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CODEX COMMITTEE ON FOOD HYGIENE

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PROPOSED DRAFT GUIDELINES FOR CONTROL OF SPECIFIC ZOOBOTIC PARASITES IN MEAT: *TRICHINELLA SPIRALIS* AND *CYSTICERCUS BOVIS*

(At Step 3)

Prepared by the Physical Working Group led by European Union and New Zealand

Governments and interested international organizations are invited to submit comments on the attached Proposed Draft Guidelines at Step 3 (*see* Appendices I and II) 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, 1400 Independence Avenue, SW, Washington, D.C. 20250, USA, FAX +1-202-720 3157, or email Barbara.McNiff@fsis.usda.gov with a copy to: The Secretariat, Codex Alimentarius Commission, Joint WHO/FAO Food Standards Programme, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy, by email codex@fao.org or fax: +39-06-5705-4593 **by 15 October 2011**.

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 Annex to this document.

Report of the physical working group on the

Proposed Draft Guidelines for Control of Specific Zoonotic Parasites in Meat: *Trichinella spiralis* and *Cysticercus bovis*

1. Following the proposal from the 42nd session of CCFH and the decision of the 34th session of the Codex Alimentarius (CAC34) to approve new work on the development of Guidelines for Control of Specific Zoonotic Parasites in Meat: *Trichinella spiralis* and *Cysticercus bovis*, the Physical Working Group (p-WG), co-chaired by the European Union (EU) and New Zealand, hosted by the EU, met on 14 - 15 July 2011 in Grange, Ireland.
2. Delegates from Argentina, Australia, Belgium, Brazil, China, Cyprus, European Union, Finland, France, Germany, Ireland, Italy, Japan, New Zealand, Norway, Poland, Spain, Switzerland, Sweden, Thailand, United Kingdom and United States of America, the CCFH Chair, the Codex secretariat, respective representatives from FAO and WHO, and observers from CLITRAVI and OIE, attended this meeting. A complete list of participants is given in Appendix V to this report.
3. The p-WG recalled that its mandate was to develop two annexes regarding the two parasites *Trichinella spiralis* and *Cysticercus bovis* in meat. It was also underlined that CAC34 requested the approach to be based on risk and that work should be conducted in close cooperation with OIE.
4. The representative of FAO/WHO reported on the state of play of the on-going work aiming at gathering data with the objective to develop a general document on parasites in food to which annexes on specific parasite/food combinations would be attached. It was recalled that a call for data was launched in early May.

5. The co-Chair from the New Zealand Delegation detailed that the rationale of this work was to provide risk-based guidance following the principles of risk analysis. He underlined that this approach was adding much value to Codex work by providing more specific guidance following a farm to fork approach. He also stressed that this work was also an excellent opportunity to enhance the cooperation with OIE by the development of provisions in parallel while ensuring that no duplication, no gaps and no contradiction would occur in this context. Another key principle to be taken into account in this work is that that the control measures applied should be proportional to the risks to the consumer.

6. The representative of OIE recalled the good history of close cooperation with Codex Alimentarius and welcomed the cooperation with Codex, which would allow a complete coverage from the farm to fork. He also encouraged delegates from Codex and OIE at national level to ensure a better coordination.

PART 1: *Trichinella spiralis*

7. A draft document was circulated for comments in advance of the meeting and comments submitted by Japan, European Union and the observer Clitravi (Liaison Centre for the Meat Processing Industry in the EU) were distributed to the p-WG members.

8. The p-WG used as a starting point for its discussion a version of the document including the comments received to facilitate the discussion.

The key points brought forward in revising the document are summarised as follows:

9. Scope: The p-WG agreed to recommend the extension of the scope to *Trichinella* spp in Suidae.

10. Definitions: the p-WG decided to include the text of all relevant definitions in the document and introduce a footnote when the definitions were copied from the OIE terrestrial code.

11. Risk profile: it was agreed that the risk profile would be attached to the report of the p-WG meeting, noting that it was not part of the proposed guidelines and submitted to CCFH, which would then decide on the future of this document.

12. Control measures at farm level: it was agreed to include a reference to section 8.13.3 of the new OIE proposal currently discussed in an OIE ad hoc working group.

13. Post slaughter control measures: the p-WG clarified that the objective was to provide several approaches allowing members to choose the best combination according to their own situation. It was decided to keep the table time/temperatures as reference in the ICT document. A reference to the General Standard for Irradiated foods has to be added to the section on irradiation. Some discussion occurred on the treatment of positive carcasses before being put on the market and it was finally agreed to include a provision stating that laboratory testing and disposal of positive carcasses should be carried out according to the competent authority. Any treatment method should be validated by the competent authority.

14. Conditions for official recognition of *Trichinella* free herds/compartments and negligible risk regions or countries: it was concluded that this section (8.1 to 8.3) should remain square bracketed until OIE made further progress on the work in respect of quantitative description of on-farm status with the objective to include a cross-reference to OIE provisions and use these provisions as a reference point for developing a risk-based approach to implementation of post-harvest control measures. OIE indicated that a new draft would be made available well before the CCFH meeting in December 2011.

15. Wild boars and cross-breeds: carcasses intended for human consumption should be subject to *Trichinella* control measures (refer to chapter 2.1.16 of the OIE terrestrial code or an alternative validated method) according to a risk-based approach.

16. Monitoring and review: it was also decided for this section to wait until OIE had made further progress on the relevant provisions (as in paragraph 14). A risk-based approach developed by Codex will be dependent on clear description of the on-farm status.

17. Risk communication: It was agreed that the part regarding risk communication to the consumers would be developed on the basis of a proposal to be submitted by the delegation of Japan.

PART 2: *Cysticercus bovis*

18. Dr Claire Morlot from France gave a presentation of the epidemiological survey on bovine cysticercosis in France in 2010. The results confirmed head and heart as the main targets for meat inspection. Serological testing, vaccination of cattle, routine de-worming before slaughter and actions on waste water treatment were mentioned as possible on-farm control measures.

19. The OIE representative informed that bovine cysticercosis is not a notifiable disease for the OIE and consequently there is no chapter for it in the OIE Terrestrial Animal Health Code. No new work is anticipated for bovine cysticercosis in the OIE as it has not been prioritised on public health grounds. There are FAO/WHO/OIE Guidelines for the surveillance, prevention and control of taeniasis/cysticercosis.

20. The co-Chair from New Zealand presented data demonstrating that in countries with very low prevalence of *Cysticercus bovis* there is virtually no difference in the level of consumer protection achieved by intensive compared with reduced inspection to detect cysticercosis. He suggested that this could allow risk-based adjustment of meat inspection methods.

The key points brought forward in revising the document are summarised as follows:

21. It was decided to keep the guidelines on *Trichinella* and on *C. bovis* as separate texts at this stage although they contain generic parts. The modifications agreed earlier for guidelines concerning trichinellosis were introduced into the Guidelines on *C. bovis* where these were generic for both texts.

22. It was agreed that the scope would be restricted to domestic cattle noting that CCFH should consider what is included in this general description.

23. References to the OIE texts were replaced with references to the FAO/WHO/OIE guidelines for cysticercosis as the OIE has not issued specific guidance on bovine cysticercosis.

24. Text was added to section 7.2.1 to the effect that when suspects were found in routine inspection, additional inspection should take place.

25. Alternative measures, in addition to freezing were introduced in section 7.2.3 for post-harvest treatment of affected meat and it was noted that they should be validated.

26. Provisions on follow-up of positive cases of cysticercosis were introduced in section 7.2.4, such as movement controls and intensified inspection of slaughtered animals from suspect farms. These should be risk-based.

27. Infective cysts are not present in very young animals as their development takes a few weeks. A minimum age was considered for animals that should be subject for control measures in section 7.3.2. Age of 6 weeks was left in square brackets.

28. Under section 7.3 it was agreed that routine inspection should always be applied for control of bovine cysticercosis. The WG then discussed whether the intensity of inspection could be proportional to the risk. Where the disease is endemic, intensive inspection should be applied along with other control measures such as trace back to farm of origin and trace forward to the slaughterhouse for animal from suspect herds. Where the prevalence of infection is very low, competent authorities, on a basis of a sufficient risk-based evidence, may apply a lesser intensity of inspection.

Conclusions and recommendations

The p-WG agreed to:

PART 1: *Trichinella spiralis*

- Submit the draft document, as presented in Appendix I, for consideration at the 43rd CCFH in December 2011;
- Attach the risk profile to this report (*see* Appendix III) and request CCFH to decide on the future of this document;
- Recommend to CCFH to extend the scope to *Trichinella* spp in Suidae.
- Recommend to CCFH to support the development of a general document on parasites in foods on the basis of the input from FAO and WHO; and

- Recommend to CCFH to pursue the close cooperation with OIE with the objective to work in parallel on this issue taking into account progress made by OIE in developing quantitative provisions related to the on-farm status of the animals.

PART 2: *Cysticercus bovis*

- Submit the draft document, as presented in Appendix II, for consideration at the 43rd CCFH in December 2011;
- Attach the risk profile to this report (*see* Appendix III) and request CCFH to decide on the future of this document;
- Attach the table in the draft document on post-mortem inspection procedures in different countries to this report (*see* Appendix IV) and request countries to consider this information in further development of the proposed guidelines (section 7.2.1);
- Attach the Appendices 3, 4 and 5 to the Report of this meeting as resources for further development of the draft guidelines: Theoretical examples of *T. saginata* cysticercosis risk profiling of three different veal calves production systems; Comparison of intensified post mortem inspection procedures when a “suspect” *C. bovis* cyst is found; and Comparison of intensified post mortem inspection procedures when a “suspect” *C. bovis* line is identified to this report (*see* Appendix IV) and request countries to consider this information in further development of the proposed guidelines;
- Recommend CCFH to take the opportunity to develop a description of a slaughter population where the prevalence of infection represents a very low public health risk and develop recommendations for risk-based controls on this basis. Quantitative examples can be developed to illustrate the level of consumer protection achieved with different status of the slaughtered population and different intensities or types of interventions.

APPENDIX I

**PROPOSED DRAFT GUIDELINES FOR CONTROL OF SPECIFIC ZOOONOTIC PARASITES IN MEAT:
TRICHINELLA IN MEAT OF SUIDAE
(at Step 3 of the Procedure)**

1. Introduction

1. Trichinellosis is a parasitic disease that has been recognized as being of major public health and economic importance for a long time. Infections occur in humans by the consumption of raw or undercooked infected meat of different species (e.g. pork, horse, game). Meat from Suidae is considered to be the most important food vehicle for human infection.. In some countries, extended monitoring data are available and have demonstrated the absence of *Trichinella* in certain herds/compartments. In other geographical situations, there is a negligible risk to human health from consumption of meat from finishing pigs.

2. As governments review their meat hygiene systems, it appears that in the national or regional situation, some traditional control measures for meat and meat products in trade as now applied can be singularly inappropriate in terms of proportionality to the level of risk reduction achieved.

3. These Guidelines incorporate elements of a “risk management framework” (RMF) approach as developed by the Codex Committee on Food Hygiene for managing microbiological hazards (reference) i.e.

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

2. Objectives

4. The primary objective of these Guidelines is to provide risk-based guidance to governments and industry on the control of *Trichinella* in meat of Suidae.

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

6. These Guidelines address exclusively the control of *Trichinella* in meat of Suidae being considered as the most important source of infection of humans and therefore the highest priority. The control of *Trichinella* in meat from other susceptible species (e.g. horses and bears) may be included in a future extension of this guidance or a separate annex. The occurrence of *Trichinella* in these other species is however taken into account where considered relevant to *Trichinella* control in pig meat.

3. Scope and use of the Guidelines**3.1. Scope**

7. These Guidelines apply to the control of all *Trichinella* that may infest meat of Suidae and can cause food borne disease. The proposed Guidelines are based on Working Principles for Risk Analysis for Application in the Framework of the Codex Alimentarius and the Code of Hygienic Practice for Meat (CAC/RCP 58-2005) that provides generic advice on a risk-based approach to meat hygiene.

8. The Guidelines apply to all steps in a “primary production-to-consumption” food chain. Example situations where the epidemiology and prevalence of infestation in the slaughter population differs according to country, region or farming system are provided so as to inform risk management decisions at the national level.

9. While the biosecurity provisions in this document have been developed primarily for controlled housing they also have applicability to other production systems.

3.2. Use

10. The Guidelines develop specific guidance for control of *Trichinella* in meat of Suidae with potential control measures being considered at each step, or group of steps, in the process flow. The Guidelines are supplementary to and should be used in conjunction with the *Recommended International Code of Practice – General Principles of Food Hygiene* (CAC/RCP 1 – 1969), the *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005), the *International Code of Practice for the Processing and Handling of Quick Frozen Foods* (CAC/RCP 8-1976), the FAO/WHO/OIE Guidelines for the surveillance, management, prevention and control of trichinellosis and the *Recommendations on the Methods for the Control of Trichinella in Domestic and Wild Animals intended for Human Consumption* of the International Commission on Trichinellosis.

11. The primary production section of these Guidelines is supplementary to and should be used in conjunction with the *OIE Terrestrial Animal Health Code (Chapter 8.13 Trichinellosis)*. The diagnostic techniques referred to in the Guidelines are those of the *OIE Terrestrial Manual (Chapter 2.1.16 Trichinellosis)*.

12. 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 food safety measures for meat of Suidae in different countries for international trade.

13. The Guidelines take a primary production to consumption risk-based approach that presents both pre-slaughter and post-slaughter control measures as risk management options. Examples are provided to illustrate the likely level of consumer protection that is afforded by different combinations of measures and these can be referred to by both governments and industry to inform risk management decisions.

4. Definitions

<i>Compartment</i>¹	means an animal subpopulation contained in one or more establishments under a common bio-security management system with a distinct health status with respect to a specific disease or specific diseases for which surveillance, control and bio-security measures have been applied for the purpose of international trade.
<i>Controlled housing</i>	means a type of husbandry where domestic swine are kept at all times under conditions controlled with regard to feeding and housing.
<i>Cross breeds</i>	means the progeny of domestic swine bred with wild boars.
<i>Finishing pigs</i>	means domestic swine solely kept for meat production.
<i>Herd</i>¹	means a number of animals of one kind kept together under human control or a congregation of gregarious wild animals. A herd is usually regarded as an epidemiological unit.
<i>Susceptible wildlife</i>	means feral animals which are known to be the most important potential direct or indirect sources of infestation for <i>Trichinella</i> to domestic swine in a region or country.
<i>Veterinary authority</i>¹	means the governmental authority comprising veterinarians, other professionals and para-professionals, having responsibility and competence for ensuring or supervising the implementation of animal health and welfare measures, international veterinary certification and other standards and recommendations in these Guidelines in the whole territory.

5. Principles applying to control of *Trichinella* in pig meat

14. 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:

¹ This definition is taken directly from OIE terrestrial Health Code www.oie.int.

- i. The principles of food safety risk analysis should be incorporated wherever possible and appropriate in the design and implementation of meat hygiene programmes.
- ii. As appropriate to the circumstances, the results of monitoring and surveillance of animal and human populations should be considered with subsequent review and/or modification of meat hygiene requirements whenever necessary.
- 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

15. Consumers are exposed to the risk of *Trichinella* infestation when they consume raw or insufficiently cooked meat from carrier animals. Risk management should incorporate a “primary production-to-consumption” approach so as to identify all steps in the food chain where control measures can potentially be applied. It is appropriate to differentiate control measures in domestic swine and wild boars due to a different epidemiology and different housing/living conditions.

16. 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
- Evaluation of the epidemiological evidence supporting a risk-based approach relative to the national or regional situation and/or trade in meat of Suidae.

6.2 Risk Profile

17. Risk profiles are an important part of “Preliminary Risk Management Activities” when applying a RMF to a food safety issue. They provide scientific information to risk managers and industry in the design of food safety control systems that are tailor-made to individual food production and processing systems.

18. A generic risk profile which takes into account the FAO/WHO/OIE Guidelines for the surveillance, management, prevention and control of zoonosis (“FAO/WHO/OIE Guidelines *Trichinella*”) has been presented to the CCFH during its 43rd meeting.

19. Epidemiological evidence to support decisions on control measures can be gathered from a range of sources. As an example, both industry and the Competent Authority may have historical records on test results from pig populations (serology) and slaughtered pigs. Survey data from other domestic species and wildlife will add to epidemiological information for a compartment or region. Human health surveillance data is important in assessing any residual risks that may occur in regions or countries where there is an extremely low prevalence of *Trichinella*, even though attribution of any human cases to a particular source may be difficult.

6.3 Risk Assessment Policy and Risk Assessment

20. In the case of *Trichinella* in pig meat, elaboration of risk assessment policy and risk assessment was not deemed necessary [by CCFH] in the application of a RMF approach.

7. Identification and selection of control measures using a risk-based approach

7.1 Control measures at farm level for domestic swine

21. At primary production, the most important risk factors for infestation of farmed swine are the intentional feeding of food waste, or intentional or unintentional exposure to carcasses of dead swine, or susceptible wildlife (FAO/WHO/OIE Guidelines *Trichinella*.). These factors are very rarely encountered in controlled housing conditions.

22. As regards prevention of *Trichinella* in pigs, reference is made to Article 8.13.3. of new OIE *ad hoc group* draft proposal.

7.2 Availability of post-slaughter control measures

23. Currently used post-slaughter control measures for *Trichinella* include: laboratory testing, freezing, cooking and curing. Irradiation of pork products is also a validated option to destroy *Trichinella* in pork prior to consumption. These measures may be subject to the approval of the competent authority.

24. Feedback information loops to the farm of origin are required if a positive confirmed animal is detected so that intensified on-farm controls can be implemented (*ref OIE*).

7.2.1 Testing:

25. When laboratory testing is being performed on individual carcasses, those selected should be tested in accordance with the diagnostic techniques recommended in Chapter 2.1.16. of OIE terrestrial Manual (B1) ("digestion method").

26. When doing serology testing for surveillance or verification of the status of swine from controlled housing then testing should be done in accordance with the diagnostic techniques recommended in Chapter 2.1.16 of *OIE Terrestrial Manual* (B2) ("serological test").

27. Other diagnostic methods for *Trichinella* may be used if endorsed in the *OIE Terrestrial Manual* or if validated in accordance with an internationally accepted protocol.

28. Any test that is chosen should have known performance characteristics, i.e. sensitivity and specificity if a risk-based approach to ensuring food safety is to be applied.

29. Laboratory testing requires a minimum of 1 g of tissue from a predilection site to provide a minimum sensitivity of 3 larvae per gram of tissue. In endemic areas, 3 g of tissue should be used (FAO/WHO/OIE Guidelines). However, it should be noted that testing according to this methodology does not have 100% sensitivity.

7.2.2 Freezing.

30. Freezing of carcasses should utilise freezing regimes that ensure lethality for all parasites in different portions of meat or whole carcasses. , Example regimes given below are from the "Recommendations on Methods for the Control of *Trichinella* in Domestic and Wild Animals Intended for Human Consumption prepared by the International Commission on Trichinellosis (ICT) Standards for Control Guidelines Committee"² for inactivation of *Trichinella* spp which are not cold tolerant.

Diameter/thickness meat	Required temperature °C (°F)	Minimum time	Place of measurement
< 15 cm	- 15 (5)	20 days	Room
< 15 cm	- 23 (-10)	10 days	Room
< 15 cm	- 29 (-20)	6 days	Room
15-69 cm	- 15 (5)	30 days	Room
15-69 cm	- 23 (10)	20 days	Room
15-69 cm	- 29 (-20)	12 days	Room
All	- 18 (0)	106 hours	Centre of cut
All	- 21 (-5)	82 hours	Centre of cut
All	- 23.5 (-10)	63 hours	Centre of cut
All	- 26 (-15)	48 hours	Centre of cut
All	- 29 (-20)	35 hours	Centre of cut
All	- 32 (-25)	22 hours	Centre of cut
All	- 35 (-30)	8 hours	Centre of cut
All	- 37 (-35)	1/2 hour	Centre of cut

² (<http://www.med.unipi.it/ict/ICT%20Recommendations%20for%20Control.English.pdf>)

7.2.3 Cooking and irradiation

31. The possible use of these methods should take into account the "Recommendations on Methods for the Control of *Trichinella* in Domestic and Wild Animals Intended for Human Consumption prepared by the International Commission on Trichinellosis (ICT) Standards for Control Guidelines Committee". The General standards on irradiated food should also be taken into account.

7.3. Selection of risk-based control measures

7.3.1. Risk-based approach

32. Based on an analysis of the epidemiology at the farm, compartment, region or country level, a risk-based approach to control of *Trichinella* will involve different levels of laboratory testing of slaughtered pigs.

7.3.2. Selection of measures

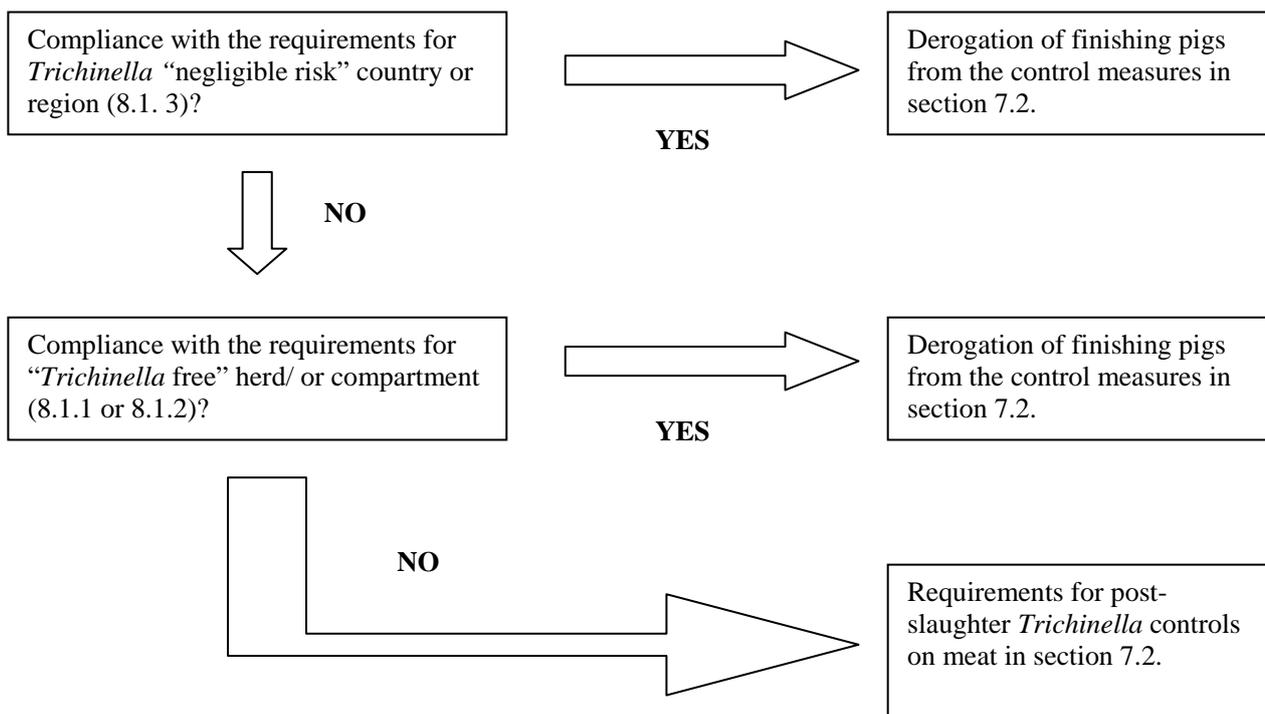
33. In the absence of epidemiological evidence of "freedom" or "negligible risk"³ of a slaughter population from *Trichinella*, all carcasses from domestic swine over five weeks of age (*provisional for discussion*) should be subject to either:

- Laboratory testing with disposition of the positive carcasses according to the Competent authority; or
- Freezing, or
- Cooking, or
- Curing, or
- Irradiation

34. The Competent Authority / Veterinary Authority may provide derogation from controls or change the level of controls where there is appropriate epidemiological evidence of:

- Finishing pigs being from "*Trichinella* free" herds or compartments, or
- Finishing pigs being from herds located in "negligible risk" regions or countries

35. A decision tool for selection of control measures is illustrated below:



³ Noting that quantification of these parameters has yet to be agreed by OIE

36. Where derogations have been applied, risk-based sentinel testing of the live domestic pig population will be required (See Section 9)

37. Quantitative examples of likely human health consequences given differences in *Trichinella* epidemiology and criteria used to establish population status are provided in Appendix X (*to be developed*)

8. Implementation of risk-based control measures

38. Testing procedures and any consequential changes to on-farm hygienic practices are described by OIE (Chapter 2.1.16 of the OIE terrestrial Manual (B1) and Article 8.13.3. of new OIE *ad hoc group* draft proposal respectively).

39. Implementation of selected control measures will be highly dependant on official recognition by the Competent Authority / Veterinary Authority of the *Trichinella* status of the herd, compartment, region of country.

8.1. Conditions for official recognition of *Trichinella* free herds

8.2. Conditions for official recognition of *Trichinella* free compartments

8.3. Conditions for official recognition of *Trichinella* “negligible risk” country or region

[Paragraphs 8.1 to 8.3 will refer to draft OIE document and be completed when this draft has progressed]

[8.4 Wild boars and cross-breeds

40. Wild boars and cross-breeds intended for human consumption should be subjected to *Trichinella* control according to a risk-based approach. Certain *Trichinella* present in wild boars are resistant to freezing. Where information is not available on the specific freezing conditions that may effectively kill these species meat of all wild boars and cross-breeds intended for human consumption should be tested in accordance with the diagnostic techniques recommended in Chapter 2.1.16. of OIE terrestrial Manual (B1) ("digestion method") or an appropriate alternative validated method.

Positive carcasses should be disposed of according to the competent authority]

9. Monitoring and review

9.1. “*Trichinella* free” herds/compartments

41. [The domestic swine should maintain under controlled housing conditions in accordance with all conditions in Article 8.13.3. of the new OIE *ad hoc group* draft proposal .These conditions should be verified at an appropriate frequency by the Veterinary Authority.

42. All sows and boars should be tested as sentinel monitoring (*details to be developed using a risk-based approach*) with a digestion method.

43. Feedback should be provided from the slaughterhouse to the herd or compartment of origin.

44. The status should be withdrawn:

- if the outcome of the audit is not favourable or
- if a positive domestic swine is detected by a digestion method.

45. The status should be restored when:

- Appropriate remedial actions have been taken to the satisfaction of the Veterinary Authority when the outcome of an audit was not favourable, or
- The conditions in 8.1 or 8.2 are again fully complied with in case a positive animal was detected by a digestion method.]

9.2 *Trichinella* “negligible risk” countries or regions

46. [All sows, boars and wild boars should be tested as sentinel monitoring with a digestion method. Other susceptible wildlife should be tested at least if intended for human consumption.

47. Feedback should be provided from the slaughterhouse to the herd or compartment of origin and to the relevant authority monitoring the status of the region or country.
48. Within the region/country, finishing pigs should be tested with a digestion method if introduced
- from regions or countries of unknown farm health status, or
 - not from free herds/compartments; and/or
 - not tested by serology in accordance with Article 8.13.3. of the new OIE *ad hoc group* draft proposal .
49. [The status should be withdrawn
- if a positive domestic pig is detected.
 - if a positive wild boar or other wildlife is detected and the prevalence in susceptible wildlife is above 1 per thousand using a rolling window].
50. The status should be restored when the country or region again fully complies with the conditions in 8.3.]

10. Risk communication

51. Best practice in the control of *Trichinella* in Suidae should be communicated to all stakeholders in swine production. Similarly, all stakeholders should be aware of the benefits of obtaining *Trichinella*-free herd or compartment status.
52. Hunters should be informed on the risk of consumption of meat from susceptible wildlife, stressing the importance of testing even if for personal consumption.
53. The Competent Authority or Veterinary Authority should regularly publish laboratory results in a form that demonstrates the epidemiological status of herds, compartments, regions or the whole country. Results of epidemiological investigations of any food-borne outbreaks should also be communicated.
54. Since each country has specific consumption habits, communication programs pertaining to trichinellosis are most effective when established by individual governments.
55. Consumers should be made aware of the risk of becoming infected with *Trichinella* after consumption of pork meat, either raw or partially treated.

APPENDIX II

**PROPOSED DRAFT GUIDELINES FOR CONTROL OF SPECIFIC ZOOONOTIC PARASITES IN MEAT:
CYSTICERCUS BOVIS IN MEAT OF DOMESTIC CATTLE
(at Step 3 of the Procedure)**

1. Introduction

1. Bovine cysticercosis refers to the infestation of cattle with metacestodes of *Taenia saginata*. Humans acquire the infection (taeniasis or beef tapeworm infection) solely by consumption of raw or undercooked beef containing live cysticerci. The presence in human populations varies world-wide with a high prevalence in some countries. Very few countries are free of *T. saginata*. Bovine cysticercosis is not a condition notifiable to the OIE.
2. As governments review their meat hygiene systems, national or regional situation, some traditional control measures for meat and meat products in trade as now applied can be singularly inappropriate in terms of proportionality to the level of risk reduction achieved. The public health significance of the beef tapeworm is limited due to the mostly benign clinical symptoms. However, the economic importance is high due to several reasons:
 - Resources involved in routine meat inspection
 - Downgrading and condemnation of affected carcasses (or routine treatment to inactivate cysticerci such as by freezing or cooking)
 - Intensified livestock controls at farm level when affected herds are identified.
3. 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.
4. These Guidelines incorporate elements of a “risk management framework” (RMF) approach as developed by the Codex Committee on Food Hygiene for managing microbiological hazards (reference) i.e.
 - Preliminary risk management activities
 - Identification and selection of risk management options
 - Implementation of control measures
 - Monitoring and review.

2. Objectives

5. The primary objective of these Guidelines is to provide risk-based guidance to governments and industry on the control of *C. bovis* in meat from domestic cattle.
6. The Guidelines also provide a consistent and transparent technical basis for reviewing national or regional control measures based on epidemiological information and risk analysis. They should be taken into account in the judgement of equivalence by importing countries where such measures differ from their own, thereby facilitating international trade.

3. Scope and use of the Guidelines**3.1. Scope**

7. These Guidelines apply to the control of cysticercosis in the meat of domestic bovine (including *Bubalus* and *Bison* species) that may cause human taeniasis. They are based on the Working Principles for Risk Analysis for Application in the Framework of the Codex Alimentarius and the *Code of Hygienic Practice for Meat* (CAC/RCP 58-2005) that provides generic advice on a risk-based approach to meat hygiene.

8. The Guidelines apply to all steps in a “primary production-to-consumption” food chain. Example situations where the epidemiology and prevalence of infestation in the slaughter population differs according to country, region or farming system are provided so as to inform risk management decisions at the national level.

3.2. Use

9. The Guidelines develop specific guidance for control of cysticercosis in meat according to a “primary production-to-consumption” food chain and a risk-based approach to selection of control measures. The Guidelines are supplementary to and should be used in conjunction with the *Code of Practice – 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 for the surveillance, prevention and control of taeniasis/cysticercosis.

10. The primary production section of these Guidelines is supplementary to and should be used in conjunction with the *OIE Terrestrial Animal Health Code*¹. The diagnostic techniques referred to in the Guidelines are those of Chapter 2.6.5 of the *OIE Terrestrial Manual*.

11. Examples are provided to illustrate the likely level of consumer protection that is afforded by different control measures and these examples can be referred to by both governments and industry to inform risk management decisions.

12. 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

Compartment means an animal subpopulation contained in one or more establishments under a common bio-security management system with a distinct health status with respect to a specific disease or specific diseases for which surveillance, control and bio-security measures have been applied for the purpose of international trade.

Herd means a number of animals of one kind kept together under human control or a congregation of gregarious wild animals. A herd is usually regarded as an epidemiological unit

5. Principles applying to control of bovine cysticercosis

13. 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 wherever possible and appropriate in the design and implementation of meat hygiene programmes.
- ii. As appropriate to the circumstances, the results of monitoring and surveillance of animal and human populations should be considered with subsequent review and/or modification of meat hygiene requirements whenever necessary.
- 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

14. Preliminary risk management activities appropriate to these Guidelines include:

¹ Under review

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

6.2 Risk Profile

15. Risk profiles provide a collation of scientific information that guides risk managers and industry in taking further actions as part of applying a rRMF approach to a food safety issue. Both risk profiles and risk assessment can assist in decision-making on food control systems that are tailor-made to individual food production and processing systems. In the case of bovine cysticercosis, elements of risk profiling can be found in the FAO/WHO/OIE Guidelines for the surveillance, prevention and control of taeniosis/cysticercosis².

16. Epidemiological evidence to support decisions on control measures can be gathered from a range of sources. Governments will likely have historical records on test results from slaughter populations and farm investigations. Human health surveillance and treatment data are useful in assessing any residual risks that may occur in different regions or countries.

6.3 Risk Assessment Policy and Risk Assessment

17. In the case of cysticercosis in beef meat, elaboration of risk assessment policy and risk assessment was not deemed necessary [by CCFH] in the application of a RMF approach.

7. Identification and selection of control measures using a risk-based approach

7.1 Control measures at farm level

18. Selection and application of control measures at the farm level are fully described in the FAO/WHO/OIE Guidelines for the Surveillance, Prevention and Control of Taeniasis/cysticercosis. Serology using validated methodology may be used for epidemiological studies or herd diagnosis of infestation

19. Information from the slaughterhouse when suspect cysts are confirmed by laboratory examination may result in investigation of risk factors at the farm level (FAO/WHO/OIE Guidelines) and possible intensification of post mortem inspection controls

7.2 Post-slaughter control measures

7.2.1. Post mortem inspection procedures

20. Routine post-slaughter control measures for *C. bovis* are essentially limited to meat inspection. Suspect cysts will be subject to laboratory identification according to standard techniques.

21. Any test that is chosen 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 *C. bovis* is very low, particularly in lightly infested animals, and this means a significant proportion of individual carcasses containing *C. bovis* cysts will pass undetected. Only a proportion of undetected cysts will be viable and this proportion depends on the extent and phase of infestation in the herd of origin.

The range and intensity of post mortem inspection procedures varies from country to country³

7.2.2. Supplementary inspection procedures

22. When a suspect carcass or part is identified during routine inspection procedures, additional inspection of the suspect carcass and parts and the group of animals can increase the sensitivity of the inspection process for identifying infested parts and/or further infested carcasses. The range and intensity of post mortem inspection procedures varies from country to country⁴

² <ftp://ftp.fao.org/docrep/fao/011/aj005e/aj005e.pdf>

³ Refer Table 1 attached to the Meeting Report accompanying these draft guidelines

⁴ Refer Tables 2 and 3 attached to the Meeting Report accompanying these draft guidelines

7.2.3. Treatment of meat

23. Freezing of carcass parts at regimes that ensure lethality for all parasites is an available control measure. Freezing is also used as a treatment for carcass parts from confirmed *C. bovis* and suspect *C. bovis* carcasses and lines of carcasses.

24. A proportion of meat from domestic cattle will routinely be subjected to heat treatment (freezing or cooking) that is lethal for *C. bovis*, and this will further limit consumer exposure.

Salting and irradiation according to validated processes are further treatments that may be available.

7.2.4. Traceability system for slaughtered cattle

25. A traceability system between slaughterhouse and farm should be available so that information from the slaughterhouse can be utilised for application of control measures at farm level (and elsewhere) when deemed appropriate by the Competent Authority / Veterinary Authority. This may include notification of “suspect” lines to the slaughterhouse for routine application of intensified post mortem inspection procedures.

7.2.5. Movement control and surveillance

26. The Competent Authority / Veterinary Authority may apply movement control requirements to herds where a high prevalence of infection persists⁵.

7.3. Selection of risk-based control measures

7.3.1. Risk-based approach

7.3.2. Selection of measures

27. Based on an analysis of the epidemiology at the herd, region or country level, a risk-based approach to control of *C. bovis* in the carcasses of domestic cattle over [six weeks] of age should take into account options for:

- Procedures applied during routine post mortem inspection (visual, palpation and incision);
- Further post mortem procedures applied to an individual carcass when a suspect cyst is detected;
- Further post mortem inspection procedures applied to a line of carcasses after a “suspect” *C. bovis* is detected;
- Procedures applied with knowledge of prior animal slaughter status
- Carcass disposition requirements, including post-harvest treatment and freezing regimes applied to carcass parts.

28. The Competent Authority / Veterinary Authority may provide derogation from some routine post mortem inspection procedures and / or reduce the intensity of some routine post mortem inspection procedures (palpation and/or incision) where there is:

- "Public health data demonstrating that human infestation attributable to the domestic slaughter population is very rare; and/or
- Slaughterhouse information demonstrates a very low prevalence of suspect cysts in the meat of the slaughtered population over time

29. Intensified post mortem procedures applied to an individual carcass when a suspect cyst is detected, and further post mortem inspection procedures applied to a line of carcasses after a “suspect” *C. bovis* is detected, should also be established according to the characteristics of infection in the slaughter population and the likelihood of reduction in risks to the consumer.

30. Quantitative examples of likely human health consequences given differences in *C. bovis* epidemiology and post mortem inspection regimes are provided in Appendix X (*to be developed*)

⁵ Refer to new draft guidelines for on-farm controls being prepared by OIE

8. Implementation of risk-based control measures

31. Intensive post-mortem inspection should be applied in the routine situation.
32. Where there is a sufficiency of evidence based on public health data and slaughter house data of a very low risk of transmission of taeniasis through the food chain, the Competent Authority/ Veterinary Authority may apply a different intensity of routine post-mortem inspection.
33. [To be further developed, taking into account OIE guidance for on-farm control and reference to quantitative examples illustrating likely risks to human health]

9. Monitoring and review

34. A robust system for data monitoring at the farm, slaughterhouse and laboratory level 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 slaughter house and on-farm information;
 - Traceback 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 / Veterinary Authority;
 - Notification of results of intensified inspection to the Veterinary / Competent Authority
 - Involving public health authorities as appropriate;
35. The farm / compartment of origin may be ascribed a “risk status” until slaughterhouse results and/or epidemiological investigation indicates that the prevalence of *T. saginata* in the slaughter population no longer warrants intensified control measures.
36. [To be further developed, taking into account OIE guidance for on-farm control and reference to quantitative examples illustrating likely risks to human health]

10. Risk communication

37. Best practice in the control of *C. bovis* in the meat of domestic cattle should be communicated to all stakeholders in cattle production.
38. All persons involved in cattle production should receive basic public health awareness on the life cycle of the parasite and how humans may pose a risk as a source of the cattle infestation.
39. The Competent Authority / Veterinary Authority should make available monitoring and investigation information to all interested parties and conduct public education campaigns as appropriate e.g. tourists

APPENDIX III**SUMMARY RISK PROFILES****A. SUMMARY RISK PROFILES ON *TRICHINELLA*****1. Hazard-food commodity of concern**

Trichinellosis is a parasitic zoonosis due to nematodes belonging to the genus *Trichinella*. Trichinellosis has been recognized as being of major public health and economic importance for a long time. Infections occur in humans by the consumption of raw or undercooked infected meat of different species (e.g. pork, horse, game). The most important source of human infection worldwide is the domestic pig, but, e.g., in Europe, meat from horses and wild boars has played a significant role during outbreaks within the past three decades (Gottstein et al., 2009). Reference is made to the FAO/WHO/OIE Guidelines for the surveillance, management, prevention and control of trichinellosis for detailed information of *Trichinella* spp. infections in animals and humans by continent and country.

In some countries, extended monitoring data are available and have demonstrated the absence of *Trichinella* in certain herds/compartments of domestic swine and a negligible prevalence in certain regions or countries. Although testing of meat from domestic swine may no longer be considered proportionate to the risk, trade restrictions exist if not tested.

Indeed, in the EU, more than 167 million pigs are tested for the presence of *Trichinella* even though all pigs from indoor modern housed production have tested negative since 1960 (Alban et al., 2011). Cost estimates for classical *Trichinella* inspection by digestion ranges from 0.12 to 2.5 Euro per pig (Kapel, 2005). This represents large economic costs, yet the vast majority of these pigs test negative and the public health risk in many countries is therefore considered very low.

2. Description of the public health concern

It is estimated human trichinellosis could affect at least 11 millions people all over the world (Kapel, 2005) In the EU, where the *Trichinella* species of the highest concern present in pigs are *T. spiralis* followed by *T. britovi* and *T. pseudospiralis* (EFSA, 2005), transmission to humans primarily occurs through meat from infected pigs or horses (domestic cycle) or from infected wildlife, e.g., wild boar (sylvatic cycle). In 2009, at EU level, there were 1,073 reported human cases of trichinellosis of which 69.9 % (748 cases) were reported as confirmed, with an increase of 11.6 % compared with 2008. The contribution to this change derived mainly from the increased reported cases in Bulgaria, which accounted for almost 90% of confirmed reported cases in the EU together with Romania (EFSA, 2011).

The epidemiology of the trichinellosis and the regional differences in the incidence are extensively described in the FAO/WHO/OIE Guidelines for the surveillance, management, prevention and control of trichinellosis.

The public health significance of *Trichinella* is linked mainly to the seriousness of the disease, the high infectivity of *Trichinella* larvae for humans and difficulty of effective treatment.

Based on the collection of outbreaks, the infectivity of *Trichinella* in humans is high: only a few pairs of *Trichinella* larvae are needed to achieve a considerable probability of infection (Teunis et al., 2011).

The clinical symptoms of trichinellosis in humans are dose and species-dependent and show the same clinical characteristics irrespective of whether the infection is mild, moderate or severe, and the infections differ mostly in its strength/intensity.

The clinical course of trichinellosis may be described by an intestinal (enteral) phase and by a muscular (parenteral) phase. In principle, the sudden occurrence of gastrointestinal symptoms (diarrhoea, nausea, vomiting), high fever, facial oedema and myalgia in a group of persons suggests the presence of a *Trichinella* infection. The severe form is characterized by the development of all typical symptoms, including secondary signs such as hypoproteinaemia and hypoalbuminaemia accompanied by cardiovascular and/or neurological complications. In the moderately severe form all symptoms are present as well, but with a significant lower

intensity and a lower incidence of neurological and cardiological complications, such as myocarditis, encephalitis and thromboembolic diseases.

Typical for the benign forms of trichinellosis are the low intensity of the clinical symptoms and the lack of complications.

The neurological and cardiological complications mentioned above can develop early or lately during the course of the disease. They are observed not only in severe cases, but may also occur in patients with a moderate infection, particularly elderly persons, as well as in patients treated improperly or too late. Death is a rare event in trichinellosis and has been reported in 5 persons out of the more than the 6500 infections that occurred in the European Union in the past 25 years. Usually, in elderly patients (over 65 years of age) death follows a thrombo-embolic disease.

Late stage and chronic trichinellosis may begin in the 5th - 7th week *post infection*. Transition to this stage is expressed by a disappearance of the typical symptoms of the disease. This period is characterized by chronic fatigue and persisting myalgias.

The treatment of trichinellosis includes anthelmintics (benzimidazoles), glucocorticosteroids, and preparations that compensate for protein and electrolyte deficits. The effectiveness of chemotherapy is strongly dependent upon the time of administration, since anthelmintic applications yields good effectiveness only at the early stage of infection. Unfortunately, most infected people are diagnosed several weeks after the infection, when the larvae have already established themselves in the muscles, and where drug bioavailability may be limited. In those cases longer time of anthelmintic treatment is recommended, but it may be still ineffective against long-term sequelae and chronic trichinellosis.

3. Food production, processing, distribution and consumption

The importance of different meat (mainly horse meat, pork meat from domestic swine and from wild boars) as source of infection depends mainly on consumption habits and pig production systems. Other susceptible species that are consumed in certain parts of the world are walruses, whales, bears, crocodiles and dogs.

Consumers expose themselves to the risk of trichinellosis when they consume raw or insufficiently cooked meat from improperly examined carriers of *Trichinella*. Consumption of pork and horse meat considerably differs throughout the world, mainly because of cultural and social reasons. Moreover the migratory flow of humans with peculiar food practices including the consumption of raw meat, the illegal importation of not-controlled meat from endemic to non-endemic countries, and new food habits and dishes including raw meat resulted in outbreaks in many EU Member States. Even the increasing number of international travelers has resulted in many reports of trichinellosis in tourists who acquired infections while traveling or hunting in areas of endemicity and subsequently developed disease (Gottstein et al., 2009).

At primary production, most important risk factors for farmed swine are the intentional feeding of food waste, or intentional or unintentional exposure to carcasses of dead swine, or wildlife. These risks are usually encountered in free-range pasturing and traditional rural outdoor rearing practices, e.g. in Eastern Europe, where this constitutes recurrently the source of human infections (Malakauskas et al., 2007). More generally the access scavenge on garbage dumps or feeding of carcasses or scraps from susceptible species to susceptible species are risk factors. Also the rodents are considered as important carriers for domestic swine. Even the access of large carnivorous and omnivorous birds, to *Trichinella*-free farm should be impeded, since they could be potential reservoirs for *T. pseudospiralis* (EFSA, 2005).

Concerning post harvest methods for *Trichinella* inactivation, three methods have been shown to reliably inactivate *Trichinella* larvae in meat, namely cooking, freezing, and irradiation.

Freezing at minimum -15°C for no less than 3 weeks (meat up to 15 cm in thickness) and for no less than 4 weeks (up to 50 cm in thickness) can kill *T. spiralis* in pig meat but certain *Trichinella* species (e.g. *T. britovi*, *T. nativa*) occurring in game and horses are resistant when freezing is carried out using the recommended temperature and time combinations for meat of domestic swine (EFSA, 2004).

Heat treatment is a suitable method for killing *Trichinella spiralis* in meat from domestic swine. Different time/temperature combinations can be applied to pork to ensure the destruction of trichinellae, ranging from 49°C for 21 hours to 62.2°C for less than 1 minute, after the indicated core temperature has been reached (EFSA, 2004).

It should be noted that available data concern the inactivation of the species *Trichinella spiralis* in pork, as no experiments on the heat inactivation of the other *Trichinella* species in different hosts' meat have been reported to date.

In countries where it is authorized, irradiation can be also an acceptable method for rendering meat safe for human consumption, since levels of at least 0.3 kGy are proven to inactivate *Trichinella*. Curing and smoking processes are not recommended to inactivate *Trichinella* larvae in pork, horse, or game meat (Gamble et al., 2000).

4. International trade

International trade of meat from swine (mainly domestic swine) is important, and it represents one of the fastest growing sectors in livestock production and trade. As an example the EU is exporting each year about 1 million tonnes of meat from swine. International trade of horse meat is less important but the EU 27 is, nevertheless, importing about 40,000 tonnes per year.

B. SUMMARY RISK PROFILE ON *C. BOVIS* IN MEAT FROM DOMESTIC CATTLE

1. Hazard-food commodity of concern

Infestation of humans by *Taenia saginata* occurs worldwide and the public health importance of this parasitic zoonosis varies greatly from very little clinical significance for many to serious adverse health effects for some, especially amongst those who are malnourished. The life cycle of this taeniad involves only humans as the primary host and bovines as the intermediate host and infestation of humans by *T. saginata* can only occur by the consumption of raw or undercooked beef. Reference is made to the FAO/WHO/OIE Guidelines for the surveillance, management, prevention and control of taeniosis/cysticercosis for detailed information of *Taenia* spp. infections in animals and humans by continent and country.

The distribution of *T. saginata* varies globally with the highest prevalence recorded in sub-Saharan Africa, Latin America, Asia and some Mediterranean countries. The WHO guidelines consider the prevalence in humans to be divided into three groups; highly endemic regions with prevalences that exceed 10%, moderate prevalences, and those with a prevalence below 0.1% or free from *T. saginata* taeniosis. In general the prevalence of human taeniosis will reflect the prevalence of bovine cysticercosis in the local cattle population. Most countries collect and collate slaughterhouse data to establish the proportion of cattle that have the cysticerci detected by meat inspectors and these levels range from almost zero in very low risk countries to levels between 5 and 10% and even more (up to 80%) in others. Organoleptic meat inspection is considered to have a low sensitivity, especially for lightly infested animals, and most infected animals entering the slaughterhouses will be consumed by people.

2. Description of the public health concern

Given the range of clinical significance of *T. saginata* to infested humans, any estimation of the prevalence of human taeniosis with *T. saginata* will be difficult although the WHO (1996) considered that up to 50 million cases worldwide was possible. The WHO guidelines have described infection rates in children of up to 65% in some Mediterranean countries

The epidemiology of taeniosis and the regional differences in the prevalence of this parasite are extensively described in the FAO/WHO/OIE Guidelines for the surveillance, management, prevention and control of taeniosis/cysticercosis.

The public health significance of *T. saginata* is not readily categorized as the clinical symptoms vary widely between those so infested. For many humans who are otherwise in good health with adequate nutrition, the symptoms range from very few and mild to occasionally serious. One consequence of this parasite being associated with very few symptoms in most cases is that epidemiological data about human prevalence in developed countries is sparse. However in those countries with high rates of endemic taeniosis, where many live in poverty, are malnourished and practice cultural customs that favour completion of the life cycle of *T. saginata* (such as in sub-Saharan Africa), the additional burden of this parasite can have severe health consequences.

The clinical symptoms of taeniosis in humans range include; no abdominal discomfort but the discharge of proglottids, gastrointestinal symptoms such as abdominal pain, diarrhoea or constipation, nausea, weakness, loss of weight, increased appetite, headache, dizziness, pruritis ani, excitation, and very rarely arthritis. For many otherwise healthy humans infested with *T. saginata*, the symptoms will be mild and unrecognized for many years until the parasite dies or is eliminated

Most human intestinal cestode infections can safely and effectively be treated with a single oral dose of praziquantel or niclosamide. (Craig, 2007)

3. Food production, processing, distribution and consumption

The food production systems that are least likely to produce cattle infested by *C. bovis* are those not carried out in close proximity to the public, that are not prone to flooding, that do not use effluent as fertilizer that may contain human sewerage, that do not provide cattle with potentially infective feed stuff and employ labour that is not infested with *T. saginata*. If any of these risk factors exist on the food production system,

the likelihood of cattle becoming infective for the consumer increases.

The sole means of infestation of humans by *T. saginata* is by the consumption of beef although the likelihood of infective beef meat reaching the consumer diverges widely between different countries. For those countries with no endemic taeniasis and where all locally consumed meat processed at government regulated establishments with competent and reliable meat inspection, the probability of local human infestation is close to zero.

The processing of cattle has some influence on the likelihood of beef being infective to consumers. It is imperative that all beef is processed within government regulated establishments with competent meat inspection and that there is not a clandestine supply of beef to the local community. Those establishments that use freezing rather than chilling for cold storage of carcass meat and viscera, especially heart and head meat, will reduce the likelihood of their product being infective to the consumer. The infectivity of *C. bovis* is highest for meat consumed without sufficient intervening heat or freezing treatment and thus in countries where most meat is consumed locally within days of slaughter, endemic taeniasis is likely to continue where cultural practices include consumption of poorly cooked meat.

Beef carcass and viscera meat that is distributed locally for immediate consumption is less likely to have received any cold or heat treatment and thus is more likely to be infective than product that is exported globally which generally necessitates cold storage by freezing with a consequent reduction of viability of any infective cysts in the product

Human consumers expose themselves to the risk of taeniasis when they consume insufficiently cooked or raw beef or bovine viscera. The methods of preparation and cooking meat used globally show great variability and are influenced by trends. Most of the public is unaware of the existence of cysticerci and the potential for beef to be infective and this extends to many public eating houses where the concept of eating poorly cooked meat is seen as desirable. In some countries the consumption of eating raw meat is practiced.

Freezing beef carcass meat and viscera for a minimum of -12°C for no less than 20 days or heating to a core temperature of 56 °C for more than one second is considered sufficient to render the cysticerci non viable

4. International trade

The international trade of beef and beef products is the largest of the red meat trade sector and likely to remain in that position. Almost 7.5 million tonnes of beef and veal were exported in 2010 (FAS/USDA/2011) Much of the global trade in beef is destined for the fast food market and in general this processing, from initial freezing to manufacture then cooking, ensures the likelihood of the consumer being infested with *T. saginata* close to zero. The international trade in chilled beef, especially to those markets in which the consumption of raw or poorly cooked meat in practiced is one that carries a risk to human infestation by *T. saginata*.

APPENDIX IV**Table 1: Post mortem inspection procedures carried out by different countries**

Tissue	United States	Canada	European Union	Australia	New Zealand
Tongue	Observe & palpate	Observe & palpate	Observe & palpate	Observe & palpate. Observe tongue root when saved for edible	Observe & palpate
Internal masseter muscle (internal pterygoid)	Incise & observe	Incise & observe	Incise once and observe	Incise once and observe	Incise once and observe
External masseter muscle	Incise & observe	Incise & observe	Incise twice parallel to mandible & observe	Incise once & observe	Incise twice (EU market) parallel to mandible and observe
Oesophagus	Observe	Observe	Observe	Observe only if saved for edible	Observe & palpate
Diaphragm	Observe & palpate	Observe	Observe	Observe	Observe & palpate including lifting to view pleural cover
Heart	Incise from base to apex through interventricular septum & observe	Either (1) Observe exterior surface after incising once or more from base to apex or (2) Everting heart and making shallow incisions to enable cardiac valves and muscle tissue to be observed	Incise lengthways to open ventricles and incise through interventricular septum. Observe.	Palpate and observe. Incise internal musculature 3-4 times and observe	Observe & palpate all external surfaces of the heart. Incise left ventricle from apex to base and through the interventricular septum and the atrioventricular orifices. Observe the internal surface and muscular surfaces exposed by incisions. Then incise both parallel to and within both cut surfaces of the interventricular septum and observe.
Carcass	Observe cut surfaces of muscles & diaphragm pillars	Observe cut surfaces of muscles & diaphragm pillars	Observe cut surfaces of muscles & diaphragm pillars	Observe internal and external surfaces (including musculature)	Observe cut surfaces of muscles & diaphragm pillars

Table 2: Comparison of intensified post mortem inspection procedures when a “suspect” *C. bovis* cyst is found

Tissue	United States	Canada	European Union	Australia	New Zealand
Tongue	Observe & Palpate. If cysts are suspected in muscle then thoroughly incise & observe	Routine	Note: The routine inspection procedures are the minimum requirements for the examination for cysticercosis in bovines over 6 weeks. No further examination of suspect carcasses or viscera is specified under Council Directive 64/433/EEC. Incision of the masseters is not necessary when a specific serological test is used (L226/116: Chapter X B.1)	Multiple incisions and observation.	View & palpate. Make mid line incision through suspensory muscle then observe
Internal masseter muscle	Incise thoroughly & observe	Routine		Additional incision and observation	Incise once, observe & palpate
External masseter muscle	Incise thoroughly & observe	Routine		Additional incision and observation	Incise twice, observe & palpate
Oesophagus	Observe closely	Observe closely		Routine	Re-examine, observe & palpate
Diaphragm	Remove peritoneum, incise thoroughly & observe	Routine		Incise and observe after removal of serous membrane	Remove peritoneum, observe, palpate & incise diaphragm & pillars
Heart	Incise thoroughly & observe	Extra incisions as deemed necessary & observe		Additional incision and observation	Make three extra incisions, observe & palpate
Carcass	Observe all exposed muscular surfaces. Remove peritoneum from diaphragm pillars, incise thoroughly & observe	Routine		Routine	Observe all exposed muscular surfaces again.
	If carcass is found to have cysts in two or more of the above sites – follow steps below				If carcass is found to have cysts in two or more of the above sites – follow steps below
Forequarters	Incise once in each shoulder to humerus, expose triceps brachii & observe cut surfaces				Incise once in each shoulder to humerus, expose triceps brachii & observe cut surfaces
Hindquarters	Incise once each round & observe cut surfaces				Incise once each round & observe cut surfaces

Table 3: Comparison of intensified post mortem inspection procedures when a “suspect” *C. bovis* line is identified

Tissue	United States	Canada	Australia	New Zealand
	When one carcass is found to contain a cyst, the following is to be performed on all carcasses the plant receives from the same supplier. If available and identified as part of the affected lot, hearts and cheeks of carcasses of line passed inspection prior to finding cyst to be incised as below (Regs: M-310, 311, 315; P-Subpart K)	When at least one carcass from a line of cattle is considered infested , all other carcasses from that line with gross lesions suggestive of <i>C. bovis</i> shall be considered infested	When a suspect cyst is found in a line, routine post mortem inspection procedures are considered sufficient for the remainder of the line	All animals from a line in which one carcass is suspected of having a cysticercus cyst, shall be examined as below
Tongue	Observe & Palpate. (Routine)	Routine	Routine	View & palpate. Make mid line incision through suspensory muscle then observe
Internal masseter muscle	Make multiple incisions & observe	Routine	Routine	Incise once, observe & palpate
External masseter muscle	Make multiple incisions & observe	Routine	Routine	Incise twice, observe & palpate
Oesophagus	Observe closely	Observe closely	Routine	Re-examine, observe & palpate
Diaphragm	Observe (routine)	Routine	Routine	Remove peritoneum, observe, palpate & incise diaphragm & pillars
Heart	Make multiple incisions of interventricular septum	Extra incisions as deemed necessary & observe	Routine	Make three extra incisions, observe & palpate
Carcass	Observe closely all exposed muscular surfaces	Routine	Routine	Observe all exposed muscular surfaces again.

THEORETICAL EXAMPLES OF *T. SAGINATA* CYSTICERCOSIS RISK PROFILING OF THREE DIFFERENT VEAL CALVES PRODUCTION SYSTEMS (RISK SCORE FOR EACH INDIVIDUAL RISK FACTOR IS GIVEN RANDOMLY TO THE SYSTEMS)

Risk factors potentially contributing to infestation of calves with <i>T. saginata</i> eggs	Risk scoring of different related scenarios	Risk profiles of different veal calves production systems		
		Theoretical example A	Theoretical example B	Theoretical example C
Water supply for animals potentially contaminated with <i>T. saginata</i> eggs	Score 4: Use of untreated surface (river/lake) water	4		
	Score 2: Use of treated local water		2	
	Score 1: Use of municipal water			1
Floods potentially spreading <i>T. saginata</i> eggs on the grazing and/or feed components production areas	Score 4: Regularly occurring, with waters known as receiving sewage			
	Score 3: Irregularly occurring, with waters known as receiving sewage	3		
	Score 2: Regularly or irregularly occurring with waters not receiving sewage		2	
	Score 1: No floods			1
Organic wastes potentially contaminated with <i>T. saginata</i> eggs used as fertilisers on grazing and/or feed components production areas	Score 4: Use of untreated sewage	4		
	Score 3: Use of treated sewage			
	Score 2: Use of farm manure		2	
	Score 1: No organic wastes used			1
Potential for <i>T. saginata</i> eggs contamination as related to general animal husbandry	Score 4: Animals kept mainly outdoor, grazing at multiple locations	4		
	Score 3: Animals kept combined indoor (milk-fed) and outdoor (local grazing)		3	
	Score 2: Animals kept in indoor only; milk-fed with some roughage			2
	Score 1: Animals kept in indoor only, milk-fed only			
Potential for <i>T. saginata</i> eggs contamination of roughage.	Score 4: Traceability indicates origin of roughage from high risk geographic areas"			
	Score 3: Roughage used is not traceable; multi –source and multi-component roughage	3		
	Score 2: Roughage used is traceable; multi-source and multi component roughage		2	
Potential for exposure to <i>T. saginata</i> eggs as related to farm location	Score 1: Roughage used is traceable; single-source and single- component roughage			1
	Score 4: Near camping sites	4		
	Score 3: Near bus/railway stations			
Potential for <i>T. saginata</i> eggs exposure as related to calf age	Score 2: Near public footpaths		2	
	Score 1: Isolated			1
	Score 4: >6 months	4		
Potential for <i>T. saginata</i> eggs exposure as related to calf age	Score 3: 3-6 months		3	
	Score 1: <3 months			1

Risk factors potentially contributing to infestation of calves with <i>T. saginata</i> eggs	Risk scoring of different related scenarios	Risk profiles of different veal calves production systems		
		Theoretical example A	Theoretical example B	Theoretical example C
Potential for <i>T. saginata</i> eggs exposure from direct human excrement deposition	Score 4: Unknown number of people accessing grazing area			
	Score 3: Unknown number of people accessing animal housing	3		
	Score 2: Unknown number of people accessing area for feed-components production		2	
	Score 1: Little human access			1
Potential for <i>T. saginata</i> eggs exposure as related to staff-related aspects	Score 4: Staff not trained; high turnover			
	Score 3: Staff not trained, low turnover	3		
	Score 2: Staff trained; high turnover		2	
	Score 1: Staff trained; low turnover			1
<i>T. saginata</i> cysticercosis monitoring/surveillance in animals from the farm area	Score 4: No data available	4		
	Score 3: Irregular, with positive findings		3	
	Score 2: Regular, but infrequent, with positive findings			2
	Score 1: Regular, frequent, no positives			
<i>T. saginata</i> monitoring/surveillance in humans from the farm area	Score 4: No data available	4		
	Score 3: Irregular, with positive findings		3	
	Score 2: Regular, but infrequent, with positive findings			2
	Score 1: Regular, frequent, no positives			
TOTAL SUM		System A: 40 (higher-risk-profile range: 32-43)	System B: 26 (medium-risk-profile range: 21-31)	System C: 14 (lower-risk-profile range: 10-20)

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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:

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Specific comments should include a reference to the relevant section and/or paragraph of the document that the comments refer to.

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