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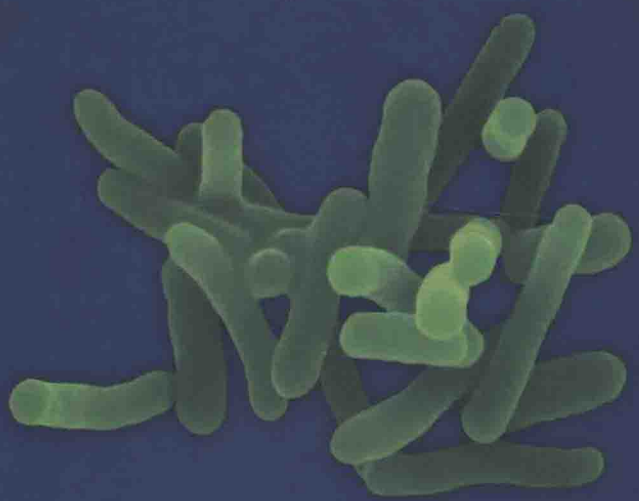

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Multicriteria-based ranking for risk management of food-borne parasites

**Report of a Joint FAO/WHO Expert Meeting,
3–7 September 2012, FAO Headquarters, Rome, Italy**

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DECLARATIONS OF INTEREST

All participants completed a Declaration of Interests form in advance of the meeting. None were considered to present any potential conflict of interest.

Abbreviations used in the report

CAC	Codex Alimentarius Commission
CCFH	Codex Committee on Food Hygiene
FAO	Food and Agriculture Organization of the United Nations
FERG	WHO Food-borne Disease Epidemiology Reference Group
GAP	Good Agricultural Practice
GHP	Good Hygiene Practice
HACCP	Hazard Analysis and Critical Control Points
OIE	World Organisation for Animal Health
WHO	World Health Organization

Executive Summary

At the 42nd Session (December 2010) of the Codex Committee on Food Hygiene (CCFH), the Committee requested that FAO and WHO

> "review the current status of knowledge on parasites in food and their public health and trade impact in order to provide CCFH with advice and guidance on the parasite-commodity combinations of particular concern, issues that need to be addressed by risk managers, and the options available to them."

On the basis of this information, CCFH would determine the feasibility of developing general guidance as a framework for annexes that would address specific parasite-commodity combinations.

To address this request FAO and WHO initiated a series of activities that culminated in an expert meeting on 3–7 September 2012. Preceding the meeting, relevant data were identified and collated through a formal "call-for-data" and by written reports from experts representing the African, Asian, Australian, European, Near Eastern, North American and South American Regions. Some 93 potential parasites were initially identified for consideration. Preliminary work was also undertaken on the development of a ranking tool and experts provided inputs to this through an on-line questionnaire. This preliminary ranking work combined with additional discussions during the meeting, resulted in a list of 24 parasites for ranking. Experts further identified specific vehicles of transmission for each of the 24 parasites.

It is important to note that food-borne parasitic diseases present some unique challenges, and are often referred to as neglected diseases. Notification to public health authorities is not compulsory for most parasitic diseases, and therefore official reports do not reflect the true prevalence or incidence of the disease occurrences (under-reporting). The parasites have complicated life cycles, which may include multiple hosts, some of which could become food, or the parasites themselves could contaminate food. The disease can present with prolonged incubation periods (up to several years), be sub-clinical or asymptomatic, and epidemiological studies associating illness with a specific food type may not be possible.

With technical guidance, the experts defined global criteria for evaluating the 24 food-borne parasites and rated each parasite along these criteria. The criteria can be summarized as: (1) number of global illnesses; (2) global distribution; (3) mor-

bidity-acute; (4) morbidity-chronic; (5) percentage chronic; (6) mortality; (7) increasing illness potential; (8) trade relevance; and (9) socio-economic impact. Each criterion was then weighted by the experts in terms of their importance. The three criteria for disease severity (3, 4 and 5) were combined into one criterion, giving a total of 7 criteria weights, reflecting the relative importance of each criterion to the overall score. The overall score for each parasite was calculated by normalized parasite criteria scores multiplied by fractional weights, and summed.

The primary outputs of the expert meeting were the development of the ranking tool and the actual global ranking, based primarily on public health concerns, i.e. 85% of weighting. The global ranking of food-borne parasites by "importance" and their primary food vehicle in descending order was:

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

This ranking should be considered a "snapshot" and representative only of the information available at the time, the criteria used for ranking, and the weightings assigned to those criteria. Also, some of these parasites had very similar rankings, so it might be more relevant to consider the parasites in groups of concern, e.g. top 5, or top 10, rather than the individual ranking position. With more information or with changing human and animal behaviour, and with climate change effects, parasite scoring and subsequent ranking could also change. As with many phases of risk analysis, it may be important to repeat and update the process on a regular basis. In fact, with heavily weighted public health criteria, the ranking results in part reflect risk defined as a function of the probability of an adverse health effect, and the severity of that effect consequential to a hazard in food. If the parasites are ranked only on trade criteria scores, the order of importance changes: *Trichinella spiralis*, *Taenia solium*, *Taenia saginata*, Anisakidae and *Cyclospora cayetanensis* are the top five. In this way, individual criteria can be considered, e.g. by CCFH, outside of the total scoring and weighting processes to assure that specific concerns can be addressed transparently and separately if needed.

Since criteria weights were calculated separately from the individual parasite scoring, alternative weighting schemes reflecting the judgments of risk managers could be used to generate alternative ranking, using the scoring of the parasites undertaken by the expert meeting. Thus, the ranking process that was developed was considered to be as important an output of the meeting as the ranking result, since it allows the global ranking to be updated through changes in scoring and to reflect the priorities of different groups of risk managers or stakeholders through different weighting. The process can be completely re-run at national or regional level using data more specific to that particular country or region.

Finally, the meeting also highlighted some considerations for risk management including possible approaches for the control of some of these food-borne parasites. Reference is also made to existing risk management texts as appropriate. This information, together with the global ranking of the parasites, the identification of the primary food vehicles and information on food attribution, is aimed to assist Codex in terms of establishing their priorities and determining the next steps in terms of managing these hazards. However, it should be noted that management of specific parasites may then require further scientific input, which it was not feasible to provide as part of this present process.

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ANNEXES