**Epidemiology of *Taenia multiceps***
in animals and humans of Europe and control strategies

*Antonio Varcaasia*

**Adult size:** 40-80 cm  
**Prepatent period:** 41-120 DAYS  
**Proglottids mobility:** YES  
**Eggs/proglottid:** 37,000  
**Eggs particular signs:** NONE  
**Eggs resistance:** 42-60 DAYS (T/UV)
• Adult size: 40-80 cm
• Prepatent period: 41-120 DAYS
• Proglottid mobility: YES
• Eggs/proglottid: 37,000
• Eggs particular signs: NONE
• Eggs resistance: 42-60 DAYS (T/UV)
Other definitive hosts for Coenurosis?

“Fox doesn’t seem a good host for Coenurosis as they can’t break the skull of sheep” [Deiana, 1971]
Primary DH: shepard dogs
Other DH: foxes, wolves

- WILD definitive hosts can change epidemiological scenario and control
Pre-patent period: 18-21 DD
Acute forms: 21-40 DD
Chronic forms: 6-18 MM
Pre-patent period: 18-21 DD
Acute forms: 21-40 DD
Chronic forms: 6-18 MM
**Seasonal trend of coenurosis**

Willis 1984, UK; Scala 2006, Sardinia; Varcasia 2015, Sardinia

<table>
<thead>
<tr>
<th>Month</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>October-November</td>
<td>Births and replacements; lambs selection</td>
</tr>
<tr>
<td>January-March</td>
<td>Indoor breeding of replacements</td>
</tr>
<tr>
<td>March</td>
<td>Replacements on pasture</td>
</tr>
<tr>
<td>April-May</td>
<td>Acute infection after 18-21 days of prepatence; Coenurus cherry size</td>
</tr>
<tr>
<td>June</td>
<td>Mating season</td>
</tr>
<tr>
<td>July</td>
<td>Dry season, most eggs are killed by UV and high T °</td>
</tr>
<tr>
<td>September-October</td>
<td>Coenurus start to be mature</td>
</tr>
<tr>
<td>September-October</td>
<td>Clinical symptomatology in relation to the localization of cysts;</td>
</tr>
<tr>
<td></td>
<td>- Death of the animal in few months;</td>
</tr>
<tr>
<td></td>
<td>- Max exposure of dogs and other hosts to parasites</td>
</tr>
<tr>
<td></td>
<td>- In pregnant animals is observed a stop of parasitic growth and</td>
</tr>
<tr>
<td></td>
<td>symptomaticology</td>
</tr>
</tbody>
</table>

**Sheep**

- Taenia multiceps

**Taenia multiceps**

- Eggs of T. multiceps
- Oncosfere maturation
- Coenurus cherry size
- Coenurus start to be mature
- Coenurus reach complete development

**Only one?**
- Only in sheep?
- Only in the SNC?
- Only in young animals?
Only one?  
Only in sheep?  
Only in the SNC?  
Only in young animals?
Only one?
Only in sheep?
Only in the SNC?
Only in young animals?
Short communication

Molecular characterization of subcutaneous and muscular coenurosis of goats in United Arab Emirates


a Dipartimento di Malattie Zoovederne e Biotecnologie, University of Milan, Italy
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d Dipartimento di Scienze Ambientali e Agrobiologiche, University of Milan, Italy

Abstract: Coenurosis is a zoonosis caused by Dipylidium caninum, a cestode that parasitizes the subcutaneous and muscular tissues of domestic and wild animals. The aim of this study was to investigate the prevalence and molecular characterization of D. caninum in goats in the United Arab Emirates (UAE).

Materials and methods: A total of 120 goats from 10 different farms in the UAE were examined. A total of 1200 muscles and subcutaneous tissues were collected from the goats and examined for the presence of D. caninum. DNA was extracted from the tissues and the CO1 mitochondrial gene was amplified and sequenced.

Results: D. caninum was found in 20% of the goats examined. The CO1 gene sequence obtained from the infected goats was compared with previously published sequences. The sequence obtained was found to be identical to the sequence of D. caninum from other regions of the world.

Conclusion: Coenurosis is a significant problem in goats in the UAE. Molecular characterization of the parasite is important for understanding the epidemiology of the disease and for developing effective control strategies.

Table 1: Prevalence of Coenurosis in Goats (in %)

<table>
<thead>
<tr>
<th>Farm</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm A</td>
<td>20%</td>
</tr>
<tr>
<td>Farm B</td>
<td>20%</td>
</tr>
<tr>
<td>Farm C</td>
<td>20%</td>
</tr>
<tr>
<td>Farm D</td>
<td>20%</td>
</tr>
<tr>
<td>Farm E</td>
<td>20%</td>
</tr>
<tr>
<td>Farm F</td>
<td>20%</td>
</tr>
<tr>
<td>Farm G</td>
<td>20%</td>
</tr>
<tr>
<td>Farm H</td>
<td>20%</td>
</tr>
<tr>
<td>Farm I</td>
<td>20%</td>
</tr>
<tr>
<td>Farm J</td>
<td>20%</td>
</tr>
</tbody>
</table>

Fig. 1: Phylogenetic tree of D. caninum CO1 gene sequences from different regions of the world. The tree was constructed using the neighbor-joining method.
• The results of this study support the association of *T. multiceps* variability with the geographical origin of the isolates.

• Genetic distances of isolates suggest that the development of cerebral coenurosis in sheep may be an ancestral property of *T. multiceps*.

• All variants are therefore able to produce cerebral forms, but only some variants have acquired the additional capacity to affect the brain of other species (goats and cattle) or to produce non-cerebral forms, mostly in goats and more rarely in sheep.
70 human cases have been reported in literature [China/URSS?]

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Table I. Clinical details of the cases

<table>
<thead>
<tr>
<th>Case no.</th>
<th>Sex</th>
<th>Age</th>
<th>Neurological sign(s)</th>
<th>Cyst(s)</th>
<th>Location</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M, 20y</td>
<td>Drowsiness, bilateral papilledema, right hemiparesis</td>
<td>Single</td>
<td>Intracerebral (left P.P. reg.)</td>
<td>6 years able to work, drank for road accident</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>F, 51y</td>
<td>Seizures, psychogenic seizures, headache, drowsiness</td>
<td>Multiple</td>
<td>Cerebral (left anterior, right posterior)</td>
<td>50 years able to work, normal, improvement, drank for recurrent infections</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>M, 52y</td>
<td>Headache, drowsiness</td>
<td>Single</td>
<td>Intracerebellar (lateral region of the right hemisphere)</td>
<td>30 years able to work, normal, intact</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>M, 56y</td>
<td>Seizures, bilateral papilledema, left hemiparesis</td>
<td>Multiple</td>
<td>Intracerebral (right frontal region, left frontal-polar region, cerebellar)</td>
<td>5 years able to work, normal, intact</td>
<td></td>
</tr>
</tbody>
</table>

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RACEMOSE CYSTICERCUS IN HUMAN BRAIN
A CASE REPORT

Michael B. Sig, Peter M. Schantz, and Jerrold A. Turner

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Human Cysticercosis in North America: Case Reports and Review

Michael B. Sig, Peter M. Schantz, and Jerrold A. Turner

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[Abstract]

A case of chronic encephalitis meningitis is described, which caused considerable diagnostic difficulties. Postmortem examination revealed parenchymal lesions, which were consistent with the diagnosis of chronic encephalitis meningitis. Although some of the symptoms were similar, the authors suggest in the discussion that the case was related to the laminar form of the cysticercus Taenia solium. The case was characterized by a chronic, progressive, destructive process involving the brain, with the development of multiple cysts. The authors also describe the clinical features and the diagnostic difficulties encountered in this case, emphasizing the importance of early and accurate diagnosis to prevent complications. The case report highlights the importance of considering this rare condition in the differential diagnosis of chronic meningitis and encephalitis.
INTRA-MEDULLARY CYST OF THE SPINAL CORD DUE TO THE CESTODE MULTICEPS MULTICEPS IN THE COENURUS STAGE

REPORT OF A CASE

by

J. W. LANDELS
From the Brompton Bone Institute of Pathology, London Hospital

MRS Findings in Cerebral Coenurasis due to Taenia Multiceps

Suheeb Amtekar, MBBS, Chandrakant Prasad, DM, Srinivas Dronedarth, MCh, Arthra Maheshwari, MD
From the Department of Neurology, National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore, Karnataka, India

ABSTRACT

Cerebral coenurasis due to Taenia multiceps is a rare infection with no reports from India. A 55-year-old male patient presented with progressive symptoms of hemiparesis of 3-year duration. Magnetic resonance imaging (MRI) with magnetic resonance spectroscopy (MRS) of the brain was performed that showed a multi-varicose lesion in the left parieto-occipital lobe. Multispectral MRS through the lesion was performed using repetition time of 1500 ms and time to echo of 144 ms at 3T. MRS showed mildly elevated choline (Cho), decreased creatine (Cr), and N-acetyl aspartate (NAA), a large peak of lactate, glycerol, and acetate bands. To best of our knowledge, there has been no reported case of MRS findings of coenurasis. We present MRS findings in this exceedingly rare case of T. multiceps cyst of the brain.

Coenurus Infestation of Eye and Orbit

Wenlin A. Mauchle, MD

- Histopathological examination of an eye with a subconjunctival nodule and a subcutaneous nodule in a 45-year-old woman, and of an orbital cystic tumor in a 5-year-old girl, showed the presence of Coenurus. The histological examination of these specimens revealed the presence of Coenurus infestation. The presence of Coenurus infestation is rare, but it is important to be aware of the possibility.

Case report

Huge intraparenchymal cyst caused by Taenia multiceps in a child

Case report

MONI BENELA, M.D., RASANI BARLELE, M.D., ILAN SHIRE, M.D., JOSIP EL-OON, M.D., and EMMANUEL AGA, M.D.
Departments of Neurology, Neurosurgery, and Pediatrics, Soroka University Medical Center and Ben-Gurion University of the Negev, Beer-Sheva, Israel
Per single animal/Euro

| Animal value at market (2 months lamb) | 120 |
| Feeding and farming for 12 months | 136 |
| Anthelmintic treatment with Praziquantel | 60 |
| Surgery | 250 |
| Lost production of meat (lamb) and milk (120L/55C) | 70+70 |
| Genetic selection lost | ? |
| Emergence Slaughtering | 6+30 |
| Carcass disposal | 100 |

Average prevalence in replacements: 5%
Even each year we have farm with 50 to 100% prevalence

Diagnosis

- Farm history and management
- Neurological symptoms in young animals
- Acute gid: 3-4 months
- Chronic forms 8-18 months
- Imaging is often necessary, CT or MRI

Control

- Sanitary education
- Control and anthelmintic treatment of dogs
- What about wild definitive hosts?
- Culling of infected animals and skull disposal
- Anthelmintic treatment in acute forms
- Surgery in chronic forms
- Vaccination
### Experimental anthelmintic protocols in acute forms in sheep [Verster et al. 1982]

<table>
<thead>
<tr>
<th>Drug</th>
<th>Posology</th>
<th>days</th>
<th>Eggs x 1000</th>
<th>Efficacy</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Praziquantel</td>
<td>25mg/kg i.m.</td>
<td>3 gg</td>
<td>5500</td>
<td>42.8%</td>
<td>65% degenerated cysts</td>
</tr>
<tr>
<td>Albendazole</td>
<td>100mg/kg i.m.</td>
<td>14 gg</td>
<td>2500</td>
<td>28.5%</td>
<td>75% degenerated cysts</td>
</tr>
<tr>
<td>Praziquantel</td>
<td>100mg/kg i.m.</td>
<td>5 gg</td>
<td>5500</td>
<td>100%</td>
<td>40mm Coenurus sterile</td>
</tr>
<tr>
<td>Praziquantel</td>
<td>100mg/kg i.m.</td>
<td>3 gg</td>
<td>5500</td>
<td>100%</td>
<td>40mm Coenurus sterile</td>
</tr>
<tr>
<td>Praziquantel</td>
<td>100mg/kg i.m.</td>
<td>5 gg</td>
<td>5500</td>
<td>100%</td>
<td>Small coenurus sterile</td>
</tr>
<tr>
<td>Praziquantel</td>
<td>100mg/kg i.m.</td>
<td>5 gg</td>
<td>5500</td>
<td>100%</td>
<td>4 small cysts degenerated</td>
</tr>
<tr>
<td>Praziquantel</td>
<td>100mg/kg i.m.</td>
<td>2 gg</td>
<td>5500</td>
<td>100%</td>
<td>3 small cysts degenerated</td>
</tr>
</tbody>
</table>

- **74% complete recovery**
- **8.5% partial recovery**

Sanna Passino E. et al. 2006
Immunity

- The first parasites entering the body survive and grow, but immunity is generated against further parasitic insults.
- It is difficult to generate immunological control of the developing parasite, but immunity can be easily stimulated against new invaders.

Vaccines & antigens

- Extracts (antigens) of the oncospheres are able to induce protection against challenge infection.
- This molecule has been cloned, and expressed in a number of systems, and all are able to produce protein that can induce protective responses.
- In the past years following this protocol a TM16 Vaccine has been produced in lab and field testing give very good results.

How does Protection occur?

- In vitro studies have shown that protection (killing of invading oncospheres) can be the result of antibody-specific complement-mediated lysis.
- Both IgG1 and IgG2 are able to fix complement in the lytic attack against invading oncospheres.
- Leukocytes from immune hosts also lodge on microvilli being created by the developing metacestode.
After a period of more than 40 months from the beginning of the field trial, 33 episodes of cerebral coenurosis occurred in the monitored farms, including 32 cases in control sheep and 1 case in a vaccinated animal ($x^2 = 14.08, P < 0.001$).

- This is the first successful field test of a practical vaccine against T. multiceps and, considering the high degree of effectiveness achieved, could be a prelude to routine application in field situations of particular risk.

- But, it’s only another “orphan vaccine”