CODEX ALIMENTARIUS COMMISSION

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World Health Organization

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Agenda Item 5 **CX/FH 15/47/6**

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FOOD HYGIENE

Forty-seventh Session

Boston, Massachusetts, United States of America, 9 - 13 November 2015

PROPOSED DRAFT GUIDELINES ON THE APPLICATION OF GENERAL PRINCIPLES OF FOOD HYGIENE TO THE CONTROL OF FOODBORNE PARASITES

Prepared by the Electronic Working Group led by Japan and co-chaired by Canada

(At Step 3)

Governments and interested international organizations are invited to submit comments on the attached Proposed Draft Guidelines on the Application of General Principles of Food Hygiene to the Control of Foodborne Parasites at Step 3 (*see* Annex) 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, email: Barbara.McNiff@fsis.usda.gov with a copy **to**: The Secretariat, Codex Alimentarius Commission, Joint WHO/FAO Food Standards Programme, FAO, Rome, Italy, email codex@fao.org **by 30 September 2015.**

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 Appendix I to this document.

Background

1. At the 45th Session of the Committee on Food Hygiene (Hanoi, Vietnam, November 2013) (CCFH45), the Committee agreed to start new work on *Guidelines on the Application of General Principles of Food Hygiene to the Control of Foodborne Parasites*. The Committee agreed to establish:

- A physical Working Group (pWG), led by Japan and co-chaired by Canada, and working in English only, to discuss and prepare proposals for the structure and approach for the document, as well as for possible annexes (Tokyo, Japan, May/June 2014).
- An electronic Working Group (eWG), led by Japan and co-chaired by Canada, and working in English only, to develop the proposed draft Guidelines based on the proposals of the pWG for comments at Step 3.
- A pWG to meet immediately prior to the next Session, led by Japan and co-chaired by Canada and working in English, French and Spanish, to consider the comments submitted at Step 3 and prepare proposals for consideration by the next Session.

2. Based on the decision of CCFH45 above, the pWG was held on 28-30 May, 2014 in Tokyo.

3. The draft document was further elaborated by the eWG.

4. CCFH46 (Lima, Peru, November 2014), after the discussion at pWG immediately before the Committee and the plenary session, agreed to establish an eWG, led by Japan and Canada and working in English only, to prepare revised proposed draft Guidelines taking into account the above discussion, written comments submitted and the report of the pWG (CRD4), for consideration at its next Session.

Electronic Working Group

5. 26 member countries (Brazil, Canada, Chile, China, Croatia, Denmark, Egypt, France, Germany, Ghana, India, Iraq, Ireland, Italy, Japan, Mexico, Morocco, Netherlands, Norway, New Zealand, Republic of Korea, Russia, Spain, Thailand, Uruguay, and the United States), one member organization (European Union) and 3 international organizations (FAO, OIE and WHO), and one NGO (IDF) participated in the eWG. A complete list of participants is attached as Appendix II.

6. The draft document was circulated twice to seek comments from members.

7. Followings are the main discussion points:

Water (Previous section 3.5)

8. CCFH46 agreed to urge Members to provide information on relevant control measures and to consider the need to retain this section on the basis of the information provided. The Committee also noted the suggestion to include a reference in Section 3.5 to the WHO Guidelines for drinking-water quality. During two round comments, only one member suggested to retain water section in the primary production without recommendation on the specific contents, and majority of the members did not support the water section. Therefore it was deleted. Now in the primary production section, four categories (meat, milk, fish and fruit and vegetables) are included.

Appendix on the specific time temperature conditions.

9. The table was deleted because it was very difficult to provide complete information in a concise manner. Therefore the similar approach which the CCFH agreed on during the discussion on Annex for *Trichinella* nd *C.bovis* document was used.

The dead *Anisakis* allergen issue

10. Since there are no parasite control measures that can be applied that would eliminate the allergen, one paragraph “When people are diagnosed with an *Anisakis* spp. nematodes allergy, they should be advised to avoid eating marine fish.” was inserted in the “**9.4 CONSUMER EDUCATION**”.

Definition

11. The eWG simplified some definitions to adapt more simple explanations since it is a risk management document with more wide readers.

Recommendations

12. The eWG further recommends that the Committee consider the Proposed Draft Guidelines on the Application of General Principles of Food Hygiene to the Control of Foodborne Parasites and with a view to forward it to the Commission for adoption at step 5/8.

13. At this moment, no specific needs for elaborating parasite specific annex(s) is identified. But this issue could be discussed at the next Session of the CCFH.

Annex

PROPOSED DRAFT GUIDELINES ON THE APPLICATION OF GENERAL PRINCIPLES OF FOOD HYGIENE TO THE CONTROL OF FOODBORNE PARASITES

(at Step 3)

SECTION 7 – ESTABLISHMENT: PERSONAL HYGIENE

SECTION 9 – PRODUCT INFORMATION AND CONSUMER AWARENESS

9.2 PRODUCT INFORMATION

9.4 CONSUMER EDUCATION

SECTION 10 – TRAINING

10.2 TRAINING PROGRAMMES

10.3 INSTRUCTION AND SUPERVISION

INTRODUCTION

1. Foodborne parasites are a major public health burden worldwide, particularly with poor sanitary facilities and in populations that traditionally consume raw and undercooked food dishes. It is estimated that over 2 billion people are currently infected by foodborne parasites. Infections may have prolonged, severe, and sometimes fatal outcomes, and result in considerable hardship in terms of food safety, security, quality of life, and negative impacts on livelihood.

2. The joint Food and Agriculture Organization of the United Nations (FAO)/ World Health Organization (WHO) report on *Multicriteria-Based Ranking for Risk Management of Foodborne Parasites* lists 24 parasite species, genera or families that ranked highest in global public health concern. The top 8 highly ranked parasites are *Taenia solium*, *Echinococcus granulosus*, *Echinococcus multilocularis*, *Toxoplasma gondii*, *Cryptosporidium* spp., *Entamoeba histolytica*, *Trichinella* spp, and *Opisthorchiidae*. The ranking was based on 7 criteria of which 5 were public health related, and based primarily on public health concerns, i.e. 85% of weighting. Overall scores of each parasite was calculated by normalised parasite criteria scores based on published data multiplied by fractional weights and summed up to the definite score per parasite. The ranking was based on worldwide impacts and regionally other foodborne parasites may be more important. That ranking indicates that the foodborne parasites of great concerns from a global public health perspective are not limited to a single parasite group or a food vehicle, but could span a number of different parasites, sources and food vehicles.

3. Knowledge of the parasite cycles, transmission routes and environmental requirements is needed to understand which control measures may be effective. Foodborne parasites can be transmitted to humans by ingestion of fresh or processed foods that have been infested (e.g. meat that contains *Trichinella* larvae or *Toxoplasma* tissue cysts) or that have been contaminated with the infective stages of parasites (e.g., cysts, oocysts, eggs). In the first case, human infection can occur through the consumption of an infective stage in raw, undercooked or poorly processed meat and offal from domesticated animals, game, fish, crustaceans, cephalopods and molluscan shellfish. In the second case, human infection can also occur from ingestion of infective stages in water and on foods such as fresh fruit and vegetables resulting from animal or human faecal contamination (e.g. oocysts of *Cryptosporidium* in fresh vegetables).

4. Control of foodborne parasites can be achieved through the prevention of infection of farmed food animals (e.g., livestock, poultry, fish) with infective stages, laboratory testing and follow-up actions (e.g. those included in the section 7.2.1 in the Guidelines for the Control of *Trichinella* spp. in meat of Suidae), the prevention of contamination of fresh and processed foods with infective stages, and/or the inactivation of parasites in or on foods during processing. Control during primary production is important for many parasite/food combinations, while control measures during post-harvest are necessary for other parasite/food combinations. During a parasite hazard analysis, producers should consider how the product will be further processed, prepared and consumed in order to determine appropriate parasite control measures. Education and awareness-raising are important components of consumer protection from foodborne parasitic diseases and, in many cases, may be the only feasible option available.

5. The first step of foodborne parasite risk management should be identifying any potential parasite hazard(s) applicable to the food being produced[1]. The details of the epidemiology (both human and animal disease) and life cycle of each parasite are essential in the identification, prevention and control of the risks associated with that parasite. Epidemiological data collection in meat producing animals and environmental parasite surveys could be effective in identifying hazards and collecting information to be used for the decisions making of risk management strategies. Surveillance for parasitic diseases in humans is complicated by the often prolonged incubation periods, sub-clinical nature, and unrecognized chronic sequelae and lack of easily available diagnostic procedures.

6. The occurrence and distribution of parasitic species in the raw commodities used for food can be affected by climate changes, land use, and other environmental factors. The spread of foodborne parasitic diseases is also affected by human behaviour (for instance, the environmental contamination by human faeces due to the lack of latrines, and the human-to-human contacts favouring the spread of intestinal parasites, mainly protozoa), demographics, and global trade. For example, globalization of food trade offers new opportunities for parasite dissemination into new areas. In addition, variations in food preferences and consumption patterns, such as the increasing tendency to eat meat, fish and seafood raw, undercooked, smoked, pickled or dried, and the demand for free-range and exotic foods such as bush meat or wild game also influence the spread of parasitic diseases.

[1] The *Principles and Guidelines for the conduct of Microbiological Risk Management (MRM)* (CAC/GL 63-2007).

SECTION 1 - OBJECTIVES

7. The primary purpose of these guidelines is to provide guidance on preventing, inactivating, or reducing foodborne parasite hazards that present a public health risk to an acceptable level. The guidelines provide science-based advice to governments and the food industry with the aim of protecting the health of consumers against foodborne parasites and ensuring fair practices in food trade. The guidelines also provide information that will be of value to consumers and other interested parties.

SECTION 2 - SCOPE, USE AND DEFINITION

2.1 SCOPE

8. These guidelines for the control of foodborne parasites are applicable to all foods, except for water, from primary production through consumption. They should complement guidelines in place for any other pathogens (e.g. bacterial and viruses).

9. Resources targeting control measures should be applied to parasite hazards in proportion to the public health risk. Countries in which specific parasites are endemic should take special measures to reduce the identified risk to an acceptable level.

10. The Section 3 (Primary Production) is subdivided into four food categories: i) Meat and meat products, ii) Milk and milk products, iii) Fish and fishery products, iv) Fresh fruits and vegetables. The scope of these categories are the same as provided in the following codes:

- Meat and meat products: *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005), especially, raw or undercooked meat
- Milk and Milk products: *Code of Hygienic Practice for Milk and Milk Products* (CAC/RCP 57-2004), especially, unpasteurized milk and milk product
- Fish and Fishery products: *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003), especially, raw or undercooked fish and fishery products
- Fresh Fruits and Vegetables: *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53- 2003), especially fruits and vegetables consumed raw or undercooked

11. The remaining sections contain guidelines applicable to the food chain after primary production (i.e., processing, food service and home preparation), but are not subdivided into food categories.

12. The joint FAO/WHO Expert meeting on *Multicriteria-Based Ranking for Risk Management of Foodborne Parasites* ranked foodborne parasites by "importance" on a global basis. The 24 top ranked parasite-food combinations corresponding to four food categories (shown in the table 2 of the FAO/WHO report) are as follows (other parasites may be more important locally/regionally).[2]

Meat and meat products:

- *Taenia solium*
- *Toxoplasma gondii*
- *Trichinella spiralis, and other Trichinella* spp.
- *Taenia saginata*
- *Sarcocystis* spp.
- *Spirometra* spp.

Milk and Milk products:

- *Cryptosporidium* spp.
- *Toxoplasma gondii*

Fish and Fishery products:

- Opisthorchiidae

[2] Refer to Table 2 of the report of a joint FAO/WHO Expert Meeting on Multicriteria-based ranking for risk management of food-borne parasites

- *Paragonimus* spp.
- Anisakidae
- Heterophyidae
- Diphyllobothriidae

Fresh Fruits and Vegetables:

- *Taenia solium*
- *Echinococcus granulosus*
- *Echinococcus multilocularis*
- *Cryptosporidium* spp.
- *Entamoeba histolytica*
- *Ascaris* spp.
- *Giardia duodenalis (syn. G. intestinalis, G. lamblia)*
- *Fasciola* spp.
- *Cyclospora cayetanensis*
- *Trichuris trichiura*
- *Balantidium coli*
- *Toxocara* spp.
- *Toxoplasma gondii*

2.2 USE

13. These guidelines follow the format of the *General Principles of Food Hygiene* (CAC/RCP 1-1969) and should be used in conjunction with it and other relevant codes of practice such as:

- *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005),
- *Code of Hygienic Practice for Milk and Milk Products* (CAC/RCP 57-2004),
- *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003),
- *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003)

14. The World Organization for Animal Health (OIE) develops standards for the prevention, detection and control of some foodborne parasites at the primary production stage. Therefore, these guidelines should also be used in conjunction with relevant chapters of the OIE Codes and Manuals and the OIE/FAO guide to Good Farming Practices for Animal Production Food Safety. Other technical reports provided by FAO/WHO may also be relevant.

15. Additional guidance for the control of specific parasites in certain food may be found in annexes and supplements.

16. Flexibility in application of the Guidelines is important. They are primarily intended for use by government risk managers and industry in the design and implementation of food control systems.

2.3 DEFINITIONS

17. Definitions relevant to these guidelines include:

Fish[3]

Aquaculture [3]

Feed[4]

Fish farm [3]

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[3] *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003)
[4] *Codes of Practice on Good Animal Feeding* (CAC/RCP 54-2004)

Cyst – environmental life cycle stage of some protozoan parasites, including cysts (e.g., *Entamoeba histolytica*, *Giardia duodenalis*); it may also refer to tissue cysts of *Toxoplasma gondii*, sarcocysts of *Sarcocystis* spp., or hydatid cysts of *Echinococcus* spp.

Foodborne Parasite – Any parasite that can be transmitted to human by ingesting food.

Host – An organism which harbours the parasite.

Definitive Host – The host in the life cycle of a parasite in which sexual reproduction occurs

Intermediate Host – The host which harbours the larval stages of the parasite.

Metacercariae – (singular: metacercaria) – Encysted infectious larval stage of trematodes; found in the tissues of animal intermediate hosts or attached to aquatic plant.

Oocyst – the infective, developmental stage of coccidian parasites, produced through sexual reproduction in the definitive host.

Larvae – immature form of any parasite, before the assumption of the mature shape. It can be infective or not.

Tachyzoite – motile life cycle stage of some coccidian parasites (e.g. *Toxoplasma gondii*); undergo rapid multiplication in the host before developing into bradyzoites and forming tissue cysts.

SECTION 3 - PRIMARY PRODUCTION

18. It is necessary to conduct a hazard analysis to identify the foodborne parasite hazards that could be present in the feed and food production environment and that may contaminate foods during primary production. Control of parasites during primary production is particularly important when subsequent control steps during processing may not be adequate to eliminate the hazard or reduce it to an acceptable level.

19. Sources of parasitic contamination of feed, food and food producing animals at the primary production site include water, soil, workers, untreated manure, sludge or fertilizers contaminated by faeces of human and domestic or wild animals, or proximity to other activities which could result in run-off or flooding with contaminated water. In addition to the above, food-producing animals feeding on other live and dead animals (e.g., mammals, fish, birds, invertebrates), are important sources of parasitic infections.

A. Meat

20. Important meat-transmitted foodborne parasites include, but are not limited to, *Taenia saginata (cattle), Taenia solium (pigs), Trichinella spiralis (pigs, horse, game), Toxoplasma gondii (pigs, cattle, sheep, goats, horses, game)*, *Trichinella* spp. (other than *T. spiralis*) (pigs and game), *Sarcocystis* spp.,(pigs, cattle) and *Spirometra* spp.(frogs snake). Foodborne parasites, present in domestic and wild animals and which are not transmissible to human via meats, but are transmissible via fecal contamination of food (e.g. *Echinococcus, Cryptosporidium, and Giardia*) should be controlled in animal production in order to interrupt the life cycle of parasites. For information on specific food vehicles for these parasites, see Table 2 in *Multicriteria-Based Ranking for Risk Management of Food-Borne Parasites*, Report of a Joint FAO/WHO Expert Meeting, 2012.

3.1 ENVIRONMENTAL HYGIENE

21. Refer to *Section 3.1 (Environmental Hygiene) of the General Principles of Food Hygiene (CAC/RCP 1-1969), and Section 5.5 (Hygiene of the Primary Production Environment)* of the *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005).

22. Faeces of domestic and wild animals (e.g. *Toxoplasma* oocysts in felids), as well as human faeces (e.g. *Taenia* eggs), may contain parasites that are infective to domestic food-producing animals. Some parasites may also be transmitted to domestic animals or other animal hosts when these animals eat infected tissues from other animals. Where parasites will not be controlled at a later processing stage, the feasibility of producing meat products with concepts to avoid environmental contamination of foodborne parasites by controls during primary production should be considered before production begins. A production area may be unsuitable if controls cannot be applied at primary production and they will not be controlled at later stages. The risk associated with the introduction of organic material (e.g., faecal and other material that may contain oocysts or eggs) from non-food-producing animals into the production environment should also be addressed.

23. Game meat may contain parasites that infect humans. The environment of wild animals, and open range domesticated animals cannot be controlled, requiring measures to be taken in order to minimize the risk at a later stage in the food chain.

3.2 HYGIENIC PRODUCTION OF FOOD SOURCES

24. For information related to the control of parasites related to animal feed, refer to the *Code of Practice on Good Animal Feeding* (CAC/RCP 54-2004) *Section 5. (Primary production)* of the *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005), and *Chapter 6.3.* (The Control of Hazards of Animal Health and Public Health Importance in Animal Feed) and *Chapter 6.4.* (Biosecurity Procedures in Poultry Production) of the *OIE Terrestrial Animal Health Code* (2014), and the WHO/FAO/OIE Guidelines for the surveillance, prevention and control of taeniosis/cysticercosis, and FAO/WHO/OIE Guidelines for the surveillance, management, prevention and control of trichinellosis.

25. Where indicated by a hazard analysis, control measures and/or hygienic practices should be implemented that prevent foodborne parasites from contaminating foods during primary production, or that reduce contamination to an acceptable level.

26. Domestic animals (e.g., cats and dogs), wild animals (e.g., foxes and rodents), and unauthorized people should be excluded from barns and outdoor areas used for food animals, and the primary production environment to the extent possible; for example Felidae are the definitive hosts for *Toxoplasma gondii* and faeces from contaminated cats contains oocysts that contaminate fields and other feeding areas.

27. Fully enclosed animal housing systems, or other systems that prevent intrusions of potentially contaminated small animals or unauthorized people, combined with other good production practices, can be effective in controlling foodborne parasite hazards in meat, since such systems have been demonstrated to be very effective for a number of parasites (e.g. *Trichinella*, *Toxoplasma*).

28. Good hygienic practices including management of waste, such as maintaining and using sanitary toilet facilities should be in place and implemented. Toilets for staff and visitors should be provided. Human faeces should be disposed of in such a way as to eliminate contact with animals or pasture land.

29. Feed for food-producing animals should be manufactured and stored in such a manner as to avoid parasite contamination. Food sources should conform to section 4, 5 and 6 of the *Code of Practice on Good Animal Feeding* (CAC/RCP 54-2004).

30. Feed should be effectively protected against rodents (for *Trichinella* spp. control), cats (for *Toxoplasma gondii* control) and other animals. All dead animals should be immediately removed from feed storage and food-producing animal production areas.

31. Primary producers should supply water which is not a significant source of transmission of foodborne parasite to food-producing animals and block access of food producing animals to surface water to minimize the potential for infection with parasites.

32. In order to assess whether foodborne parasite controls at primary production are properly implemented and effective, control measures should be documented and verified. Animal surveillance may be a useful tool for assessing control measure needs/shortcomings; however, because of the practical limitations of sampling and testing methodology, testing cannot assure the absence of a parasite hazard.

33. Information exchange between primary production and the slaughterhouse or processing plant should be encouraged e.g.:

- the status of the herd (controlled housing or not, history of parasitic infection) in order to facilitate a more targeted control on parasites in the slaughterhouse;
- feedback from findings in slaughterhouse to the herds on findings during inspection, with the purpose to review preventive measures at the farm.

3.3 HANDLING, STORAGE AND TRANSPORT

34. Refer to *section 5.6 Transport* of the *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005) and *Chapter 7.2.* (Transport of animals by sea)*, 7.3.* (Transport of animals by land)*, 7.4.* (Transport of animals by air) of the *OIE Terrestrial Animal Health Code* (2014).

3.4 CLEANING, MAINTENANCE AND PERSONNEL HYGIENE AT PRIMARY PRODUCTION

35. Refer to *Section 11. Personal Hygiene* of the *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005), *Chapter 4.13.* (General recommendations on disinfection and disinsection) of the *OIE Terrestrial Animal Health Code* (2014)*,* for recommendations on cleaning, disinfection and personal hygiene.

36. Farm workers may be from endemic areas and homes with inadequate sanitary facilities. Workers may be infected with parasites without feeling ill or showing any symptoms. In order to minimize the opportunity for contamination of the production environment with parasitic stages from human faeces, installation and use of the on-farm sanitary facilities should be installed, e.g., functional latrines in the field, and an adequate means of hygienically washing and drying hands. Waste from sanitary facilities should be hygienically disposed.

3.5 MONITORING AND SURVEILLANCE AT PRIMARY PRODUCTION

37. Refer to *Chapter 1.4.* of the *OIE Terrestrial Animal Health Code* (2014). Surveillance and monitoring of foodborne parasites in food animals and in species that are potential sources of parasites could be effective in developing risk management strategies. Monitoring and surveillance can be useful as tools to verify the effectiveness of parasite controls, should begin at primary production

38. Assurance that a parasite hazard is adequately controlled can be attained through demonstration of properly implemented controls and hygienic practices, which may be supported by a series of negative test results over a sufficient time period through risk-based surveillance programme.

39. It is important to exchange information between primary production and the slaughterhouse or processing plant e.g.

- If the herd of origin is kept under controlled management conditions, this information should be provided to the slaughterhouse in order to facilitate a more targeted control on parasites.
- When the status of the herd in relation with parasite infection (e.g. raised in controlled housing or not(where applicable), history of parasitic infection) is known, it should be communicated to the slaughterhouse in order to facilitate a more targeted assessment of parasite controls in the slaughterhouse
- The status of the meat, following a post-mortem inspection in the slaughterhouse should be provided to owner of herds, to facilitate a more targeted control at primary production.

B. Milk and milk products

40. Important milk-transmitted foodborne parasites include *Cryptosporidium* spp. and *Toxoplasma gondii.* Unpasteurized milk has been associated with outbreaks of cryptosporidiosis and toxoplasmosis. Contamination of unpasteurized milk with *Cryptosporidium* may result from unsanitary milking conditions, such as when the udders are not properly cleaned. Outbreaks of toxoplasmosis have been associated with the consumption of unpasteurized goat and camel milk. Tachyzoites of *Toxoplasma* in recently infected animals may be excreted in the milk, resulting in milk-borne infection. Unpasteurized milk has been associated with outbreaks of cryptosporidiosis in Australia and the United Kingdom.

3.1 ENVIRONMENTAL HYGIENE

41. Refer to section 3.1 of the *Code of Hygienic Practice for Milk and Milk Products* (CAC/RCP 57-2004).

42. Cats should be excluded from barns and food production, handling and storage areas used for dairy herds (e.g., cows, goats, sheep and camels). Dairy herds should not be allowed to graze areas where Felidae are commonly found since cats are the only definitive hosts for *Toxoplasma gondii* and faeces from recently infected cats contain environmentally resistant oocysts that contaminate fields and other feeding areas.

3.2 HYGIENIC PRODUCTION OF FOOD SOURCES

43. Refer to the *Code of Practice on Good Animal Feeding* (CAC/RCP 54-2004) and section 3.2 of the *Code of Hygienic Practice for Milk and Milk Products* (CAC/RCP 57-2004).

3.3 HANDLING, STORAGE AND TRANSPORT

44. Refer to section 3.3 of the *Code of Hygienic Practice for Milk and Milk Products* (CAC/RCP 57-2004).

3.4 CLEANING, MAINTENANCE AND PERSONNEL HYGIENE AT PRIMARY PRODUCTION

45. Refer to section 6 of the *Code of Hygienic Practice for Milk and Milk Products* (CAC/RCP 57-2004).

C. Fish and fishery products

46. Important fish-transmitted foodborne parasites include Opisthorchiidae in freshwater fish, *Paragonimus* spp. in freshwater crustacea, Anisakidae in marine fish, crustaceans and cephalopods, Heterophyidae in freshwater/brackish water fish, and Diphyllobothriidae in freshwater and marine fish.

47. During the parasite hazard analysis, producers should consider how the food will be further processed, prepared and consumed in order to determine appropriate parasite controls. For example, fish that may contain foodborne parasites, but may not have gone through appropriate parasite control can be marketed as **"not suitable for raw consumption"** if the fish is cooked before consumption although allergies may need to be considered.

3.1 ENVIRONMENTAL HYGIENE

48. Refer to Section 6.1.1 (Site selection), Section 6.1.2 (Growing water quality), of the *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003).

49. Wild fish and aquacultured fish with no controlled rearing conditions may contain parasites that infect people. The environment of wild fish cannot be controlled, requiring measures to be taken at a later stage of the food chain, e.g. processing, for fish that will be consumed raw or undercooked.

50. Some species of wild large tuna (e.g. *Thunnus alalunga, Thunnus albacares)* appear to have few or no parasites and thus my not have a significant parasite hazards.

51. Animals and people present in the vicinity of aquaculture ponds can be infected with foodborne parasites that are transmitted to humans through fish. Animals and humans may excrete parasite eggs that enter water and develop into larval stages that subsequently infect farmed fish.

52. The source of water used for aquaculture fish farming can be a risk factor for parasitic infections. The larval stages of certain trematodes, which may be present in fish farm water, can penetrate fish skin and infect fish tissues. Aquaculture primary producers should use clean water and seek appropriate guidance on water quality, and should prevent influx of contaminated water (including waste water). The hygienic suitability of the water, under both normal and rain-storm conditions, should be assessed prior to the development of the operation.

53. Some aquaculture methods may reduce a parasites hazard to an acceptable level, for example, ocean pen-reared salmon that are raised on commercial pelleted feed have not been observed to contain the same levels of anisakid worms observed in wild salmon. Closed systems with controlled feed and environment conditions can effectively eliminate parasites that normally occur in wild fish.

3.2 HYGIENIC PRODUCTION OF FOOD SOURCES

54. Refer to Section 3 (Prerequisite Programmes) and Section 6 (Aquaculture Production) of the *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003), and the *Code of Practice on Good Animal Feeding* (CAC/RCP 54-2004).

55. To prevent potential transmissions of parasites, fingerlings should only be purchased from producers who implement reliable source management systems and Good Aquaculture Practice (GAP).

56. Animals, including dogs and cats, may be fishborne parasite hosts and should be excluded from aquaculture ponds to the extent possible, for example by placing fences around ponds. Good practices include not feeding raw meat/offal of fish to dogs and cats, preventing fish-eating mammals from accessing fish ponds and controlling the population of semi-domesticated or stray/feral dogs and cats in close vicinity of fish farms. Workers being treated for fish-borne trematodes (liver and intestinal flukes) should be excluded from the farm environment during treatment.

57. Particular attention should be given to animals that serve as intermediate hosts in the life cycle of fishborne parasites. For example, in the case of aquaculture, the exclusion of snails, as intermediate hosts for fishborne trematodes, from fish farm areas, may help interrupt trematode life cycles in fish ponds. For wild fish, intermediate hosts cannot be controlled, and fish migrate from different areas with varying risks for exposure to parasites.

58. Using raw fish as feed for aquaculture is likely to introduce a risk of parasitic infection, therefore it should be avoided as much as possible. Raw fish used for feed may be previously frozen in order to inactivate parasites. It is particularly important to inactivate parasites in feed where the fish will not be subsequently frozen, and may be consumed raw or undercooked. Fingerlings collected from the wild may contain foodborne parasites that remain a hazard in adult fish.

59. Toilets should not directly empty into fishponds. Fishponds should be protected from contamination from human and animal faeces, pollution with sewage and other wastes. Untreated human and animal excreta should not be used as fertilizer or as fish food.

60. Where needed, control measures at primary production should be assessed in order to determine if they are properly implemented and effective. Fish surveillance may be a useful tool for assessing control measure needs/shortcomings; however, because of the practical limitations of sampling and testing methodology, testing cannot assure the absence of a parasite hazard.

61. Eviscerating fish without any undue delay during harvest is helpful to prevent parasite migration from the viscera into the meat after harvest.

3.3 HANDLING, STORAGE AND TRANSPORT

62. Refer to *Section 6.3.5 Holding and transportation* and *Section 6.3.6 Storage and transportation of live fish* of the *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003), and *Chapters 5.5.* (Control of Aquatic Animal Health Risks Associated with Transport of Aquatic Animals) of the *OIE Aquatic Animal Health Code* (2014) for considerations for transport.

3.4 CLEANING, MAINTENANCE AND PERSONNEL HYGIENE AT PRIMARY PRODUCTION

63. Refer to *Section 3.4 Hygiene Control Programme and 3.5 Personal Hygiene and Health* of the *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003).

3.5 MONITORING AND SURVEILLANCE AT PRIMARY PRODUCTION

64. Monitoring and surveillance can be useful tools to assess the effectiveness of the control of parasites and, for better effectiveness, may need to begin at primary production. Data from monitoring and surveillance can be useful to develop and review risk management strategies.

65. Assurance that a parasite hazard is adequately controlled can be attained through demonstration of properly implemented controls and hygienic practices, which may be supported by a series of negative test results over a sufficient time period through risk-based surveillance programme.

D. Fresh fruits and vegetables

66. Important fruit- and vegetable-transmitted foodborne parasites include, but are not limited to, *Taenia solium*, *Echinococcus granulosus*, *Echinococcus multilocularis*, *Toxoplasma gondii,Entamoeba histolytica, Cryptosporidium* spp., *Ascaris spp., Giardia duodenalis*, *Fasciola* spp., *Cyclospora cayetanensis*, *Trichuris trichiura*, *Balantidium coli*, and *Toxocara* spp. For information on specific food vehicles for these parasites see Table 2 in *Multicriteria-Based Ranking for Risk Management of Food-Borne Parasites,* Report of a Joint FAO/WHO Expert Meeting, 2012.

67. Certain fruits and vegetables are consumed raw without a cooking or freezing step to kill parasites. In this case, controls that reduce the parasite hazard to an acceptable level during primary production are especially important. Adequate washing is one control measure feasible to be used in many cases.

3.1 ENVIRONMENTAL HYGIENE

68. Refer to section 3.1 of the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

69. Areas for cultivation of fresh fruits and vegetables need to be assessed in terms of their susceptibility to direct or indirect faecal contamination from wild animals, domestic animals and/or humans, whether from run-off, flooding, irrigation water, or natural fertilizers. Prior to selecting the site for cultivation it should be determined if adequate control measures can be implemented to manage any identified risks.

3.2 HYGIENIC PRODUCTION OF FOOD SOURCES

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

71. The use of biological soil amendments of animal origin, particularly on fresh produce, should be managed to minimize the potential for contamination with parasites (e.g., adequately treating manure). Parasite eggs and cysts can survive for years in the environment, and can be highly resistant to environmental changes; for example *Ascaris* eggs can remain viable in anaerobically digested sewage sludge.

72. In case the presence of snail intermediate host (Lymnaeidae) is identified, aquatic plants, such as watercress, grown in the area should not be harvested for raw consumption in order to prevent infection with *Fasciola hepatica and F. gigantica*.

73. Flooding may cause contamination of crops with water containing the parasite eggs, cysts and oocysts from animal or human faeces. After such events, produce should be evaluated for risk of contamination and where there is a risk, proper disposal of the affected produce is needed.

3.4 CLEANING, MAINTENANCE AND PERSONNEL HYGIENE AT PRIMARY PRODUCTION

74. Refer to section 3.2.3 and 3.4 of the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

75. Farm workers may be from endemic areas and homes with inadequate sanitary facilities. Workers may be infected with parasites without feeling ill or showing any symptoms. In order to minimize the opportunity for contamination of the production environment with parasitic stages from human faeces, installation and use of the on-farm sanitary facilities should be established, e.g., functional latrines in the field, and an adequate means of hygienically washing and drying hands. Waste from sanitary facilities should be hygienically disposed of.

SECTION 4 - ESTABLISHMENT: DESIGN AND FACILITIES

4.2 PREMISES AND ROOMS

4.2.1 Design and layout

76. The post-harvest processing establishment should be designed to exclude animals that may excrete faeces that contain parasite stages. The layout should minimize the introduction of soil that may contain feces from animals and parasite stages from the outside environment. (e.g. presence of hygiene barrier, or changing boots/clothes at the entrance of the establishment).

SECTION 5 - CONTROL OF OPERATION

5.1 CONTROL OF FOOD HAZARDS

77. Control measures are used to address specific foodborne parasite hazards, e.g., as part of a Hazard Analysis and Critical Control Point (HACCP)-based system. Contamination of foods during processing with parasites transmitted by the fecal-oral route is typically controlled by a stringent application of hygiene control systems, which could be referred to as, e.g., Good Hygienic Practices (GHPs) and sanitation standard operation procedures (SSOPs). These prerequisite programs, together with validated interventions for specific parasites provide a framework for the control of foodborne parasites.

78. During the parasite hazard analysis, food business operators should consider how the product will be further processed, prepared and consumed in order to determine appropriate parasite controls. Where the hazard analysis indicates the presence of a significant foodborne parasite hazard, slaughter and post-harvest processing operations should have control measures in place that prevent or eliminate the hazard or reduce it to an acceptable level.

79. The hazard analysis may determine that a foodborne parasite hazard is adequately controlled at primary production, or by the previous processor. In this case, methods may be used to verify that previous control measures are adequate, such as inspecting the implementation of control measures at the primary producer or previous processor, and for some products, testing incoming product for the presence of parasites.

80. Various processes have been shown to control parasites in selected food items, but the conditions needed to inactivate parasites are subject to substantial variability depending on the parasites, the food matrix and the location of parasites in the food matrix. Specific processing steps and processing combinations should be subject to rigorous validation to ensure consumer protection. For additional infomation on validation, refer to the *Guidelines for the Validation of Food Safety Control Measures* (CAC/GL 69-2008). Control measures may include: freezing, heat treatment, salting, drying, high pressure processing, filtration, sedimentation, UV light, ozone and irradiation. Specific processing steps and processing combinations (hurdle concept) to control parasites should be used in accordance with guidance from competent authorities, where available.

81. Newer technologies or combinations of technologies are being developed for inactivating parasites. Prior to implementation in the food production chain, methods to inactivate parasites should be validated for the specific parasite/food combination. Some treatments may be subject to prior approval by the relevant competent authority.

5.2 KEY ASPECTS OF HYGIENE CONTROL SYSTEMS

5.2.1 Time and temperature control

82. Time and temperature control treatments (freezing and heating) that will result in the reduction/elimination of viable parasites are the most commonly used preventative control measures. Such treatments should be done in accordance with validated parameters, as described in relevant and reliable guidelines and other scientific literature.

5.2.2 Specific process steps

5.2.2.1 Freezing

83. Many parasites in food are susceptible to freezing. However, specific time/temperature combinations are required to inactivate parasites by freezing, and these are also dependent on the food type and portion size. Some parasites (e.g.*Trichinella nativa* and *T britovi* larvae or eggs of *Echinococcus multilocularis*) are resistant to freezing. *T. nativa* can survive up to 5 years at -18°C. Freezing of meat cannot be recommanded in areas where *T. britovi* is found in wild mammals.

84. For control of parasites in fish and fishery products intended for raw consumption by freezing, refer to Annex 1 of the *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003). For control of parasites in cold smoked fish, smoke-flavored fish, and smoke-dried fish refer to Annex 1 of the *Standard for Smoked Fish, Smoke-flavored Fish and Smoke-dried Fish* (CODEX STAN 311-2013).

5.2.2.2 Heat treatment

85. Parasites can be inactivated by adequate heat treatment of foods and water. Other validated treatments may be used.

5.2.2.3 Salting, curing, marinating, pickling, smoking

86. Processing methods such as salting, curing, marinating, pickling, and smoking at 40°C, and addition of food additives that may be effective for the control of certain other foodborne pathogens, are generally not sufficient for the control of foodborne parasites. Combination of several treatments (hurdle concept) can be effective to control parasites. When a combination of treatments is used, it should be subject to rigorous validation to ensure consumer protection.

5.2.2.4 Irradiation

87. Irradiation serves as another possible measure for parasite control.

5.2.2.5 Washing

88. Fruit and vegetables should be washed with running, clean water to reduce parasites although it should be noted that most parasite eggs or (oo)cysts are sticky and difficult to remove from fruits and vegetables.

5.4 PACKAGING

89. It should be noted that vacuum packaging does not alter the viability of parasites in food.

5.5 WATER

90. Water used for washing fruits and vegetables during processing may need to be treated to reduce parasites. Some parasites are resistant to common water disinfection techniques. For example, some parasitic stages (e.g., *Cryptosporidium* oocysts) are resistant to common water disinfection techniques such as those utilizing chlorine. For these parasites, alternative validated methods may be used as a means of inactivating or removing parasites in water, especially those for direct human consumption, in contact with food or used as ingredient.

5.7 DOCUMENTATION AND RECORDS

91. Documentation related to validation, monitoring and verification activities regarding the control measures used for parasites should be kept.

92. Monitoring and review of foodborne parasite safety control systems is an essential component of application of a risk management framework (RMF). It contributes to verification of process control and demonstrating progress towards achievement of public health goals.

93. Information on the level of control of parasite at appropriate points in the food chain can be used for several purposes e.g. to validate and/or verify outcomes of food control measures, to monitor compliance with public health goals, and to help prioritise regulatory efforts to reduce foodborne parasite illnesses.

SECTION 6 – ESTABLISHMENT: MAINTENANCE AND SANITATION

6.3 PEST CONTROL SYSTEMS

94. Insects, such as flies and cockroaches, and animals such as rodents and birds can transport parasite stages from faeces to food and should be controlled.

SECTION 7 – ESTABLISHMENT: PERSONAL HYGIENE

95. Proper personal hygiene such as hand-washing practices should be used to prevent faecal-oral transmission of parasites. For example, workers infected with the tapeworm *T. solium* can spread eggs that cause the severe disease neurocysticercosis.

SECTION 9 – PRODUCT INFORMATION AND CONSUMER AWARENESS

9.2 PRODUCT INFORMATION

96. Labels may be used to help differentiate between products that are intended for raw consumption, and products that are intended to be cooked by the consumer. However, labels are often overlooked by the consumer and are not considered to be adequate control measures. Therefore, even with the beneficial use of labels instructing consumers to cook the product, a parasite hazard should be reduced to an acceptable level before marketing products that are likely to be consumed raw or undercooked.

9.4 CONSUMER EDUCATION

97. In order to increase consumer awareness of foodborne parasite hazards, education, is an important component of risk management, and in some cases may be the only practical option available. Consumers should recognize the risks associated with consumption of raw, undercooked, and lightly processed (e.g., marinated, smoked) meat and fish. Consumer advice should be provided on how to prepare foods (e.g., cooking times and temperatures) and on the importance of good hygiene (e.g., hand-washing) in order to avoid infection with foodborne parasites. Consumer should always make sure to separate raw foods from cooked foods, and ready to eat fruit and vegetables to prevent cross-contamination while handling and preparing meals. The WHO Five keys to safer food could assists in this process.[5]

98. Education is particularly important for consumers in endemic areas, and in high risk groups, such as those who are pregnant or immunocompromised (e.g., *Toxoplasma gondii* in pregnant women and immunocompromised groups; *Cryptosporidium* in children, immunocompromised groups and older adults.) For such consumers, advice on the preparation and consumption of high-risk foods such as fresh produce, adequate cooking of meat and fish prior to consumption and the importance of hygiene, e.g., hand-washing, is critical.

99. When people are diagnosed with an *Anisakis* spp. nematodes allergy, they should be advised to avoid eating marine fish.

SECTION 10 – TRAINING

100. Workers engaged in primary production, processing, preparation, retail or food service should be trained and/or instructed in the control of foodborne parasites (e.g. good animal husbandry practices to hygiene and sanitation measures) to a level appropriate to the operations they are to perform in particular abattoir workers who may be performing post-mortem inspection procedures.

10.2 TRAINING PROGRAMMES

101. Training programmes should contain information on the following, as appropriate to those being trained:

- The potential for food to be a vehicle of transmission of foodborne parasites if contaminated.
- The potential sources and routes of transmission of foodborne parasites.
- The potential for persistence of parasites in/on contaminated foods and food production settings.
- The need to comply with good animal husbandry practices and the importance of compliance with such practices, including:
    - the role of domestic and wild animals in the transmission of certain parasites;
    - the importance of on-farm sanitation and hygiene in interrupting the life cycle of parasites and minimizing the opportunity for faecal-oral transmission; and
    - the importance of animal feed management to avoid domestic and wild life parasite contamination.

[5] WHO. 2006. Five keys to safer food manual. Available at: http://www.who.int/foodsafety/publications/5keysmanual/en/

- Proper hand washing practices and the importance of strict compliance with hand washing instructions at all times, particularly after being in contact with faecal matter. It is advisable to educate each new employee in the proper practices that are to be followed for hand-washing.
- The importance of adequate food processing and preparation to eliminate potential parasite risks.
- Task-specific practices to reduce or eliminate the risks of parasites in foods.

10.3 INSTRUCTION AND SUPERVISION

102. Training and instructions should be given to all new personnel on the transmission and management of foodborne parasites.

103. Inspectors or other relevant authorities, who inspect fields, post-harvest processing plants, and food service facilities, should also be trained as per paragraph 92.

Appendix I

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 ~~strikethrough 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.

APPENDIX II

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