CODEX ALIMENTARIUS
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GUIDELINES FOR THE CONTROL OF *TAENIA SAGINATA* IN MEAT OF DOMESTIC CATTLE

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Table of Contents

1. INTRODUCTION

Bovine cysticercosis refers to the infection of the striated muscle of cattle with the metacestode (e.g. cysticerci) of *Taenia saginata,* traditionally referred to as "*Cysticercus bovis*". Humans acquire the infection (taeniasis or beef tapeworm infection) solely from consumption of raw or undercooked beef containing live cysticerci. Taeniasis in human populations varies worldwide with a high prevalence in some countries. Very few countries are free from *T. saginata*. Bovine cysticercosis is not a condition notifiable to the OIE and is regulated in some countries.

The public health significance of *T. saginata* is limited due to the mostly benign clinical symptoms (or asymptomatic forms illustrated in the global ranking of foodborne parasites using a multicriteria ranking tool for scoring parasites based on public health criteria only during the FAO/WHO expert meeting on Foodborne Parasites – Multicriteria based ranking for risk management (Annex 5, Figure 2 of the report[1]). However, the economic importance is high for several reasons:

- Resources involved in routine meat inspection
- Downgrading and condemnation of affected carcasses (or routine treatment to inactivate cysticerci such as freezing or cooking)
- Intensified livestock controls at farm level when affected herds are identified.

As governments review their meat hygiene systems, non-risk based control measures for meat and meat products in trade can be disproportionate to the level of risk reduction achieved.

Where the parasite is common in domestic cattle, mitigation of risks to consumers is hampered by the low sensitivity of routine post mortem meat inspection.

These Guidelines incorporate elements of a risk management framework (RMF) approach as developed by the Codex Committee on Food Hygiene for managing microbiological hazards (*Principles and Guidelines for the Conduct of Microbiological Risk Management* (CAC/GL 63-2007)) i.e.:

- Preliminary risk management activities
- Identification and selection of risk management options
- Implementation of control measures
- Monitoring and review.

2. OBJECTIVES

The primary objective of these Guidelines is to provide guidance to governments and industry on risk-based measures for the control of *T. saginata* in meat of domestic cattle.

These Guidelines also provide a consistent and transparent technical basis for reviewing national or regional control measures based on epidemiological information and risk analysis. These Guidelines should be taken into account in the judgement of equivalence by importing countries where such measures differ from their own, thereby facilitating international trade[2].

3. SCOPE AND USE OF THE GUIDELINES

3.1. Scope

These Guidelines, used in conjunction with *FAO/WHO/OIE Guidelines for the Surveillance, Prevention and Control of Taeniasis/Cysticercosis*[3] ("*FAO/WHO/OIE Guidelines Taeniasis*") address the control of cysticercosis in the meat of domestic cattle that may cause human taeniasis. They are based on the *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005) that provides generic advice on a risk-based approach to meat hygiene.

These Guidelines, used in conjunction with the *FAO/WHO/OIE Guidelines Taeniasis*, apply to all steps in a "primary production-to-consumption" food chain continuum.

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[1] http://www.fao.org/food/food-safety-quality/a-z-index/foodborne-parasites/en

[2] *Guidelines on the Judgement of Equivalence Sanitary Measures associated with Food Inspection and Certification Systems* (CAC/GL 53-2003)

[3] FAO/WHO/OIE Guidelines for the Surveillance, Prevention and Control of Taeniasis/Cysticercosis (www.oie.int/doc/ged/d11245.pdf)

3.2. Use

These Guidelines provide specific guidance for control of cysticercosis in meat according to a risk-based approach to selection of post-harvest control measures as risk management options. The Guidelines are supplementary to and should be used in conjunction with the *General Principles of Food Hygiene* (CAC/RCP 1–1969), the *Code of Hygienic Practice for Meat (*CAC/RCP 58-2005) and the *FAO/WHO/OIE Guidelines on Taeniasis*.

The diagnostic techniques referred to in the Guidelines are those of the *OIE Manual of Diagnostic Tests and* Vaccines *for Terrestrial Animal.*

Provision of flexibility in application of the Guidelines is an important attribute. They are primarily intended for use by government risk managers and industry in the design and implementation of food control systems. The Guidelines could also be used when judging the equivalence of different control measures for beef meat in different countries.

4. DEFINITIONS

Domestic cattle mean all domesticated cattle species, including *Bos taurus* and *B. indicus*, banteng (*Bos javanicus*), gayal (*Bos frontalis),* and yaks (*Bos grunniens*), and additionally all *Bubalus* and *Bison* species.

Herd means a number of animals of one kind kept together under human control.

5. PRINCIPLES APPLYING TO CONTROL OF BOVINE CYSTICERCOSIS

Overarching principles for good hygienic practice for meat are presented in the *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005) section 4: *General Principles of Meat Hygiene*. Three principles that have particularly been taken into account in these Guidelines are:

i. The principles of food safety risk analysis should be incorporated in the design and implementation of meat hygiene programmes wherever possible and appropriate.

ii. As appropriate to the circumstances, the results of monitoring of slaughter populations and surveillance of human populations should be considered when reviewing or modifying meat hygiene requirements

iii. Competent authorities should recognise the equivalence of alternative hygiene measures where appropriate, and promulgate meat hygiene measures that achieve required outcomes in terms of safety and suitability and facilitate fair practices in the trading of meat.

6. PRELIMINARY RISK MANAGEMENT ACTIVITIES

6.1 Identification of a food safety issue

Preliminary risk management activities appropriate to these Guidelines include:

- Development of a national or regional level risk profile taking into account the generic Codex risk profile; and
- Evaluation of the epidemiological evidence supporting a risk-based approach relative to the national or regional situation or trade in meat.

6.2 Risk Profile

Risk profiles provide a collation of scientific information that guides risk managers and industry in taking further actions as part of applying a RMF approach to a food safety issue. Both risk profiles and risk assessment can assist in the design of food control systems that are tailor-made to individual food production and processing systems. A generic risk profile is available on the repository of risk profiles on the FAO[4] and WHO[5] websites.

Epidemiological evidence to support decisions on appropriate control measures to be applied can be gathered from a range of sources. For example, both industry and governments may have historical records on test results from slaughter populations and farm investigations. Human health surveillance and treatment data, where available, are useful in assessing any residual risks that may exist in different regions or countries.

[4] http://www.fao.org/food/food-safety-quality/a-z-index/foodborne-parasites/en/
[5] http://www.who.int/foodsafety/micro/jemra/assessment/parasites/en/

7. IDENTIFICATION, SELECTION AND IMPLEMENTATION OF RISK-BASED CONTROL MEASURES

7.1. Control measures at farm level

These Guidelines should be applied in conjunction with the FAO/WHO/OIE Guidelines on Taeniasis, regarding selection and application of control measures. These control measures cover all steps of the "primary production-to-consumption" food chain continuum.

7.2 Post-slaughter control measures

7.2.1. Post mortem inspection

Routine post-slaughter control measures for T. saginata are essentially limited to meat inspection. Where necessary and practicable, a sample of suspect cysts should be confirmed by histopathology (identification of cysts that are viable) according to validated techniques acceptable to the national competent authority.

Any laboratory-based test should have known performance characteristics, i.e. sensitivity and specificity if a risk-based approach to ensuring food safety is to be applied. The sensitivity of routine post mortem meat inspection for *T. saginata* is very low, particularly in lightly infected animals, and this means a significant proportion of individual carcasses containing T*. saginata* cysts will pass undetected. Only a proportion of undetected cysts will be viable and this proportion depends on the extent and cycle of infection in the herd of origin.

The range and intensity of post mortem inspection procedures varies from country to country.

7.2.2. Alternative inspection procedures

When a suspect carcass or part is identified during routine inspection procedures, additional inspection of the suspect carcass and its parts and cohorts can increase the sensitivity of inspection for identifying infected parts and/or further infected carcasses. The range and intensity of alternative post mortem inspection procedures varies from country to country.

7.2.3. Treatment of meat

Temperature treatment (heating and freezing) at regimes that ensure lethality for *T. saginata* is an available routine preventative control measure[6]. Heat treatment is also used for meat from suspect or confirmed *T. saginata* carcasses and carcasses from the same herd. Such treatments should be validated according to national guidelines.

Salting and irradiation are further treatments that may be available provided the treatment has been validated and has been approved by the competent authority to ensure the lethality of *T. saginata*. Guidance on irradiation is given in the *General Standard on Irradiated Food* (CODEX STAN 106-1983) and the *Code of Practice for Radiation Processing of Food* (CAC/RCP 19-1979).

7.2.4. Traceability for slaughtered cattle

Traceability of cattle between slaughterhouse and place of production should be in place so that information on carcasses positive for *T. saginata* can be utilised for application of control measures at farm level (and elsewhere) when deemed appropriate by the competent authority. This may include notification of “suspect” cohorts of animals sent to the slaughterhouse for application of intensified post mortem inspection procedures.

7.2.5. Movement control and surveillance

The competent authority may apply movement control requirements to herds where they judge from monitoring information that this is an appropriate risk-based measure.

7.3. Selection of risk-based control measures

7.3.1. Risk-based approach

Slaughter populations may be regarded as being of low prevalence if the following conditions are met:

- Slaughterhouse information demonstrating the absence of, or a low prevalence of, suspect cysts in the meat of the slaughtered population over time; or
- If available, public health data demonstrating that human infection attributable to the domestic slaughter population is absent or very rare;

[6] Temperatures of -10 ^{o}C for no less than 10 days or heating to a core temperature of 60 ^{o}C have been recommended (WHO 1995. Food Technologies and Public Health).www.who.int/entity/foodsafety/publications/fs_management/en/foodtech.pdf

- Other epidemiological data as relevant.

In such circumstances, risk modelling can be used to demonstrate that derogation from some routine post mortem inspection procedures and/or reduction in the intensity of some routine post mortem inspection procedures (palpation and/or incision) would have negligible impact on the level of consumer protection afforded by traditional and highly intensive procedures. Where this situation occurs, the competent authority should apply risk-based post mortem inspection derogations as appropriate.

Examples of levels of consumer protection provided by different levels of post mortem inspection for slaughter populations were modelled for low and high prevalence populations by FAO[4] and WHO[5].

Intensified post mortem procedures applied to an individual carcass when a suspect cyst is detected, and further post mortem inspection procedures applied to a related group of carcasses should also be considered according to the characteristics of infection in the slaughter population and the likelihood of reduction of risks to the consumer.

Episodes of cysticercosis can occur regardless of the available information on past history. Incursions can occur, and occasionally do, from sources out of the country, including via contaminated feed and infected people.

8. MONITORING AND REVIEW

A robust system for monitoring of data obtained at slaughterhouse level by both organoleptic post-mortem inspection and histopathology, where practicable, should be in place. This system should provide for evaluation of the performance of the selected control measures relative to the level of consumer protection that is sought and may include:

- Collection and evaluation of slaughterhouse information as well as related laboratory reports (e.g. histopathology);
- Trace back to the farm when suspect cysts are found in the slaughterhouse and application of on-farm controls and more intensive slaughterhouse inspection if required by the competent authority;
- Notification of results of intensified inspection to the competent authority;
- Involving public health authorities.

9. RISK COMMUNICATION

Best practice in the control of *T. saginata* in the meat of domestic cattle should be communicated to all stakeholders in cattle production.

All persons involved in cattle production should receive basic public health awareness training on the life cycle of the parasite and how humans may pose a risk as a source of infection to the cattle.

The competent authority should make appropriate information (e.g. monitoring, investigation information) publicly available where possible when there is a public health risk and conduct public education campaigns as appropriate.