – natural dried components or mixtures of dried plants used in foods (including dried herbs and teas) for flavoring, seasoning and imparting aroma, including whole, broken, ground and blended forms.

10. **Disinfest** – to eliminate harmful, threatening, or obnoxious pests, e.g., vermin

11. **Microbial Reduction Treatment** – process applied to dried spices or dried aromatic plants to eliminate or reduce microbial contaminants to an acceptable level.

12. **Source Plant** – undried plant from which the dried spice or dried aromatic plant is derived.

SECTION III - PRIMARY PRODUCTION

3.1 Environmental Hygiene

13. Source plants for dried spices and dried aromatic plants should be protected from contamination by human, animal, domestic, industrial and agricultural wastes which may be present at levels likely to be a hazard to health. Adequate precautions should be taken to ensure that these wastes are disposed of in a manner that will not contaminate plants and constitute a health hazard to consumers of the final product.

3.1.1 Location of the production site

14. The proximity of production sites that pose a high risk for contamination of source plants, such as animal production facilities, hazardous waste sites and waste treatment facilities, should be evaluated for the potential to contaminate production fields for source plants for dried spices and dried aromatic plants with microbial or other environmental hazards.

15. Consideration of production site location should include an evaluation of the slope and the potential for runoff from nearby fields, the flood risk as well as hydrological features of nearby sites in relation to the production site.

16. When the environmental assessment identifies a potential food safety risk, measures should be implemented to minimize contamination of dried source plants for dried spices and dried aromatic plants at the production site.

3.1.2 Wild and domestic animals and human activity

17. Many animal species (e.g., insects, birds, amphibians, rodents, chickens, feral pigs, and domestic or wild cats and dogs), and humans, that may be present in the production environment are known to be potential carriers of foodborne pathogens. Animals are also a common source of contamination of surface water that may be used for irrigation. The following should be considered:

- Domestic and wild animals should be excluded from production and handling areas, to the extent possible, using appropriate biological, physical and chemical pest control methods. Fences or other structures should be used where necessary to prevent animals from entering the growing and harvest areas.

Methods selected should comply with local, regional, and national environmental and animal protection regulations.

- [Where domestic animals are used in the harvest of source plants for dried spices and dried aromatic plants, the source plants should be protected from microbial contamination by animal feces.]
- Production and handling areas for source plants for dried spices and dried aromatic plants should be properly maintained to reduce the likelihood of pest attraction. Activities to consider include efforts to minimize standing water in fields, to restrict access by animals to water sources, and to keep production sites and handling areas free of waste and clutter.
- Source plant production sites and handling areas for dried spices and dried aromatic plants should be evaluated for evidence of the presence of wildlife or domestic animal activity (e.g., presence of animal feces, large areas of animal tracks, or burrowing). Where such evidence exists, growers should evaluate the risks and whether the affected sections of production sites for the source plants for the dried spice or dried aromatic plant should be harvested.

3.2. Hygienic production of food sources

18. Source plants for dried spices and dried aromatic plants should be grown, harvested and cleaned of debris in accordance with Good Agricultural Practices (*Code of Hygienic Practice for Fresh Fruits and Vegetables*).

19. Arrangements for the disposal of domestic and industrial wastes in areas from which raw materials are derived should be acceptable to the official agency having jurisdiction

3.2.1 Agricultural input requirements

20. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

3.2.1.1 Water for primary production including irrigation

21. Source plants for dried spices and dried aromatic plants should not be grown or produced in areas where the water used for irrigation might contaminate plants. Growers should identify the sources of water used on the farm (e.g., municipality, re-used, irrigation water, reclaimed wastewater, discharge water from aquaculture, well, open canal, reservoir, rivers, lakes, farm ponds). It is recommended that growers assess and manage the risk posed by these waters as follows:

- Assess the potential for microbial contamination (e.g., from livestock, human habitation, sewage treatment, manure and composting operations) and the water's suitability for its intended use. Reassess the potential for microbial contamination if events, environmental conditions (e.g., temperature fluctuations, heavy rainfall, etc.) or other conditions indicate that water quality may have changed.
- Identify and implement corrective actions to prevent or minimize contamination. Possible corrective actions may include fencing to prevent large animal contact, proper maintenance of wells, filtering water, not stirring the sediment when drawing water, building settling or holding ponds, and water treatment facilities. Settling or holding ponds that are used for subsequent irrigation may be microbiologically safe, but may attract animals or in other ways increase the microbial risks associated with water for irrigating plants. If water treatment is needed, consult with water safety experts.
- Determine if microbial and chemical testing should be done to evaluate the suitability of water for each intended use. Analytical testing may be necessary after a change in irrigation water source, flooding or a heavy rainfall when water is at a higher risk of contamination. If testing, determine and document
 - What tests need to be performed, (e.g., which pathogens and/or sanitary indicators)
 - Which parameters should be noted (e.g., temperature of water sample, water source location, and/or weather description),
 - How often tests should be conducted,
 - What the test outcomes indicate, and
 - How tests will be used to define corrective actions.

- Frequency of testing should depend on the source of the irrigation water (less for adequately maintained deep wells, more for surface waters) and the risks of environmental contamination, including intermittent or temporary contamination (e.g., heavy rain, flooding, etc.).
- If water testing is limited to non-pathogenic indicators, frequent water tests may be useful to establish the baseline water quality so that subsequent changes in the levels of contamination can be identified.
- If the water source is found to have unacceptable levels of indicator organisms or is contaminated with foodborne pathogens, corrective actions should be taken to ensure that the water is suitable for its intended use. Testing frequency should be increased until consecutive results are within the acceptable range.
- [Sprinkler irrigation should be avoided in order to minimize the potential for growth of mycotoxin-producing mold. Because of the risk of contamination, flood irrigation should not be used.]

3.2.1.2 Manure, biosolids and other natural fertilizers

22. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

3.2.1.3 Soil

23. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

3.2.1.4 Agricultural chemicals

24. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003). In addition:

- Growers should use agricultural chemicals according to the manufacturer's instructions or recommendations provided by government authorities. Residues should not exceed levels as established by the Codex Alimentarius Commission.
- The use of soil fungicides (on seedbeds or fields) reduces the amount of spores of mycotoxin-producing molds. If appropriate, for preventive purposes, fungicides should be used on source plants, e.g., fruits, to avoid the introduction and development of mold through wounds or fissures.

3.2.3 Personnel health, hygiene and sanitary facilities

25. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003). In addition, the following should be considered:

- Where appropriate, each business operating primary production operations should have written Standard Operating Procedures (SOPs) that relate to health, hygiene and sanitary facilities. The SOPs should address worker training, facilities and supplies to enable agricultural workers to practice proper hygiene, and company policies relating to expectations for worker hygiene as well as illness reporting.
- All agricultural workers should properly wash their hands using soap and clean running water, followed by thorough drying, before handling dried spices and dried aromatic plants, particularly during harvesting and post-harvest handling. Agricultural workers should be trained in proper techniques for hand washing and drying.
- Non-essential persons, [casual visitors and, to the extent possible, children,] should be deterred from entering the harvest area as they may present an increased risk of contamination.

3.2.3.1 Personnel hygiene and sanitary facilities

26. Growers should consider providing areas away from the field for agricultural workers to take breaks and eat. For worker convenience, these areas should provide access to toilet and hand-washing facilities so agricultural workers can practice proper hygiene.

27. As far as possible, sanitary facilities should be located close to the field and readily accessible to the work area.

- Sanitary facilities should be located in a manner to encourage their use and reduce the likelihood that agricultural workers will relieve themselves in the field.

- Portable facilities should not be located or cleaned in cultivation areas or near irrigation water sources or conveyance systems. Growers should identify the areas where it is safe to put portable facilities and to prevent traffic in case of a spill.
- Facilities should include clean running water, soap, toilet paper or equivalent, and single use paper towels or equivalent. Multiple use cloth drying towels should not be used. Hand sanitizers should not replace hand washing and should be used only after hands have been washed.
- If clean running water is not available, an acceptable alternative hand washing method should be recommended by the relevant competent authority.

3.2.3.2 Health status

28. The following should be considered:

- Growers should be encouraged to observe symptoms of diarrheal or food-transmissible, communicable diseases and reassign agricultural workers as appropriate.
- Agricultural workers should be encouraged and, where feasible, be motivated with appropriate incentives to report symptoms of diarrheal or food-transmissible, communicable diseases.
- Medical examination of agricultural workers should be carried out if clinically or epidemiologically indicated.

3.2.3.3 Personal cleanliness

29. When personnel are permitted to continue working with cuts and wounds covered by water proof dressings, they should wear gloves to cover the bandages thereby providing a secondary barrier between them and the source plants they handle.

3.3 Handling, Storage and Transport

30. Each source plant should be harvested using a method suitable for the plant part to be harvested in order to minimize damage and the introduction of contaminants. Plant matter that is damaged or other plant waste material should be disposed of properly and not left in the field in order to minimize the potential for it to serve as a source of mycotoxin-producing mold. Only the amount that can be processed in a timely manner should be picked in order to minimize growth of mycotoxin-producing mold prior to processing.

3.3.1 Prevention of cross-contamination

31. Specific control methods should be implemented to minimize the risk of contamination from microorganisms associated with manual harvesting methods. The following should be considered:

- The soil under the plant should be covered with a clean sheet of plastic during picking/harvest to avoid contamination by dirt or plant matter that has fallen prior to harvesting.
- Source plant matter that has fallen to the ground should be disposed of properly if it cannot be made safe by further processing.

3.3.2 Storage and transport from the field to the packing establishment

32. The conveyances for transporting the source plant material or dried spices and dried aromatic plants from the place of production to storage for processing should be cleaned and disinfested before loading. Products should be protected against outdoor conditions when transported. Prevent field debris from entering packing and storage facilities by cleaning the outside of harvest bins and requiring workers to wear clean clothes in those areas.

33. Dried spices and dried aromatic plants should be stored on raised platforms under a non-leaking roof. The storage location should prevent access by rodents or other animals and birds and should be isolated from areas of excessive human or equipment traffic.

3.3.3 Field packing

34. Packing activities can occur in the field. Field packing operations should include the same sanitary practices, where practical, as packing dried spices and dried aromatic plants in establishments or modified as needed to minimize risks. To prevent germination and growth of mold spores, the products must be dried to a safe moisture level prior to packing.

35. When packing dried spices and dried aromatic plants in the field for transport, storage, or for further sale, use new bags to prevent the potential for microbial, physical and chemical contamination. When bags are marked, food-grade dye should be used to minimize the potential for contamination with dyes. When bags have an open structure, such as jute bags, the bag should not be marked when filled with dried spices or dried aromatic plants to prevent liquid dye from contaminating the contents and increasing the moisture in the dried spices or dried aromatic plants.

36. Removal of discarded plant material should be done on a regular basis in order to avoid accumulation that would promote the presence of pests.

3.4 Cleaning, Maintenance and Personnel Hygiene at Primary Production

3.4.1 Cleaning programs

37. The following should be considered:

- Harvesting equipment, including knives, pruners, machetes, that come into direct contact with source plants for dried spices and dried aromatic plants should be cleaned at least daily or as the situation warrants and, when necessary, disinfected.
- Clean water should be used to clean all equipment directly contacting dried spices and dried aromatic plants, including farm machinery, harvesting and transportation equipment, containers and knives.
- Equipment should be allowed to dry before use.

3.4.2 Cleaning procedures and methods

38. Cleaning and disinfection programs should not be carried out in a location where the rinse water might contaminate plant material used for dried spices and dried aromatic plants.

SECTION IV - ESTABLISHMENT: DESIGN AND FACILITIES

4.2 Premises and Rooms

39. Buildings and facilities should be designed to provide separation, by partition, location or other effective means, between those operations which may result in cross contamination. They should be designed to facilitate hygienic operations by means of an appropriate flow in the process from the arrival of the raw materials at the premises to the finished product, and should provide for appropriate temperature conditions for the process and the product.

40. The application of appropriate hygienic design standards to building design and layout is essential to ensure that contaminants are not introduced into the product and if a pathogen such as *Salmonella* is introduced it remains a transient strain and does not become established in specific areas that can serve as a source of contamination of the product. Premises and rooms used for dried spices and dried aromatic plants should be physically separated from wet processing areas and designed such that they can be cleaned routinely with little or no water. When wet cleaning is required, premises and rooms should be thoroughly dried before introducing dried spices and dried aromatic plants again.

41. Since limiting water is the primary means to control microbial growth from pathogens such as *Salmonella* or mycotoxin-producing molds, in establishments processing and packing dried spices and dried aromatic plants, premises and rooms should be designed to exclude moisture from the environment. In general, areas in which dried spices and dried aromatic plants are handled should not have drains; however, if drains are present, the surrounding floor should be properly sloped for effective drainage and kept dry under normal conditions.

42. Procedures should be established to inspect the integrity of the establishment (e.g., for roof leaks); such problems should be corrected as soon as they are detected.

43. Proper ventilation should be in place to correctly manage temperature, humidity and dust in the establishment. In addition, airflow in the establishment should provide for higher air pressures in the packaging areas and lower air pressures in rooms where incoming materials are handled. Exhaust vents should be hygienically designed to prevent the formation and accumulation of condensation around the vent exit and to prevent water from re-entering the establishment. Exhaust ducts should be cleaned on a regular basis and should be designed to prevent reverse air flow.

44. Premises and rooms should be designed with a means of dust control, since spices and dried aromatic plants are likely to generate particulate matter that can be carried to other parts of the room or premise by air currents. If the dried spices or dried aromatic plants are contaminated with a pathogen such as *Salmonella*, it can become established in a specific area. If the harborage site becomes wet, the pathogen can grow to large numbers and the harborage site can serve as a source of contamination to other places in the establishment, including food contact surfaces and products exposed to the environment.

45. Elevated infrastructure should be designed to minimize the accumulation of dust and dry material, especially when pipes, overhead structures and platforms are directly above exposed dried spices and dried aromatic plants.

46. Construction and major maintenance activities can dislodge microorganisms from harborage sites where they have become established and lead to widespread contamination of the establishment. Because some microorganisms such as *Salmonella* can survive in dry environments for long periods of time, construction activities may release these microorganisms from unknown harborage sites. Preventive measures such as temporary isolation of the construction or maintenance sites, rerouting of employee and equipment traffic, proper handling of construction material entry and waste material egress, maintaining negative pressure in the work site, and other appropriate measures should be implemented during construction and maintenance.

4.3 Equipment

47. Equipment should be designed to facilitate cleaning with little or no water and, when wet cleaning is required, to allow thorough drying before reusing the equipment for dried spices or dried aromatic plants. Alternatively the design should allow disassembly such that parts can be taken to a room designed for wet cleaning. The equipment design should be as simple as possible, with a minimal number of parts and with all parts and assemblies easily accessible and/or removable for inspection and cleaning. Equipment should not have pits, cracks, corrosion, crevices, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets, or dead ends.

48. Hollow areas of equipment should be eliminated whenever possible or permanently sealed. Items such as bolts, studs, mounting plates, and brackets should be continuously welded to the surface and not attached via drilled and tapped holes. Welds should be ground and polished smooth.

49. Push buttons, valve handles, switches and touch screens should be designed to ensure product and other residues (including liquid) do not penetrate or accumulate in or on the enclosure or interface.

50. Equipment should be installed so as to allow access for cleaning and to minimize transfer of dust particles to other pieces of equipment or to the environment.

51. Wherever possible, forklifts, utensils, and maintenance tools for the finished product and packaging areas should be different from those used in the “raw” material area (e.g., prior to the microbial reduction treatment).

SECTION V - CONTROL OF OPERATION

5.1 Control of Food Hazards

52. Measures should be taken at each step in the supply chain to minimize the potential for contamination of dried spices and dried aromatic plants by microbial pathogens, mycotoxin-producing molds, excreta, rodent hair, insect fragments and other foreign materials.

53. Depending on the activities conducted at the establishment, it may be useful to separate the establishment into areas, or zones, such as the raw material (pre-processing) area and the post-processing area, with stricter controls in areas post-processing where a microbial reduction treatment has been delivered and in the areas where product is being packaged.

54. Traffic patterns should be established with respect to movement of personnel and materials (e.g., ingredients used in dry-mixing, packaging materials, pieces of equipment, carts, and cleaning tools) in order to minimize tracking of materials from other areas, e.g., the raw material area to the finished product area, in order to prevent cross-contamination.

55. In the case of an unusual event, such as a roof leak or a faulty sprinkler that introduces water into the dry production or packaging environment, production should be stopped. The leak should be fixed, and the area cleaned, disinfected, and dried before production resumes.

5.2 Key Aspects of Hygiene Control Systems

5.2.1 Time and temperature control

56. Dried spices and dried aromatic plants are susceptible to mold growth if storage conditions are not appropriate. Dried spices and dried aromatic plants should be stored at a moisture low enough so that the product can be held under normal storage conditions without development of mold.

5.2.2 Specific process steps

5.2.2.1 Drying

57. Plants or parts of plants used for the preparation of dried spices and dried aromatic plants may be dried naturally or mechanically, provided adequate measures are taken to prevent contamination of the raw material during the process. To prevent the growth of microorganisms, especially mycotoxin-producing mold, a safe moisture level should be achieved.

58. If dried naturally, plants or part of plants should be dried on clean, elevated racks, concrete floors, or clean mats or tarps and not on the bare ground or in direct contact with the soil. Pathways should be made in the drying area to prevent anyone from walking on the crop. The drying plant material should be raked frequently to limit mold growth.

59. Concrete floors or slabs poured specifically for drying source plants should be subject to an appropriate cleaning program and, where appropriate, disinfected. New concrete slabs should be used for drying only when it is absolutely certain that the new concrete is well-cured and free of excess water. An approved plastic cover spread over the entire new concrete slabs can be used as a moisture barrier; however, the sheet should be completely flat to prevent the pooling of water. Suitable precautions should be taken to protect the dried spices and dried aromatic plants from contamination by domestic animals, rodents, birds, mites and other arthropods or other objectionable substances during drying, handling and storage. If drying outdoors, drying platforms should be placed under a roof/tarp free of tears, holes or frayed material that will prevent rewetting by rainfall and contamination from birds overhead.

60. If possible, use mechanical drying methods versus open air drying to limit exposure of dried spices and dried aromatic plants to environmental contaminants and to prevent growth of mold. If hot air drying is used, the air should be free of contaminants and precautions should be made to prevent combustion gases from contacting the plant material or stored plant material in the area.

61. Drying time should be reduced as much as possible by using optimal drying conditions to avoid fungal growth and toxin production. For both natural and mechanical drying, the thickness layer of the drying source plant should be considered in order to consistently achieve a safe moisture level.

62. Dried spices and dried aromatic plants should be kept in areas where contact with water or moisture is minimized.

5.2.2.2. Cleaning of dried spices and dried aromatic plants

63. Dried spices and dried aromatic plants should be cleaned properly (e.g., culled and sorted) to remove physical hazards (such as the presence of animal and plant debris, metal, and other foreign material) through manual sorting or the use of detectors, such as metal detectors. Raw materials should be trimmed to remove any damaged, rotten or moldy material.

64. Debris from culling and sorting should be periodically collected and stored away from the drying, processing and packaging areas to avoid cross-contamination and attracting pests.

5.2.2.3 Microbial Reduction Treatments

65. In order to control microbiological contamination, appropriate methods of treatment may be used in accordance with the regulations set by the official agency having jurisdiction. Whenever feasible, dried spices and dried aromatic plants should be treated with a validated microbial reduction treatment prior to reaching the consumer in order to inactivate pathogens such as *Salmonella*. For additional information on validation, refer to the *Guidelines for the Validation of Food Safety Control Measures* (CAC/GL 69-2008). Commonly used methods involve the application of steam, fumigation using ethylene oxide or propylene oxide, or radiation. Where dried spices and dried aromatic plants are irradiated, refer to the *Recommended International Code of Practice for Radiation Processing of Food* (CAC/RCP 19-1979) and the *General Standards for Irradiated Foods* (CODEX STAN 106-1983).

66. Factors that should be considered when using steam include exposure time and temperature. The process should ensure that all of the product achieves the desired temperature for the full length of time required. A drying step may be necessary to remove added moisture.

67. Factors that should be considered when using irradiation include radiation dose and the size and shape of the package, as well as the penetrability of the packing material to the type of radiation used. The process should ensure that all of the product is exposed to the minimum dose of radiation needed to provide the intended effect.

68. Factors that should be considered when using ethylene oxide or propylene oxide include chemical concentration, exposure time, vacuum and/or pressure, and penetrability of the packaging material. The process should ensure that all product is directly exposed to the gas for the full length of time required.

69. For pathogen inactivation treatments the adequacy of the selected control measure (thermal or non-thermal) and associated critical limits for processing should be determined, considering the increased heat resistance reported for *Salmonella* at low water activities and the increased resistance of spores to most microbial reduction treatments. In some cases, challenge studies may be needed to support validation. Once the lethality of the process is validated by scientific data, the establishment should verify that the process continues to meet the critical limits during operation.

5.2.3 Microbiological and other specifications

70. Refer to the *General Principles of Food Hygiene* and the *Principles for the Establishment and Application of Microbiological Criteria for Foods* (CAC/GL 21-1997).

[71. When tested by appropriate methods of sampling and examination, the products:

(a) should be free from pathogenic and toxigenic microorganisms in levels that may represent a hazard to health; and

(b) should not contain any substances originating from microorganisms, particularly mycotoxins, in amounts that exceed the tolerances or criteria established by the Codex Alimentarius Commission or, where these do not exist, by the official agency having jurisdiction;

(c) should not contain levels of insect, bird or rodent contamination that indicate that dried spices or dried aromatic plants have been prepared, packed or held under unsanitary conditions;

(d) should not contain chemical residues resulting from the treatment of dried spices or dried aromatic plants in excess of levels established by the Codex Alimentarius Commission or, where these do not exist, by the official agency having jurisdiction;

(e) should comply with the provisions for food additives, contaminants, and with maximum levels for pesticide residues established by the Codex Alimentarius Commission or, where these do not exist, by the official agency having jurisdiction.]

72. In view of the limitations of end-product testing, food safety should be ensured through the design of an appropriate food safety control system and by verification of the implementation of the system and the effectiveness of the control measures e.g., through appropriate auditing methods.

[73. Microbiological testing can be a useful tool to evaluate and verify the effectiveness of safety and sanitation practices, provide information about an environment, a process, and even a specific product lot, when sampling plans and methodology are properly designed and performed. The intended use of information obtained (e.g., evaluating the effectiveness of a sanitation practice, evaluating the risk posed by

a particular hazard, etc.) can aid in determining what microorganisms are most appropriate to test for. Test methods should be selected that are validated for the intended use. Consideration should be given to ensure proper design of a microbiological testing program. Trend analysis of testing data should be undertaken to evaluate the effectiveness of food safety control systems.

74. Verification activities may include, as necessary, appropriate environmental and/or product testing. A microbiological criterion for *Salmonella* in ready-to-eat dried spices and dried aromatic plants is provided in Annex I. When monitoring control measures and verification results demonstrate deviations, appropriate corrective action should be taken and the finished product should not be released until it is shown that it complies with appropriate specifications.]

5.2.4 Microbiological cross contamination

75. Effective measures should be taken to prevent contamination of uncontaminated dried spices and dried aromatic plants by direct or indirect contact with material at earlier stages of the processing. Raw products that may present a hazard should be processed in separate rooms, or in areas physically separate from those where end-products are being prepared. Dried spices and dried aromatic plants that have undergone a microbial reduction treatment should be processed and stored separately from untreated dried spices and dried aromatic plants. Equipment should not be used for both treated and untreated products without adequate cleaning and sanitizing before use with treated products.

76. Persons handling raw materials or semi-processed products capable of contaminating the end-product should not come into contact with any end-product unless and until they discard all protective clothing worn during the handling of the material at earlier stages of the processing and have changed into clean protective clothing. Hands should be washed and disinfected thoroughly before handling products at different stages of processing.

5.2.5 Physical and chemical contamination

77. Appropriate machines should be used to remove physical hazards such as pebbles or heavier stones. To separate foreign matter from the product, air tables or gravity separators can be used for particles of the same size and different density. Sieves of different diameters may be used to obtain the size required for each product and to remove foreign matter.

78. Regardless of the type of separator used, the following parameters should be considered: size of particles, density, weight and size, air speed, inclination of the sieve plate, vibration, etc. for the highest effectiveness of the procedure.

79. Magnets should be used to separate ferrous matter. For good extraction, magnets should be as close as possible to the metals to be extracted. Magnets work more efficiently when food flows freely. If needed, more than one magnet should be placed in the line. Magnets should be cleaned frequently. Equipment should be designed in such a way as to prevent metals extracted by magnets from being swept by the flow of product. Dried spices or dried aromatic plants should be arranged in a fine layer to facilitate this operation.

80. In all cases, if the particles eliminated are removed and records are kept of how much and what type of foreign matter was collected and when it was cleaned, it will be possible to determine how the metals or foreign matter got there in order to implement corrective measures. Records should also be kept of the origin of food.

5.3 Incoming Material Requirements

81. Dried spices and dried aromatic plants or their source plants should not be accepted by the establishment if they are known to contain parasites, pathogenic microorganisms, or decomposed, toxic, or extraneous substances which will not be reduced to acceptable levels by normal processing procedures, sorting or preparation. Precautions should be taken to minimize the potential for contamination of the establishment and other products from incoming materials that may be contaminated. Plants, parts of plants, dried spices or dried aromatic plants suspected of being contaminated with animal or human faecal material should be rejected for human consumption. Special precautions should be taken to reject dried spices and dried aromatic plants showing signs of insect damage or mold growth because of the potential for them to contain mycotoxins such as aflatoxins.

82. Raw materials should be inspected and sorted prior to processing (foreign matter, odor and appearance, visible mold contamination). Laboratory tests, e.g., for mold or pathogens such as *Salmonella*, should be conducted when necessary.

83. Dried spices, dried aromatic plants and blends of these are often manufactured without a step that would inactivate pathogens. Dried spices and dried aromatic plants should be obtained from approved suppliers. An approved supplier is one that can provide a high degree of assurance that appropriate controls in accordance with this Code have been implemented to minimize the possibility that pathogens such as *Salmonella* are likely to occur in the ingredient. Because of the diversity of production practices for dried spices and dried aromatic plants, it is important to understand the controls in place for production of the incoming material. When the control measures used to produce the dried spices or dried aromatic plants are not known, verification activities such as inspection and testing should be increased.

84. Consideration should be given to a program for testing dried spices and dried aromatic plants to be used without a lethality step for relevant pathogens, e.g., *Salmonella*. Dried spices and dried aromatic plants in which *Salmonella* is detected should not be used unless they are subjected to an effective microbial reduction treatment.

5.4 Packaging

85. Non-porous bags/containers should be used to protect the dried spices and dried aromatic plants from contamination and the introduction of moisture, insects, and rodents. The food contact packaging should be new bags or containers. All bags/containers should be in good condition and particular attention paid to the potential for loose bag fibers that can become potential contaminants. Secondary containment bags/containers providing additional protection can be reused but should not have been previously used to hold non-food materials such as chemicals or animal feed.

86. Dried spices or dried aromatic plants, e.g., dried chili peppers, should not be sprayed with water to prevent breakage during packing. This may result in growth of mold and microbial pathogens, if present.

87. Finished products may be packed in gas tight containers preferably under inert gases like nitrogen or under vacuum in order to retard possible mold growth.

5.5 Water

88. The presence of water in the food processing environment, even in very small amounts present for short, sporadic time periods, may allow microorganisms, including mycotoxin-producing molds and pathogens such as *Salmonella*, to grow in the environment. At times, moisture is obvious in the form of water droplets or puddles; or it may be from sporadic sources such as roof leaks. Other sources of moisture may be less visually apparent, including high relative humidity or moisture accumulating inside of equipment. Care should be taken to identify and eliminate such sources of water in the environment to prevent the development of harborage sites that can become a source of product contamination.

5.7 Documentation and Records

89. [Where necessary, records of the source/lot identification of incoming raw materials and the link to the lot identification of outgoing products should be kept to facilitate the identification of the source of contamination. Reference should also be made to *Principles for Traceability/Product Tracing as a Tool within a Food Inspection and Certification System* (CAC/GL 60-2006).]

SECTION VI - ESTABLISHMENT: MAINTENANCE AND SANITATION

6.1 Maintenance and Cleaning

90. Dust accumulation from product in establishments (i.e., on walls, ceilings, conveyor belts, lids and walls of batch tanks or mixing tanks, and the bottom of a bucket elevator) should be removed in a timely fashion through routine housekeeping. This is particularly important for products that are hygroscopic or in environments of high humidity leading to moisture absorption and localized condensation.

6.2 Cleaning Programs

91. A cleaning and disinfection schedule should be established to ensure that all areas of the establishment are appropriately cleaned and that special attention is given to critical areas including equipment and materials. The air handling system should be included in the cleaning and disinfection schedule. The

cleaning and disinfection schedule should describe whether to use wet or dry cleaning. The presence of water in the dry processing environment can result from improper use of water during cleaning.

92. Dry cleaning is the preferred means of cleaning establishments handling dried spices and dried aromatic plants, since the use of water can enhance the probability of contamination from pathogens such as *Salmonella*. Dry cleaning should collect, remove and dispose of residues without redistributing them or cross contaminating the environment. Dry cleaning involves the use of tools such as vacuum cleaners, brooms, and brushes. When vacuum cleaners are used, it is desirable to dedicate individual vacuum cleaners to specific areas, so that vacuumed material can be tested as part of an environmental monitoring program.

93. Dry cleaning is especially important in older establishments in which, in spite of regular maintenance, there may be a potential for the presence of cracks or other harborage sites that may be difficult to eliminate. Even if residues of dried spices or dried aromatic plants enter such a site, potential problems can be minimized if the residues and the sites are dry and kept dry. Once water enters the harborage site, microbial growth can occur and the potential risk of contamination to the environment and eventually to the product is increased.

94. Compressed air should generally not be used for dry cleaning except in special situations (e.g., to dislodge dust from inaccessible points). Moreover, if and when compressed air is used, it should be dried and filtered to exclude microorganisms and moisture prior to use.

95. Wet cleaning may be appropriate in certain circumstances, e.g., when *Salmonella* has been detected in the environment. When water usage is necessary, minimal amounts should be used, and the use of high pressure hoses should be avoided. When wet cleaning is used, it should be followed by disinfection to inactivate microorganisms. Disinfectants that will rapidly evaporate after contact, such as alcohol-based disinfectants, provide a means to spot-disinfect equipment with a very minimal introduction of water. Wet cleaning should be followed by thorough drying in order to keep the environment of the establishment as dry as possible.

6.3 Pest Control Systems

96. Drains should be equipped with appropriate means to prevent entry of pests from drainage systems.

6.4 Waste Management

97. Care should be taken to prevent access to waste by pests.

6.5 Monitoring Effectiveness

98. Verification of sanitation should include an environmental monitoring program that has been designed to identify transient and/or resident pathogens such as *Salmonella* in the processing areas. Environmental monitoring should be conducted under normal operating conditions and will usually involve non-product contact surfaces. Product contact surface testing may be done, particularly as part of corrective actions for an environmental positive. Testing of the dried spices or dried aromatic plants may also be conducted based on the results of environmental monitoring. Corrective actions should be taken when the microbiological criterion for the test organism is exceeded in an environmental monitoring or finished product sample.

SECTION VII - ESTABLISHMENT: PERSONAL HYGIENE

99. Refer to the *General Principles of Food Hygiene*.

SECTION VIII - TRANSPORTATION

100. Refer to the *Code of Practice for the Packaging and Transport of Fresh Fruit and Vegetables* (CAC/RCP 44-1995). In addition, bulk transport of dried spices and dried aromatic plants, such as ship or rail car, should be well ventilated with dry air to prevent moisture condensation, e.g., resulting from respiration and when the vehicle moves from a warmer to a cooler region or from day to night. Prior to bulk transport, the products must be dried to a safe moisture level to prevent germination and growth of mold spores.

8.1 General

101. Dried spice and dried aromatic plants should be stored and transported under conditions that maintain the integrity of the container and the product within it. Vehicles should be clean, dry, and free from infestation. Dried spices and dried aromatic plants should be loaded, transported, and unloaded in a manner that protects them from any damage or water. Care should be taken to prevent condensation when unloading dried spices and dried aromatic plants from a refrigerated vehicle or while taking out of a cold storage. In warm, humid weather, the products should be allowed to reach ambient temperature before exposure to external conditions; this may require 1-3 days. Dried spices and dried aromatic plants that have been spilled are vulnerable to contamination and should not be used as food.

SECTION IX - PRODUCT INFORMATION AND CONSUMER AWARENESS

102. Refer to the *General Principles of Food Hygiene*.

SECTION IX - TRAINING

10.2 Training Programs

103. A training program should be established to educate employees on the potential sources of contamination of dried spices and dried aromatic plants, adherence to traffic patterns, and proper hygienic practices to follow in order to minimize the entry or spread of pathogens such as *Salmonella* in the establishment. Such training should include personnel who enter the area on a temporary basis (e.g., maintenance workers, contractors).

[ANNEX I

MICROBIOLOGICAL CRITERIA FOR DRIED SPICES AND DRIED AROMATIC PLANTS

104. Microbiological criteria should be established in the context of risk management options and in accordance with the *Principles for the Establishment and Applications of Microbiological Criteria for Foods* (CAC/GL 21-97).

105. *Salmonella* is the primary pathogen of concern with respect to dried spices and dried aromatic plants, as it has been the leading cause of illnesses, as well as the pathogen most frequently isolated from dried spices and dried aromatic plants. The following microbiological criterion is to be applied to treated, ready-to-eat dried spices and dried aromatic plants at points in the food chain after any microbial reduction treatment to be applied and prior to consumer use:

Microorganism	n	c	Analytical Unit	m	Class Plan
<i>Salmonella</i>	[10]	0	25 g	0	2

106. Where n = number of samples to be taken; c = the maximum tolerable number of analytical units above the microbiological limit m in a 2-class plan. m = a microbiological limit which, in a 2-class plan, separates conforming from non-conforming product.

107. The analytical methods to be employed should be the most recent editions of ISO 6579, or other validated methods that provide equivalent sensitivity, reproducibility, reliability, etc.]

GENERAL GUIDANCE FOR THE PROVISION OF COMMENTS

In order to facilitate the compilation and prepare a more useful comments' document, Members and Observers, which are not yet doing so, are requested to provide their comments under the following headings:

- (i) General Comments
- (ii) Specific Comments

Specific comments should include a reference to the relevant section and/or paragraph of the document that the comments refer to.

When changes are proposed to specific paragraphs, Members and Observers are requested to provide their proposal for amendments accompanied by the related rationale. New texts should be presented in underlined/bold font and deletion in ~~striketrough font~~.

In order to facilitate the work of the Secretariats to compile comments, Members and Observers are requested to refrain from using colour font/shading as documents are printed in black and white and from using track change mode, which might be lost when comments are copied / pasted into a consolidated document.

In order to reduce the translation work and save paper, Members and Observers are requested not to reproduce the complete document but only those parts of the texts for which any change and/or amendments is proposed.