Trichinellosis – infections from the domestic and sylvatic cycles in Germany

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Meat inspection for Trichinella larvae

Data for domestic animals and game in Germany (2004-2013)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Prevalence (%)</th>
<th>Horses</th>
<th>Wild Boar</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>50.27</td>
<td>11,906</td>
<td>3.16 Mio</td>
</tr>
<tr>
<td>2005</td>
<td>53.19</td>
<td>11,699</td>
<td>0.003</td>
</tr>
<tr>
<td>2006</td>
<td>55.07</td>
<td>11,699</td>
<td>0.003</td>
</tr>
<tr>
<td>2007</td>
<td>54.05</td>
<td>11,699</td>
<td>0.003</td>
</tr>
<tr>
<td>2008</td>
<td>54.06</td>
<td>11,699</td>
<td>0.003</td>
</tr>
<tr>
<td>2009</td>
<td>49.99</td>
<td>11,699</td>
<td>0.003</td>
</tr>
<tr>
<td>2010</td>
<td>49.99</td>
<td>11,699</td>
<td>0.003</td>
</tr>
<tr>
<td>2011</td>
<td>49.99</td>
<td>11,699</td>
<td>0.003</td>
</tr>
<tr>
<td>2012</td>
<td>49.99</td>
<td>11,699</td>
<td>0.003</td>
</tr>
<tr>
<td>2013</td>
<td>49.99</td>
<td>11,699</td>
<td>0.003</td>
</tr>
</tbody>
</table>

*Source: Federal Office for Statistics, NRL Trichinellosis

Risk for Trichinella infection is negligible in:
- indoor pigs
- horses
Very low in:
- outdoor/backyard pigs
Low in:
- wild boar

Trichinella species in domestic pigs and wild boar

Trichinella species identification (2002-2014)

<table>
<thead>
<tr>
<th>Trichinella species</th>
<th>No.</th>
<th>Larvae per g (lpg)</th>
<th>mean</th>
<th>median</th>
</tr>
</thead>
<tbody>
<tr>
<td>T. spiralis</td>
<td>74</td>
<td>0.01-1942</td>
<td>127</td>
<td>16</td>
</tr>
<tr>
<td>T. pseudospiralis</td>
<td>17</td>
<td>0.04-362</td>
<td>53</td>
<td>3.7</td>
</tr>
<tr>
<td>T. britovi</td>
<td>5</td>
<td>0.2-12</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>T. spiralis/T. britovi</td>
<td>1</td>
<td>1</td>
<td>195</td>
<td>-</td>
</tr>
<tr>
<td>T. spiralis/T. pseudospiralis</td>
<td>1</td>
<td>1</td>
<td>602</td>
<td>-</td>
</tr>
</tbody>
</table>

Trichinella monitoring in Germany (2011)

Red foxes
- 3154 foxes were sampled from 9 Federal States
- 10 Trichinella-positive foxes, overall prevalence 0.3%
- positive findings in 5 Federal States regional prevalence 0%-1.4%
- highest prevalence in North-Eastern/ Eastern regions

Raccoon dogs
- hunting bag (MV) approx. 20.000
- 117 raccoon dogs examined in MV
- 3 Trichinella positive (2.6%)
### Trichinella species in wild animals

#### Trichinella species identification (2002-2014)

**Fox (29 isolates)**

<table>
<thead>
<tr>
<th>Trichinella species</th>
<th>No.</th>
<th>%</th>
<th>Larvae per g (lpg)</th>
<th>average (lpg)</th>
<th>median (lpg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>T. spiralis</em></td>
<td>14</td>
<td>48</td>
<td>0.35-6</td>
<td>2.5</td>
<td>1.2</td>
</tr>
<tr>
<td><em>T. britovi</em></td>
<td>9</td>
<td>31</td>
<td>2.2-218</td>
<td>60</td>
<td>10</td>
</tr>
<tr>
<td><em>T. nativa</em></td>
<td>2</td>
<td>7</td>
<td>6-112</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>T. pseudospiralis</em></td>
<td>1</td>
<td>3.5</td>
<td>2.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>T. spiralis</em>/T. nativa</td>
<td>1</td>
<td>3.5</td>
<td>2.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>T. spiralis</em>/T. pseudospiralis</td>
<td>1</td>
<td>3.5</td>
<td>7.6</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Raccoon dog (39 isolates)**

<table>
<thead>
<tr>
<th>Trichinella species</th>
<th>No.</th>
<th>%</th>
<th>Larvae per g (lpg)</th>
<th>average (lpg)</th>
<th>median (lpg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>T. spiralis</em></td>
<td>31</td>
<td>78</td>
<td>0.05-210</td>
<td>67</td>
<td>5</td>
</tr>
<tr>
<td><em>T. pseudospiralis</em></td>
<td>4</td>
<td>11</td>
<td>0.41-6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>T. britovi</em></td>
<td>2</td>
<td>5.5</td>
<td>331</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>T. spiralis</em>/T. pseudospiralis</td>
<td>3.5</td>
<td>160-138</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Trichinella isolates - spatial distribution

#### Isolates from domestic and wild animals (2002-2014)

Human trichinellosis in Germany

- 88 notified cases from 2001-2015 (average: 6.3 cases/year; median: 3 cases)
- outbreak clusters 2006: in Mecklenburg-Western Pomerania (15 cases, pork)
  - 2007: in Bavaria (3 cases, pork)
  - 2013: in Saxony (14 cases, wild boar)
  - 2015: in Baden-Württemberg (8 cases, pork)

#### Imported cases in immigrants

- Schleswig-Holstein
- Hamburg
- Lower Saxony
- Bremen
- North-Rhine Westfalia
- Hesse
- Rhineland-Palatinate
- Baden-Württemberg
- Bavaria
- Saarland
- Berlin
- Brandenburg
- Mecklenburg-Western Pomerania
- Saxony
- Saxony-Anhalt
- Thuringia

Study group: 95 cases (1996-2006)

- trichinellosis cases in immigrants (30)
  - (incl. countries from former Yugoslavia)
- trichinellosis cases in Germans (65)

Percentage of immigrants in the population

- trichinellosis cases in immigrants (30)
  - <= 0-0.5%
  - >0.5-1%
  - >1-1.5%
  - >1.5-2%

- Incidence rate: Germans: <0.01/100,000
- Immigrants: 0.30/100,000

Epidemiology of Trichinellosis in Germany, 1996-2006
Imported trichinellosis outbreak (Baden-Württemberg, 2015)

- in February 2015 a patient was admitted to hospital with clinical symptoms, incl. massive diarrhoea and weight loss, myalgia, fever and oedema
- further 8 cases in Germany

Background
- a family member spent Christmas in Serbia with relatives, backyard pig slaughtered at local butchery, Trichinella examination allegedly performed,
- sausage was brought back to Germany as a gift

Laboratory confirmation at BfR (digestion method, TrichinL, serology)
- 249 larvae per g
- spezies: Trichinella spiralis

6 people hospitalized, one patient’s life was in danger (myocarditis due to Trichinella infection?)
- 3 patients report substantial discomfort/disorders after end of therapy
- reports of 16 further cases in Serbia
- Serbian veterinarian prohibited to exercise his profession in future

Trichinellosis outbreak – autochthonous (Saxony, 2013)

Background
- accidental mix up of samples from a Trichinella-positive wild boar carcass with a negative carcass
- approx. 6 kg of positive wild boar meat was processed to raw sausages (batch: 105 kg); 1050 sausages (each 100 g) were sold at 5 mobile stalls
- the problem was identified two days after sale >>> warning and recall campaign

Imported trichinellosis outbreak (Baden-Württemberg, 2015)

- raw sausages were sold during 2 days in 9 cities in an 6300 km² (90 x 60 km) area
- 101 persons reported themselves as exposed
- 84 were confirmed as exposed
Trichinellosis outbreak – autochthonous (Saxony, 2013)

Examined ‘Knacker’ from 5 households: 2x negative (Dresden and Görlitz) 3x positive (39-125 larvae per sausage)

Laboratory findings: BfR
- 21 Trichinella-positive persons (IgM/IgG ELISA)

Follow-up study: RKI (71 persons)
- 90% of exposed people consumed ≥ 1 sausages within two days after production
- clinical signs
  - 26% diarrhoea
  - 17% abdominal pain
  - 13% fever
  - 13% periorbital edema
  - 19% muscle pain
- two patients hospitalized

Notification
- 14 cases – case definition: (1) exposure to food, (2) clinical sign, (3) positive ELISA

Prophylactic treatment
- prophylactic treatment with Mebendazole of 37 persons w/o symptoms and known exposure
- PEP < 6 days p.i. no trichinellosis case
- PEP > 6 Tage p.i. all cases (6)

administration of prophylactic treatment ASAP!

Conclusions
- trichinellosis cases in Germany are rare but may occur either as imported or autochthonous cases
- since Trichinella is prevalent in the sylvatic cycle in Germany, meat from wild boars and outdoor pigs may be of public health concern
- Trichinella meat inspection should follow the risk based approach:
  - systematic examination of animals which are at risk of Trichinella infection
  - exemption of animals where the risk is negligible
- information of hunters concerning proper discarding of carcasses
- information of consumers of the risk of raw meat consumption
- information of physicians on the nature and cause of trichinellosis; aim: early diagnosis and treatment
Acknowledgements

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Thank you for your attention

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