Systematic reviews of *Taenia solium* infection / cysticercosis

Terms of Reference

Reference Number: PDTF-001

**Purpose**

a. General purpose, objectives and outcomes – please refer to the Concept Note\(^1\).

b. Specific purpose of the systematic review:
   - To provide data to be used for the estimation of the global burden of neurocysticercosis/cysticercosis and other syndromes associated with *Taenia solium* infection.
   - Update previous estimates that suggest that in pork-consuming societies where there is poor sanitation, approximately 29% of epilepsy is attributable to neurocysticercosis (Ndimubanzi et al. 2010).

This review will focus on:

a. Epilepsy
   - Update the proportion of epilepsy due to neurocysticercosis
   - Review the proportion who have neurocysticercosis who also have epilepsy

b. Review, and where possible quantify, the proportion of other syndromes associated with cysticercosis and neurocysticercosis
   - Headache
   - Focal deficits
   - Increased intracranial pressure

**Background**

a. General - Please refer to the accompanying Concept Note.

In 2006, the World Health Organization (WHO) developed an initiative to estimate the global burden of foodborne diseases.\(^2\) In 2015, the first-ever global estimates of burden of foodborne diseases were published (WHO 2015), referring to the year 2010. In 2020, the Seventy-third World Health Assembly adopted the resolution, “Strengthening efforts on food safety” (WHA73.5\(^3\)), requesting WHO to monitor regularly, and to report to Member States on, the global burden of foodborne and zoonotic diseases at national, regional and international levels, and in particular to prepare, by 2025, an updated report on the global burden of foodborne

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\(^1\) [https://cdn.who.int/media/docs/default-source/foodborne-diseases/ferg/call-for-expressions-of-interest-ferg-concept-note-.pdf?sfvrsn=e01eebbc_5](https://cdn.who.int/media/docs/default-source/foodborne-diseases/ferg/call-for-expressions-of-interest-ferg-concept-note-.pdf?sfvrsn=e01eebbc_5)

\(^2\) [https://www.who.int/activities/estimating-the-burden-of-foodborne-diseases](https://www.who.int/activities/estimating-the-burden-of-foodborne-diseases)

\(^3\) [https://apps.who.int/gb/ebwha/pdf_files/WHA73/A73_R5-en.pdf](https://apps.who.int/gb/ebwha/pdf_files/WHA73/A73_R5-en.pdf)
diseases with up-to-date estimates of global foodborne disease incidence, mortality and disease burden in terms of DALYs.

b. To facilitate future updates, an additional goal is to identify possible time trends in the burden of foodborne diseases. WHO technical advisory group, “The Foodborne Disease Burden Epidemiology Reference Group (FERG)” was reconvened in 2021 with 26 new members to advise WHO on the methodology to estimate the global burden of foodborne diseases and review epidemiological data to support this global effort (see Terms of Reference4). FERG is organized with several thematic taskforces including enteric, parasitic, and chemical causes of diseases. In addition, FERG has taskforces dealing with methodological issues of assessing the burden of foodborne diseases. The three thematic task forces are performing systematic reviews to assess the burden of different diseases that may be transmitted by food.

c. The parasitic diseases taskforce (PDTF) has developed a workplan that prioritizes various pathogens for systematic reviews to identify the global burden associated with the individual specific pathogens and how much disease associated with the relevant pathogen was due to contaminated food. In the first iteration, it was estimated that there was an annual global burden of approximately 2.7 million disability-adjusted life years (DALYs) from 370,000 cases of neurocysticercosis caused by infection with *Taenia solium* (Torgerson et al. 2015). Neurocysticercosis is assumed to be 100% foodborne on the basis that the disease would not exist in the absence of pork consumption.

**Objectives and specific tasks**

a. Specific objective of the systematic review:

i. To provide data so that an estimate of the global incidence of syndromes that are caused by neurocysticercosis can be made; specifically, the systematic review will collect information on the following statistics:

- Proportion of epilepsy cases that are attributable to neurocysticercosis
- Proportion of neurocysticercosis cases presenting with epilepsy
- Proportion of neurocysticercosis cases presenting with headache
- Proportion of neurocysticercosis cases presenting with focal deficits
- Proportion of neurocysticercosis cases presenting with increased intracranial pressure
- Other syndromes associated with cysticercosis

ii. The metadata will include, but will not be limited to:

- input source, study location, year(s) of study, age range, and sex

iii. If available, additional information will be collected on:

- duration, age distribution, sex distribution
- Socioeconomic indicators
- Indicators of sanitation

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Scope of work

a. All applicable data sources will be included in the review where possible. These include published and unpublished research studies.
   i. Systematic searches are required to consider both peer-reviewed and grey literature. Peer-reviewed literature needs to be searched for in at least the following repositories:
      - PubMed
      - Web of Science
      - Embase
      - Scopus
      - INASP Journals Online project
      - CAB abstracts (BIDS)
      - Google scholar
      - Chinese Biomedical Literature database
      - Chinese Medical Current Content
      - China National Knowledge Infrastructure
      - vip information/Chinese Scientific Journals database
      - wanfang database (Chinese Medicine Premier)
      - Hispanic American Periodicals Index
      - Latin American Research Resources Project (LARRP)
      - SciELO Scientific Electronic Library Online
      - africabib

Grey literature needs to be searched for in at least the following repositories:
   - WHO library (WHOLIST)
   - SIGLE (grey literature database)
   - Oaister
   - Google scholar

b. Language requirements: The systematic review should also include searches in languages other than English. Searches must be undertaken in, Spanish, Portuguese, Chinese and French. Latin America, China, and parts of Francophone Africa are endemic for *Taenia solium* and so there are likely to be reports in these languages.

c. Search terms will include but not limited to: *Taenia solium*, “cysticercosis”, “neurocysticercosis”, “cysticercus”, “neurological lesion”, “neuropathology”, “Central nervous system”, “metacestode”, “morbidity”; “incidence”; “prevalence”; “sequelae”, “mortality”, “taeniasis”, “taeniosis”, “cestode”, “tapeworm”, “pork”, “pigs”, “pork tapeworm”. All combinations of these terms used will be documented and included in the methods section of the review.

d. The systematic review protocol will be examined for suitability and adapted accordingly. There may be a need to examine cross sectional studies, cohort studies, and routine diagnosis of infection published in the literature for information on incidence and sources of infection. A flow chart will keep track of the review and abstraction process, documenting the total numbers of abstracts read and the final number
of articles included in the review. All articles included in the review will be archived in a database, which will be provided to the Parasitic Diseases Taskforce for review. Exclusion criteria for articles/published works not included in the review must be clearly stated. Inclusion and exclusion criteria can also be established in discussion with the Parasitic Diseases Taskforce. The goal of the systematic reviews is to estimate morbidity and mortality for all ages, both sexes, and in all regions of the world. Where data are not available for age groups or in particular regions, the group will use all available information to estimate the incidence and prevalence using appropriate modelling techniques. Pork-consumption patterns will be an essential covariate in such analysis. All assumptions should be clearly documented.

Overall timeline (indicative)

Start date: November 2022   End date: May 2023

Deliverables and timeline for delivery

The contractors will deliver a final dataset and report documenting results, to be further analyzed and interpreted by WHO and the FERG, especially the respective taskforces and computational taskforce. It is expected that this review will result in a manuscript for publication in at least one peer-review journal, that must adhere to the WHO policy on Open Access\(^5\). Contractors are to lead the writing process, in close coordination with the relevant taskforces, respectively. The publication process will be governed by the existing publication policy, and authorship is subject to the recommendations for defining the role of authors and contributors published by the International Committee of Medical Journal Editors (ICMJE). The different deliverables and milestones will include:

a. Protocol development and registration
   - The protocol for the systematic reviews needs to be developed in line with the PRISMA-P guidelines (http://www.prisma-statement.org/documents/PRISMA-P-checklist.pdf).
   - Protocols need to be registered in Prospero, for full transparency (https://www.crd.york.ac.uk/prospero/).

b. Interim meetings with Parasitic Diseases Taskforce and Computational Taskforce

c. Final results of the systematic review
   - Summary Microsoft Word documents
   - Microsoft Excel spreadsheet with data. This will be in a standardized template developed by the computational task force.
   - Database of all articles that met the inclusion criteria of the systematic review.

Interim deliverables

a. Protocol development and registration
   - The protocol for the systematic reviews needs to be developed in line with the PRISMA-P guidelines (http://www.prisma-statement.org/documents/PRISMA-P-checklist.pdf).
   - Protocols need to be registered in Prospero, for full transparency (https://www.crd.york.ac.uk/prospero/).

b. Interim meetings with Parasitic Diseases Taskforce and the Computational Taskforce

c. Final results of the systematic review

\(^5\) https://www.who.int/about/policies-publishing/open-access
• Summary word documents
• Excel spreadsheet with data. This will be in a standardized template developed by the computational task force.
• Data base of all articles that met the inclusion criteria of the systematic review.

Final deliverables:

a. Complete final analysis (in a form of a report) to be delivered at the end of the contract period. Report content, quality and style include:
   i. Abstract
   ii. Introduction
   iii. Methods
   iv. Results
   v. Discussion
   vi. Conclusion
   vii. Annexes

b. Report documenting results in a Microsoft Word document, to be delivered at the end of the contract period (July 2024)

c. External journal publication (including authors from the Parasitic Diseases Taskforce) as the outcome of the above outputs (2025), subject to WHO clearance.* Any articles and underlying data should be published open access in accordance with WHO’s policy on open access6.

*Please note: WHO retains copyright in all work produced by or for the Organization, including work commissioned under contract.

Qualifications, experience, skills and languages

a. Educational qualifications
   Preferably, the commissioned scientist and/or team under their direction should have:
   • Postgraduate qualification in epidemiology or public health
   • MD or DVM with experience in neglected tropical diseases

b. Experience
   • Epidemiology, systematic review, data analysis, risk analysis, parasitic infections, specifically tapeworm infections

b. Languages and level required:
   • Strong communication skills in English, especially in scientific written communication
   • Skills in Chinese, Spanish, French, or Portuguese, or access to colleagues with these language skills, would be advantageous
   • Familiarity with burden of disease methods and estimates.

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6 WHO policy on Open Access: https://www.who.int/about/policies/publishing/open-access
Other requirements

The study team or individual will be selected from the submitted expressions of interest and based on the qualifications and skills (see specifications in relevant section). Geographical and gender diversity is encouraged for applications from teams. Scientists will participate in their individual capacity rather than as a representative of their employer. Once shortlisted, each individual or team member will also need to complete the standard WHO Declaration of Interest form, which will be assessed for conflict of interests. The individual or team leader may be asked to further elaborate the expression of interest in a virtual video meeting with the WHO Secretariat. The final candidates will be selected through a competitive process in accordance with WHO’s policies and procedures.

The work should be done remotely, and no travel is required.

References


HOW TO APPLY

Please note the following requirements before proceeding with your application.

To complete the application an applicant or the team leader of an applying team must provide responses to questions explicitly detailed in the application portal linked below. It is important to have all information prepared prior to applying online, as it is not possible to return to the portal to modify your submission:

1) Reference number (found in the Terms of Reference)
2) Contact information from the main focal point only (such as the Lead Investigator)
3) Cover letter/statement of motivation, including a maximum of 600 words detailing why your team are submitting this Expression of Interest, and why you believe your team is the most suitable to undertake this work. **It is recommended to prepare this in a separate Word document so you can copy and paste text into the application.**
4) Proposed fee for undertaking the work (in USD)
5) Ideal start date and completion dates to undertake the work
6) ONE document (ideally in PDF format) that includes every Curriculum Vitae (CV) of the proposed research team or an individual applicant.
7) ONE document (ideally in PDF format) that includes a brief biography of an applicant or each research team member (max 150 words per person).

Apply here:  

Contact: WHO secretariat [fbd-burden@who.int](mailto:fbd-burden@who.int)