Network for wildlife health surveillance in Europe

Diagnosis Card

Trichinellosis

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Etiology
Parasitic nematodes of the genus *Trichinella*. Nine species (*T. spiralis*, *T. nativa*, *T. britovi*, *T. murrelli*, *T. nelsoni*, *T. pseudospiralis*, *T. papuae*, *T. zimbabwensis* and *T. patagoniensis*) and 3 genotypes (T6, T8 and T9) are genetically and biologically delineated into 2 distinct clades characterized by the presence or absence of an intramuscular collagen capsule (Table 1). Four species are currently encountered in European wildlife: *T. spiralis*, *T. britovi*, *T. pseudospiralis* and *T. nativa*.

Affected species (wildlife, domestic animals, humans)
Broad spectrum of potentially infected species involving domestic or wild mammals, birds, reptiles and humans, on all continents except Antarctica (no report or investigation carried out so far):

**Table 1.** Geographical distribution and host range of *Trichinella* species and genotypes (adapted from Gottstein *et al.*, 2009).

<table>
<thead>
<tr>
<th>Species genotype and Geographical distribution</th>
<th>Typical host range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encapsulated <em>T. spiralis</em> (T1) Cosmopolitan (including <strong>Europe</strong>): Domestic and sylvatic swine, carnivores, synanthropic mammals</td>
<td>Sylvaic carnivores</td>
</tr>
<tr>
<td><em>T. nativa</em> (T2) Arctic and subarctic <strong>Europe</strong>, Asia, and North America</td>
<td>Sylvaic carnivores</td>
</tr>
<tr>
<td><em>Trichinella</em> T6 Subarctic Canada and USA</td>
<td>Sylvaic carnivores</td>
</tr>
<tr>
<td><em>T. britovi</em> (T3) Temperate <strong>Europe</strong> and Asia, and North-Western Africa</td>
<td>Sylvaic carnivores and omnivores, pigs</td>
</tr>
<tr>
<td><em>Trichinella</em> T8 South Africa and Namibia</td>
<td>Sylvaic carnivores</td>
</tr>
<tr>
<td><em>T. murrelli</em> (T5) USA and Southern Canada</td>
<td>Sylvaic carnivores</td>
</tr>
<tr>
<td><em>Trichinella</em> T9 Japan</td>
<td>Sylvaic carnivores</td>
</tr>
<tr>
<td><em>T. nelsoni</em> (T7) Southern Africa</td>
<td>Sylvaic carnivores</td>
</tr>
<tr>
<td><em>T. patagoniensis</em> (T12) Argentina</td>
<td>Cougars</td>
</tr>
<tr>
<td>Nonencapsulated <em>T. pseudospiralis</em> (T4) Sporadically cosmopolitan (including <strong>Europe</strong>):</td>
<td>Sylvaic carnivores, birds of prey, pigs</td>
</tr>
<tr>
<td><em>T. papuae</em> (T10) Papua New Guinea, Thailand</td>
<td>Wild pigs, saltwater crocodiles</td>
</tr>
<tr>
<td><em>T. zimbabwensis</em> (T11) Zimbabwe, Mozambique, Ethiopia, South Africa</td>
<td>Nile crocodiles, monitor lizards</td>
</tr>
</tbody>
</table>

The authors are responsible for the final contents of the card. Please refer to this card when you publish a study for which the APHAEA protocol has been applied. Reference suggestion: «This method is recommended by the EWDA Wildlife Disease Network (www.ewda.org); citation: Authors, Year, APHAEA/EWDA Diagnosis card: [name of disease], www.ewda.org
Epidemiological characteristics and disease course

The *Trichinella* life cycle is characterized by (1) an intestinal or enteral phase that corresponds to the release of larvae into intestinal mucosa, and (2) a muscular phase (or parenteral or systemic) starting with the migration of larvae into blood vessels and their spread throughout the body until reaching their final niche, i.e., the striated skeletal muscles.

*Transmission among animals:* Ingestion of infectious muscle from carrion of a homologous or heterologous species. Human infection: Ingestion of raw or inadequately cooked infected meat (mainly pig, wild boar and horse).

*Domestic cycle:* The focus is on a swine herd being fed, e.g., uncooked pork scraps, carrion, garbage (i.e., garbage-fed pigs), or on pigs allowed to feed on carcasses that are not promptly removed from the farm; synanthropic animals, particularly rodents, living near swine herd can contribute to the domestic cycle. *T. spiralis* and *T. britovi* are the main species involved in domestic cycle in Europe.

*Sylvatic cycle:* In Europe, transmission of the four present *Trichinella* species occurs mainly between wildlife hosts, mainly foxes, wild boars and wolves. Interaction between sylvatic and domestic cycle can occur when poor husbandry practices do not ensure strict separation between pigs and wildlife.

Clinical signs

*In animals:* no clinical signs recognized.

*In humans:* trichinellosis is characterized, during enteral phase, by nausea, diarrhea, vomiting, fatigue, fever and abdominal discomfort; and, during muscular phase, by muscle pains, headaches, fever, facial and eye swelling (edema), aching joints, chills, cough and itchy skin. More severe cases are possible including difficulties with coordinating movements, heart and breathing problems.

Gross lesions

No macroscopic lesions induced by *Trichinella* infection.

Histological lesions

Encapsulated or free larvae in the muscle.

Differential diagnosis

Other migrating nematode larvae recovered by digestion assay and/or leading to flu-like symptoms.

Criteria for diagnosis

*Morphological criteria:* Muscle larvae recovered by digestion assay are 1 mm long and 30 µm wide, contain stichosomes, and are not morphologically distinguishable to species or genotype.

*Molecular identification:* Multiplex PCR analysis generates DNA products that are unique in size for each species and genotype of *Trichinella* (Zarlenga et al., 2009).

Recommended diagnostic method(s) and preferred samples (incl. recommended amount and appropriate storage)

Digestion assays are the only recommended procedures for the reliable detection of *Trichinella* larvae in meat. Different digestion assays are officially recognized in various countries for trade purposes. Assays other than those recommended by the International Commission on Trichinellosis (ICT) (documented standards in the EU, Canada or the USA) are not recommended. Trichinoscopy (examination of tiny pieces of meat by stereomicroscopy) is less sensitive and may be useful for rapid preliminary diagnosis. The EU reference method for the detection of *Trichinella* larvae in meat is the magnetic stirrer method for pooled sample digestion (protocol in annex I, chapter 1 of the EC regulation 2075/2005; EEC, 2005). Analysis on fresh meat is recommended for human consumption. Freezing muscles prior to the artificial digestion is possible for epidemiological study on wild animals not designated for human consumption. The tongue and diaphragm of animals are main recommended sampling sites for the detection of all species/genotypes of *Trichinella* (Gajadhar et al., 2009).

**Table 2.** Predilection sites for *Trichinella* larvae in a few wild host species and size of samples to be examined.

<table>
<thead>
<tr>
<th>Animal species</th>
<th>Predilection sites</th>
<th>Sample weight to be examined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wild boar (<em>Sus scrofa</em>)</td>
<td>Forearm muscles, diaphragm, tongue</td>
<td>5 g</td>
</tr>
<tr>
<td>Fox (<em>Vulpes spp.</em>)</td>
<td>Diaphragm, forearm muscles, tongue</td>
<td>5 g at least</td>
</tr>
<tr>
<td>Bear (<em>Ursus spp.</em>)</td>
<td>Diaphragm, tongue, masseter muscle</td>
<td>10 g</td>
</tr>
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</table>

Serology using the excretory/secretory antigens ELISA is recommended by ICT only for...
epidemiological surveys.

**APHAEA protocol** (for harmonization at large scale)

Digestion assays as recommended by the International Commission on Trichinellosis.

**Laboratories that can be contacted for diagnostic support**

French NRL for Parasites transmitted by food, Anses, France (www.anses.fr/en)

EU Reference Lab for parasites, Istituto Superiore de Sanita, Italy (www.iss.it/crlp/index.php)

**Recommended literature**


