

**JOINT FAO/WHO FOOD STANDARDS PROGRAMME****CODEX COMMITTEE ON FOOD HYGIENE****Forty-fifth Session****Hanoi, Viet Nam, 11 - 15 November 2013****DISCUSSION PAPER ON THE OCCURRENCE AND CONTROL OF PARASITES IN FOOD**Prepared by the Electronic Working Group led by Australia¹**INTRODUCTION**

1. At the 44th session of the Codex Committee on Food Hygiene (CCFH) 12 - 16 November 2012, the Committee agreed that Australia lead an electronic working group (EWG) to prepare a discussion paper on the occurrence and control of parasites in food. The discussion paper should:

- i. consider whether control of parasites should be addressed in a general code of practice or within existing commodity codes;
- ii. consider whether additional guidance on criteria for prioritization of parasites for use by governments should be developed; and
- iii. include a project document as appropriate.

2. The FAO/WHO *Report on Multicriteria-Based Ranking for Risk Management of Foodborne Parasites*² (FAO/WHO report) provided some guidance on control measures for the top ranked parasites as well as information on their food attribution, the primary commodities of concern and their relevance in international trade to support risk management decisions.

3. The European Union and New Zealand are currently co-leading a working group on the development of Draft Guidelines for Control of Specific Zoonotic Parasites in Meat³: *Trichinella* spp. and *Cysticercus bovis* which will be integrated into any future document on the control of foodborne parasites.

4. This discussion paper and project document (Appendix 1) is for consideration by CCFH at its 45th Session.

BACKGROUND

5. Foodborne parasites are a major health burden worldwide, but particularly in developing countries. It is estimated that over 2 billion people are currently infected by foodborne parasites. Common symptoms include abdominal pain, diarrhoea, vomiting, anorexia, nausea, fatigue, and fever and weight loss. Some parasites can also invade organs and tissues, and cause damage or allergic reactions. For example, cyst formation in the brain can cause encephalitis, epilepsy, altered behaviour

¹ This discussion paper was prepared by an electronic working group led by Australia with input from Argentina, Benin, Brazil, Canada, Costa Rica, Ecuador, the European Union, France, Ghana, Ireland, Italy, Japan, Malaysia, Norway, New Zealand, Poland, Russian Federation, Senegal, Sweden, Thailand, United States of America, FAO, WHO, OIE, ISO, Institute of Food Technologists, the National Institute of Public Health and the Environment (see Appendix II)

² Preliminary Report of a Joint FAO/WHO Expert Meeting, 3-7 September 2012, FAO headquarters, Rome, Italy. 24 Oct., 2012

³ These guidelines were returned to Step 2 at the 44th session of the Codex Committee on Food Hygiene

or other neurological sequelae. Although some individuals may be asymptomatic following a parasite infection, immune-compromised or malnourished individuals may become severely ill.

6. General control strategies, for example good hygienic practices and adequate cooking of food can be used broadly in combating all foodborne parasites. Specific parasite control strategies can be limited in application to the control of a particular parasite type and may have no impact on other parasites and depend on the characteristics of the parasite (life cycle, transmission routes and environmental conditions). The most important food production phase for the control of most parasites, if not all of the major types of interest, is primary production.

7. Control of foodborne parasites can be achieved through prevention of infection of food producing animals or infection of intermediate hosts, and destruction or removal of parasites in food. Prevention measures include good agricultural practices, such as avoiding the use of uncomposted faeces in food production, and preventing faecal contamination of crops, water supplies and fish ponds. Another very important prevention measure is the implementation of good hygienic practices, particularly hand washing, by food handlers. Pest control measures, for example, exclusion of rodents from swine operations to prevent spread of trichinellosis may also prevent parasite transmission. Animal husbandry measures, such as deworming, limiting exposure to faecally-contaminated pastures and controlling stocking levels are essential in minimising the transmission of parasites that use food animals as their primary (definitive) or intermediate host.

8. In addition to preventative measures on farm, measures to minimise post-harvest contamination may also be highly effective. These include thorough washing of raw vegetables to reduce the number of transmission stages, and thorough cooking or other treatments that kill the parasites, or reduce their numbers.

9. It is important to understand the life cycle, transmission routes and environmental conditions required for the survival of parasites to understand which food commodities require control measures. Foodborne parasites can be transmitted by ingesting fresh or processed foods that have been contaminated with the transmission stages via the environment, animals (often from their faeces), or people (often due to inadequate hygiene). Transmission can also occur through the consumption of raw and undercooked or poorly processed meat and offal from domesticated animals, wild game, and fish containing infective tissue stages.

10. Despite the fact that parasites do not replicate outside a live host, commonly used food processing techniques can artificially increase the quantity of contaminated food that reaches the consumer, thereby possibly increasing the number of human infections. An example of such a scenario would be the foodborne transmission of Chagas disease (*Trypanosoma cruzi*), whereby lighting in processing facilities may attract insect vectors that contaminate food (e.g. fruit pulp) with faeces containing infective trypomastigotes. Consequently, specific control measures are required, in conjunction with the general sanitation and hygiene measures, to prevent parasite contamination of food.

11. An added complexity is that parasite control measures will often be country specific and will therefore need to be sufficiently malleable to account for the variable primary production practices and sanitation infrastructure in countries where foodborne parasites have the greatest public health impact. However, it should be noted that with the increase in the international availability of foods, these health risks may extend beyond their countries of origin. Additionally, several foodborne parasites need to be controlled in different food commodities. For example, toxoplasmosis may be transmitted via meat or fresh produce and *Taenia solium* taeniasis and cysticercosis may be transmitted in meat and fresh produce, respectively.

12. The FAO/WHO preliminary report lists 24 parasites or parasite genera (or families) of public health concern. This ranking was achieved using expert elicitation, published data, and multiple, weighted criteria analyses. A summary of the findings is presented in Figure 1. The rankings indicate that the foodborne parasites of greatest concern from a public health perspective are not limited to a single parasite group or a food vehicle but span a number of different parasites/parasite genera, sources and food vehicles.

OPTIONS FOR CONSIDERATION - Developing a General Code of Practice or Amending Existing Commodity Codes

13. The major food vehicles associated with parasites are meat (e.g., pork, beef, lamb), fish and crustaceans, fresh produce and fruit juices. Many of the hygienic principles to avoid bacterial contamination of food will also reduce the likelihood of parasite infestation. Therefore the importance of such practices may already be captured in various existing risk management documents. However, not all of them specifically address the risk posed to human health by parasite contamination of the food. For example, in the *Code of Hygienic Practice for Meat* measures related to primary production are unspecific to the control of parasites and the post-harvest measures described may not be feasible for most competent authorities where these parasites are endemic, due to technological constraints and supply chain dynamics. The *Code of Practice for Fish and Fishery Products* contains control measures capable of reducing the level of most parasites in the supply chain, but is not all inclusive (i.e., freezing and heating treatments may not adequately control allergic reactions associated with anisakiasis).

14. The two options for providing further guidance on pre-and post-harvest control measures for parasites are to either amend existing Codex Codes or develop a separate guideline covering parasites and commodities of concern.

Option 1 – amend existing Codes

Advantages

15. An annex or multiple annexes specific to the control of parasites of concern for the commodity could be developed for existing codes of hygienic practice for commodities.

Disadvantages

16. Codex does not have codes of hygienic practice for all of the foods associated with parasites e.g. fruit juices.

17. Resource required in amending existing documents e.g. The *Code of Practice for Fish and Fishery Products* is a code of practice but not a code of hygienic practice.

18. The FAO/WHO ranking of foodborne parasites and food vehicles identified a single type of food vehicle for each parasite; however for some parasites there are secondary vehicles from other food types. Consequently this may require duplication of effort into multiple documents to fully address parasite control in foods.

Option 2 – develop a separate guideline covering parasites and commodities of concern

Advantages

19. This approach has already been taken for viruses in food, with the creation of *Guidelines on the Application of General Principles of Food Hygiene to the Control of Viruses in Food*.

20. This option would enable the incorporation of key information from the FAO/WHO report, and risk management guidance for the major parasites of concern. The addition of annexes would provide essential details pertaining to the sources, transmission routes and food vehicles for individual or groups of parasites and identify commodity specific guidance relevant to the control of parasites along the primary production to consumption pathway.

21. Consistency in approach and less duplication of effort

Disadvantages

22. Larger initial resource commitment in developing a new document.

23. Option 2 is the preferred approach as an overarching document would consolidate the information for those parasites that are important for more than one commodity.

GUIDANCE FOR RISK RANKING OF PARASITES – CONSIDERATIONS FOR INDIVIDUAL COUNTRIES

24. The distribution of parasites, and therefore their impact (e.g. health burden, trade impact) varies from country to country. As such, there may be merit in adapting the framework used in the FAO/WHO report for application at an individual country level. The global ranking of foodborne parasites, undertaken by FAO/WHO, takes into account nine criteria, which are listed below. These criteria were used to rank the risk posed by foodborne parasites on the world population as a whole. Due to the differences between the circumstances of individual countries, FAO/WHO rankings may not be appropriate for each case. As such, this guidance summarises the ranking as done by the Experts and FAO/WHO participants, and then suggests a way countries can rank the identified parasites according to their own context.

25. The criteria used by the FAO/WHO for ranking global foodborne parasites were:

- a. Burden of global illness (number of illnesses)
- b. Global distribution of illness (number of regions)
- c. Acute morbidity severity
- d. Chronic morbidity severity
- e. Per cent of illness that becomes chronic
- f. Per cent case-fatality ratio
- g. Per cent likelihood of a significant increase in human illness
- h. International trade relevance
- i. Impact on economically vulnerable communities

26. In order to calculate the parasite scores, the criteria were weighted. Each criterion was normalized across the 9 criteria (the sum of all criteria = 1), with criteria 3, 4 and 5 combined into a single criterion for the purposes of weighting. Criteria weights reflect the relative importance of the individual criterion on the overall score. Each criterion was assigned between three and 5 possible scoring levels. These were:

Criterion	Weighting	Number of scoring levels
1. Burden of global illness (numbers)	0.22	5
2. Global distribution of illness (number of regions)	0.14	5
3. Acute morbidity severity	0.22	5
4. Chronic morbidity severity		5
5. Per cent of illness that becomes chronic		5
6. Per cent case-fatality ratio	0.15	5
7. Per cent likelihood of increased human illness	0.07	5
8. Trade relevance	0.10	3
9. Impact on economically vulnerable communities	0.1	4

27. The score was then calculated as follows:

$$C1 \times W1 + C2 \times W2 + (C3 \times (1 - C5) + C4 \times C5) \times W3 + C6 \times W6 + C7 \times W7 + C8 \times W8 + C9 \times W9$$

28. This score is therefore derived from the “scores” from each criterion multiplied by their given weight. The exception is the case of the three criteria 3, 4 and 5, which have individual scores but a combined weighting. This calculation takes into account the per cent of cases that become chronic and the severity of such chronicity of illness.

29. Risk managers at a national or regional level could determine the importance of each criterion in their particular circumstances resulting in new weights being assigned to individual criterion. It should be noted that any approach needs to be flexible and adaptable to different country issues and available data.

RECOMMENDATIONS

30. It is proposed that:

- a) Development of additional guidance for parasites or groups of parasites be added to the CCFH forward workplan and assigned a weighting value.
- b) Guidance on the occurrence and control of parasites be developed in a specific stand-alone document (i.e. similar to the *Guidelines on the Application of General Principles of Food Hygiene to the Control of Viruses in Food*). Information on the sources, transmission routes and food vehicles for individual or groups of parasites and associated specific commodity guidance (for that parasite/group of parasites) would be included in annexes.
- c) The development of this guidance is staged i.e. the parent document is progressed first followed by the development of the annexes.
- d) The current work on the Draft Guidelines for Control of Specific Zoonotic Parasites in Meat: *Trichinella* spp. and *Cysticercus bovis* be included as an annex to the Parasite document.
- e) CCFH further consider the number and structure of annexes (e.g. based on food group or parasite group or parasite/food combination).
- f) Additional guidance on prioritization of parasites for use by governments should be developed as parasite distribution (and consequential impacts) varies on a country and regional level. This additional guidance would better inform priorities for parasite-commodity risk management. FAO has advised that a progress report will be provided at the 45th Session of CCFH.

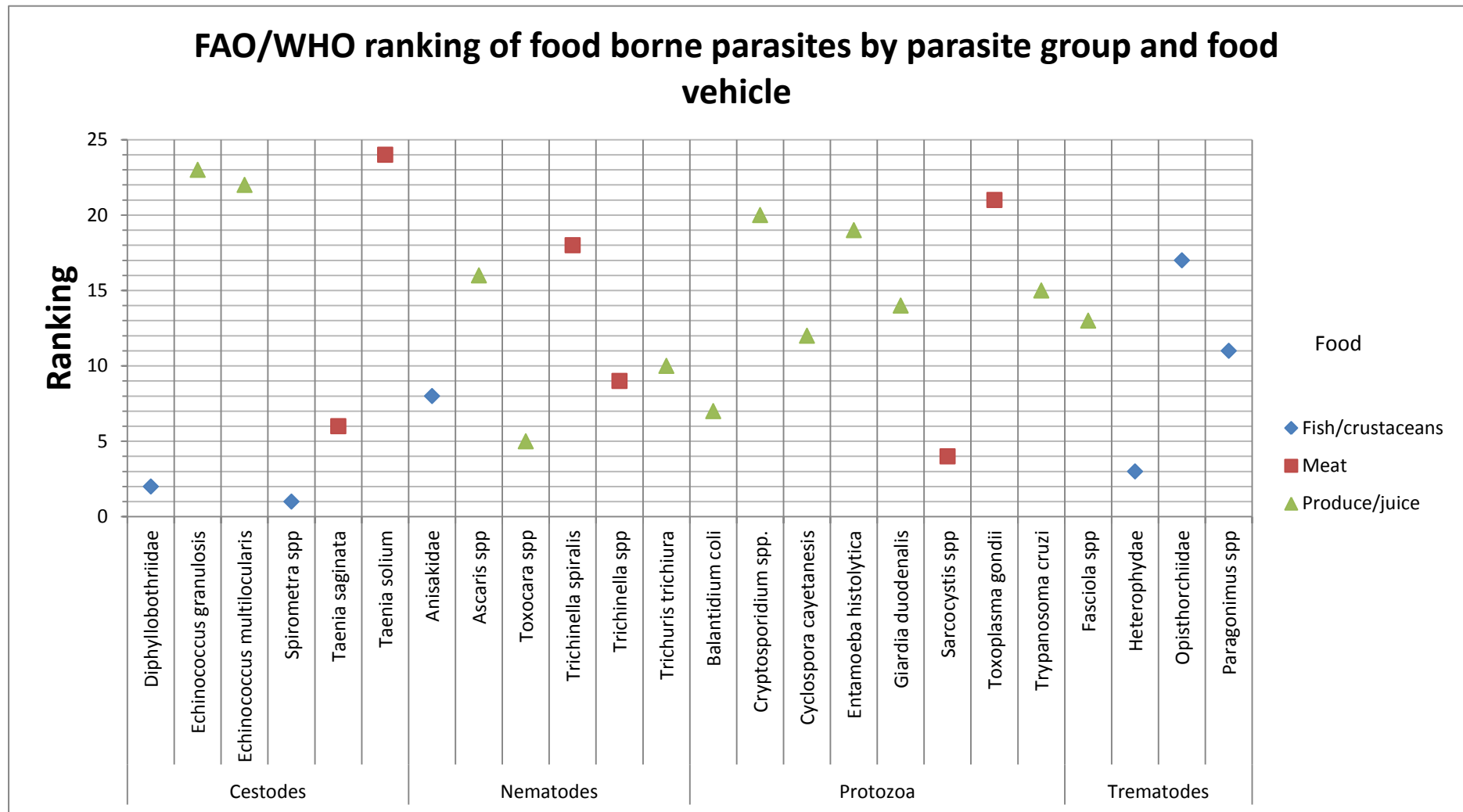


Figure 1: FAO/WHO ranking of food borne parasites. The parasites are displayed by group, ranking and most common food vehicle. The ranking is inverted from the original ranking in order to display the highest ranking parasites at the top of the graph. High-ranking parasites are not confined to particular parasite groups or food vehicles, but rather are distributed evenly between each variable.

PROJECT DOCUMENT**Development of Guidelines on the Application of General Principles of Food Hygiene to the Control of Foodborne Parasites****1. Purpose and Scope of the Guideline**

The purpose is to provide guidance on the occurrence and control of parasites in food. The parent document would include control measures applicable to all foodborne parasites such as good agricultural and hygienic practices. Information on the occurrence of major foodborne parasites (disease, distribution, foods associated with infection, transmission routes (life cycle)) and specific parasite/commodity control measures would be outlined in supporting annexes. The FAO/WHO *Report on Multicriteria-Based Ranking for Risk Management of Foodborne Parasites*⁴ (FAO/WHO report) lists 24 parasites or parasite genera (or families) of public health concern. These include protozoa, cestodes, nematodes and trematodes (Table 1).

2. Relevance and Timeliness

Foodborne parasites are a major health burden worldwide (estimated to infect over 2 billion people), particularly in developing countries. Although the global impact of foodborne diseases on public health is largely unknown due to limited data. The WHO Foodborne Disease Epidemiology Reference Group (FERG) assessed the global burden of human foodborne trematodiasis in 2005 and estimated that 56.2 million people were infected by foodborne trematodes, of which 7.8 million suffered from severe sequelae and 7,158 died worldwide (FAO/WHO report, data for the year 2005).

In 2011, the Codex Committee for Food Hygiene acknowledged the public health impacts from foodborne parasites and requested FAO/WHO to provide advice and guidance on the parasite-commodity combinations of particular concern. The major food vehicles associated with parasites are meat (e.g., pork, beef, lamb), fish and crustaceans, fresh produce and fruit juices.

3. Main aspects to be covered

The Guideline would follow the format of the General Principles of Food Hygiene (CAC/RCP 1-1969), and include only provisions of particular importance for the control of parasites. Contamination of food products by parasites may occur at several points along the food production process and the following measures are applicable to the management of all foodborne parasites:

- Minimising contamination at primary production
- Minimising contamination post-harvest
- Specific process steps to eliminate or reduce the parasite to acceptable levels
- Consumer awareness

Information on the occurrence of a particular parasite or parasite group and specific control strategies (particularly measures to minimise the number of transmission stages and/or kill the parasites or reduce their numbers) would be included in annexes.

4. Assessment against the *Criteria for the establishment of work priorities*

4.1 The Guideline needs to be developed to meet the general criterion: Consumer protection from the point of view of health, food safety, ensuring fair practices in the food trade and taking into account the identified needs of developing countries.

This guideline is directed at the control of parasites which are a major health burden worldwide. The spread of foodborne parasitic diseases is enhanced by changes in human behaviour, demographics, environment, climate, land use and trade, among other drivers. This document will provide guidance to all countries to prevent or minimise the transmission of parasites (or minimise the number of transmission stages).

⁴ Preliminary Report, 24 Oct., 2012

4.2 Consideration of the global magnitude of the problem or issue

The risk of human infection with parasites is not restricted to distinct geographical areas and transmission can occur by ingesting fresh or processed foods that have been contaminated with the transmission stages via the environment, animals (often from their faeces), or people (often due to inadequate hygiene). Foodborne parasites can also be transmitted through the consumption of raw and undercooked or poorly processed meat and offal from domesticated animals, wild game, and fish containing infective tissue stages.

5. Relevance to the Codex strategic objectives

The proposed work directly relates to the following Codex Strategic Goals from the 2014-2019 Strategic Plan.

Goal 1: Establish international food standards that address current and emerging food issues.

This work addresses Objective 1.1: Establish new and review existing food standards, based on priorities of the CAC and Objective 1.2: Proactively identify emerging issues and member country needs and, where appropriate, develop relevant food standards.

The World Organisation for Animal Health (OIE) has, and is, reviewing chapters related to the surveillance and control of certain zoonotic parasite infections such as trichinellosis and echinococcosis/hydatidosis. The current work on the Draft Guidelines for Control of Specific Zoonotic Parasites in Meat: *Trichinella* spp. and *Cysticercus bovis* highlighted the importance of strengthening the collaboration with OIE without overlapping with each other's responsibilities. This work is consistent with Objective 1.3: Strengthen coordination and cooperation with other international standards-setting organizations seeking to avoid duplication of efforts and optimize opportunities.

Goal 5: Facilitate the Effective Participations of all Codex Members

The development of this Guideline should generate interest and participation from all country members. It is anticipated that the parent document would be developed by an electronic working group and the subsequent development of the annexes be facilitated through pre-session CCFH working group meetings in year 2,3 and 4 of the development cycle.

6. Information on the relation between the proposal and other existing Codex documents

The Guideline will build on the General Principles of Food Hygiene (CAC/RCP 1-1969) and will be used in conjunction with it and other relevant Codes of practice such as *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003) and the *Code of Hygienic Practice for Meat*(CAC/RCP 58-2005) and the *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003)

7. Identification of any requirement for and availability of expert scientific advice

We anticipate that there may be a need for scientific advice from FAO/WHO (JEMRA) on individual parasites particularly regarding transmission routes. This advice will inform the development of annexes.

8. Identification of any need for technical input to the standard from external bodies so that this can be planned for

In addition to scientific expert advice from JEMRA, it is recommended that OIE is consulted on this work particularly in developing guidance on transmission routes.

9. The proposed time-line for completion of the new work, including the start date, the proposed date for adoption at Step 5, and the proposed date for adoption by the Commission.

Start date – new work approved by the Commission in 2014

Adoption at step 5 – 2016

Adoption at step 8 2018

Table 1

Grouping of parasites of public health concern⁵

Protozoa		Nematodes		Trematodes		Cestodes	
<i>Toxoplasma gondii</i>	Meat from small ruminants, pork, beef, game meat (red meat and organs)	<i>Trichinella spiralis</i>	Pork	Opisthorchiidae	Freshwater fish	<i>Taenia solium</i> –	Pork
<i>Cryptosporidium</i> spp.	Fresh produce, fruit juice, milk	<i>Ascaris</i> spp.	Fresh produce	<i>Fasciola</i> spp.	Fresh produce (aquatic plants)	<i>Echinococcus granulosus</i>	Fresh produce
<i>Entamoeba histolytica</i>	Fresh produce	<i>Trichuris trichiura</i>	Fresh produce	<i>Paragonimus</i> spp.–	Freshwater crustaceans	<i>Echinococcus multilocularis</i>	Fresh produce
<i>Trypanosoma cruzi</i>	Fruit juices, pulp	<i>Trichinella</i> spp.	Game meat	Heterophyidae	Fresh and brackish water fish	<i>Taenia saginata</i> –	Beef
<i>Giardia duodenalis</i>	Fresh produce	Anisakidae	Salt water fish, crustaceans, and cephalopods			Diphyllobothriidae	Freshwater / salt water fish
<i>Cyclospora cayetanensis</i>	Berries, fresh produce	<i>Toxocara</i> spp.	Fresh produce			<i>Spirometra</i> spp.	Fish/reptiles/amphibians
<i>Balantidium coli</i>	Fresh produce						
<i>Sarcocystis</i> spp. –	Beef and pork						

⁵ The FAO/WHO *Report on Multicriteria-Based Ranking for Risk Management of Foodborne Parasites* lists 24 parasites or parasite genera (or families) of public health concern. These include protozoa, cestodes, nematodes and trematodes

Appendix II

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