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Canine metacestodes in an organized sheep farm

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Abstract

Infections with the larval stages of canine tapeworms were recorded in sheep belonging to an organized sheep farm. Asymptomatic presence of *Cysticercus tenuicollis*, metacestode of *Taenia hydatigena*, in the peritoneal cavities of sheep, was encountered during necropsy. Deaths in lambs due to peracute and subacute *hepatitis cysticercosa* were recorded. The fact that *C. tenuicollis* lacks the characteristic armed rostellum during the early stages should be taken into account during diagnosis of peracute cysticercosis. During the lean months of winter, overwhelming chronic infection with 53 cysts of *C. tenuicollis* resulted in death of a hogget. Non-viable, calcified cysts, apparently those of *C. ovis* (intermediate stage of *T. ovis*), were documented in the heart muscles of four ewes. Death following cerebral signs of a ewe was attributed to the presence of a single *Coenurus cerebralis* cyst (larval stage of *T. multiceps*) in the occipital region of the cranial cavity. The presence of *Coenurus* acquires public health importance owing to its zoonotic potential. Hydatid cysts were not recorded in any of the sheep. The study shows the importance of restricting access of canids in sheep farms and pastures. Removal of fecal pats of domestic dogs from areas grazed by lambs will prevent fatal cysticercosis caused due to ingestion of gravid proglottids.

Keywords: Sheep, canine cestodes, *Taenia hydatigena*, *T. ovis*, *T. multiceps* metacestode

Introduction

Tapeworms of the genus *Taenia* are primarily parasites of carnivores, including domestic dogs. The adult cestodes inhabit the alimentary canals of these definitive hosts. The eggs voided in the faeces contaminate the pasture and are inadvertently consumed by the herbivore intermediate hosts during grazing. The larval stages, called as metacestodes, develop in these herbivores and are finally acquired by the definitive hosts by carnivorism or scavenging [1] *Taenia multiceps* is a cestode parasite with its larval stage (metacestode), *Coenurus cerebralis*, mainly encysts in the central nervous system of sheep and other livestock causing cerebralis coenurosis. Sheep are one of the important intermediate hosts for the Taeniid parasites of dogs. Consequently, sheep harbour the metacestodes of these tapeworms in their tissues, leading to death or condemnation of whole or parts of infected carcasses [2]. The presence of dogs in sheep farms facilitates such disease transmission. Additionally, sheep may also acquire infection from the wild canids that contaminate the pasture with Taeniid eggs. Cysticercosis has emerged as a cause of severe neurologic diseases in the United States that primarily affects immigrants from Latin America [3]. Moreover, the relevance of cysticercosis as a public health problem is highlighted by local transmission. The presence of the sheep-dog cycle in the farm may also expose the humans to those tapeworms that are zoonotic [4]. Migration of cysticerci can lead to formation of haemorrhagic and fibrotic tracts, serofibrinous peritonitis in the liver with heavy infections leading to traumatic hepatitis and death in young lambs depending upon the organ involved, infestation of the parasite and other concurrent infections [5]. The present paper reports the incidence and course of certain canine metacestode infections in sheep from an organized sheep farm.

Materials and methods

During the summer of 2010, a three month old, apparently healthy ram lamb (R1) belonging to the Sheep Breeding Research Station (SBRS), Sandynallah died suddenly. Another ewe lamb (E1) from the same batch died within three weeks after briefly exhibiting clinical signs of debility and anorexia. A hogget (R2) from the same flock died after nine months during the harsh, winter of 2011 after a prolonged bout of debility.

Another ewe (E2), which had been exhibiting clinical signs of circling and running into obstacles, died after becoming recumbent for two days. Necropsies were conducted on all the carcasses. Wherever possible, representative tissue pieces were collected for routine histopathological examination. Data from other necropsies conducted from 2009 to 2012 were also analyzed to find out the presence or evidence of canine metacestode diseases.

Results and Discussion

Cysticercus tenuicollis cysts were occasionally detected from the peritoneal cavities of sheep that died due to unrelated aetiology. Necropsy of R1 revealed that the animal had died due to severe traumatic hepatitis, with the presence of unclotted blood in the peritoneal cavity. The liver was criss-crossed by numerous haemorrhagic tracts, with small cystic bodies of less than 5 mm diameter protruding out at various places (Fig. 1a). The haemorrhagic peritoneal transudate was full of such small cystic bodies (Fig.1a). Section of liver revealed the presence of hundreds of such cysts in the parenchyma (Fig. 1b). Lungs showed discrete haemorrhagic foci, with the presence of cysts. Microscopy of the cysts revealed the presence of a thickened anterior region (Fig.1b) without any rostellum. Histopathology revealed cut section of bladder worm cysts in the liver, with multifocal moderate haemorrhage and multifocal mild subacute periportal hepatitis.

The second animal (E1) was emaciated. The liver showed the presence of the scars (Fig.2a). More than 25 cystic bodies, each measuring 10 to 15 mm diameter were found in the peritoneal cavity attached to the mesentery (Fig.2a). The cysts showed the presence of armed rostellum on microscopy. Histopathologically, liver revealed multifocal mild subacute periportal hepatitis and focal necrosis. Mesentery revealed cut section of bladder worm cysts.

The hogget R2 showed necropsy lesions of emaciation with depleted fat depots and congestion of atrio-ventricular junction. The liver was apparently normal. However, there were numerous, grape-like bunches of cysts attached to the liver and mesentery, (Fig. 2b). A total of 53 cysts (Fig. 2c), each cyst measuring about 8 cm diameter and weighing totally around 500 g, were seen. Microscopically, liver revealed focal areas of necrosis with calcification and mild bile duct hyperplasia.

The ewe E2 died after becoming recumbent for two days, exhibiting clinical signs of circling and blind staggering. On necropsy, there were lesions of toxemia, with ecchymotic haemorrhages of the diaphragm. The cranial cavity revealed the presence of about 25 ml of clear fluid. The cerebral cortex was severely congested and injected. A single cyst (Fig 3a), was found in the occipital region of the cranial cavity. The cyst was about 3 cm in diameter with numerous armed scolices, and was identified as *Coenurus cerebralis*, the metacestode of *T. multiceps*. Microscopically, diaphragm revealed focal severe haemorrhage. Thymus and lung revealed diffuse severe haemorrhage. Heart revealed diffuse mild myocardial haemorrhage. Kidney showed diffuse severe congestion.

Necropsy of sheep of the station for the period from 2009 to 2012 revealed only four cases of cysticercosis of the heart. Creamy white cysts of 5 to 10 mm diameter were found embedded in the muscles of the heart (Fig.3c) of four ewes. The cysts appeared calcified and contained caseous material. Microscopy of the contents and histopathology did not reveal the presence of scolex. Sections of myocardium revealed

moderate congestion, focal granulomatous and necrotic myocarditis. No acid fast bacilli or any other bacteria or fungi could be detected.

Hydatid cyst infection was not recorded in any of the sheep necropsied at the station during this period.

The necropsy lesions of lamb R1 revealed that the cause of death was peracute cysticercosis resulting from an overwhelming infection by *C. tenuicollis* in the liver and lungs. It is likely that the inexperienced lamb consumed entire gravid proglottid (s) of *T. hydatigena*, expelled along with the faeces of dogs, during grazing. The simultaneous emergence of the thousands of hexacanth embryos, and their subsequent migration through liver had caused traumatic hepatitis leading to haemorrhage and instantaneous death, a condition called as *hepatitis cysticercosa* [6]. During this early stage, the parasites had not developed the characteristic armed rostellum and this might lead to confusion in the diagnosis. Peracute *hepatitis cysticercosa* is also called as 'reverse fasciolosis' as it mimics peracute fasciolosis. The necropsy lesions of both these conditions are strikingly similar, characterized by the presence of traumatic hepatitis and haemorrhagic pneumonia. In peracute fasciolosis, the causative agent, immature *Fasciola* sp., penetrates into the organs from outside whereas in *hepatitis cysticercosa*, the cysts migrate from inside the organs out into the body cavities. The similarity of these two disease entities in sheep had earlier initiated investigations on cross protection, which was later proven to be non-existent [7]. The conditions can be differentiated only by demonstrating the causative parasites. In case of putrefied carcasses, diagnosis depends on identifying the anterior cone with suckers of *Fasciola* or the armed rostellum in case of *C. tenuicollis*. The absence of armed rostellum, thus, can sometimes be confusing, leading to misdiagnosis.

Death of lamb E1 was due to subacute cysticercosis of the liver. Though the intensity of infection was not high, the emergence of the numerous cysts from the liver had led to extensive scarring and hepatic insufficiency resulting in anorexia, debility and death. At this stage, the cysts had developed the characteristic armed rostellum, thus making definitive diagnosis easy.

From the necropsy lesions, it was deduced that this lamb R2 died due to chronic *cysticercosis tenuicollis*. It had survived the peracute and acute phases of the disease despite harbouring a considerably heavy number of cysts, due to abundance of pasture and a higher plane of nutrition. However, during the harsh winter, which was characterized by severe drought and lack of pasture, the competition for nutrients with an abnormally high parasite load had led to emaciation and death of this animal. Cysts of *C. tenuicollis* are routinely detected during necropsy of ruminants. In adult sheep 47.4 percent incidence was recorded in slaughter [8]. Ruminants usually tolerate the presence of a few cysts. In the present case, parasitism by a large number of cysts (53), weighing almost 500 g in a 15 kg animal, coupled with a low plane of nutrition, had resulted in debility and death. Heavy infection, with the presence of up to 117 cysts has been recorded earlier [6].

The cause of death of ewe E2 was gid or stagger. Coenurosis has been recognized as one of the important causes of neurological manifestations in sheep [3]. It can also be a potential threat to the farm workers as it has been recognized as one of the important, but underdiagnosed causes of neurological disease in humans [9].

Though no rostellum could be demonstrated in any of the cysts found in the heart of the four ewes, the location and

appearance of the cysts lead to the presumptive diagnosis of *C. ovis*, the metacestode of *T. ovis*. The cysts of *T. ovis* generally degenerate with a green or cream center [10]. It was apparent that the cysts were not the cause of death in any of the animals. Cysticercosis due to *T. ovis* is one of the important causes of condemnation of the sheep carcasses and the prevalence has been directly correlated to scavenging by dogs in the farms [4]. The low prevalence in sheep in the present study consequently indicates a low rate of infection in the dogs [11].

Hydatid cyst infection is one of the common findings in sheep in India [12] and has been recorded from caged rabbits of this station [13]. However, it was not recorded in any of the sheep necropsied at the station.

The Sheep Breeding Research Station extends over an area of about 700 acres and is contiguous with the Sandynallah reserve forest. The station maintained a unit of sheep dogs until 1998, after which it was discontinued. However, due to

the proximity to the reserve forest, wild canids including golden jackals (*Canis aureus*) and red jungle dogs (*Cuon alpinus*) have free access to the pastures of the station. Jackals have been recorded as a natural host for *T. hydatigena* [2]. Apart from these wild canids, feral dogs also frequent the pastures. All these canids can serve as definitive hosts for numerous cestodes including *T. hydatigena*, *T. multiceps* and *T. ovis* and can act as potential sources of infection for the sheep, which acquire the eggs from the contaminated pastures. Limiting access of canids, especially domestic dogs, in sheep farms and pastures will not only reduce loss due to death and condemnation of sheep carcasses, but also prevent transmission of zoonotic diseases like coenurosis and echinococcosis to humans [14]. Alternatively, prompt removal of fecal pats of domestic dogs in areas of pasture where lambs graze will prevent occurrences of fatal cysticercosis due to accidental ingestion of gravid proglottids.



Fig 1: Peracute hepatitis cysticercosa in a lamb showing (a) traumatized liver with haemorrhagic tracts and the presence of numerous small cystic bodies (arrowheads) of *Cysticercus tenuicollis* protruding from the organ. Inset shows the abundance of cysts in a scoop from the bloody peritoneal exudate. (b) Cut section of the liver showing hundreds of cysts of *C. tenuicollis* in the parenchyma. Inset shows absence of a rostellum and the thickened region of the cyst which would eventually develop into a rostellum.

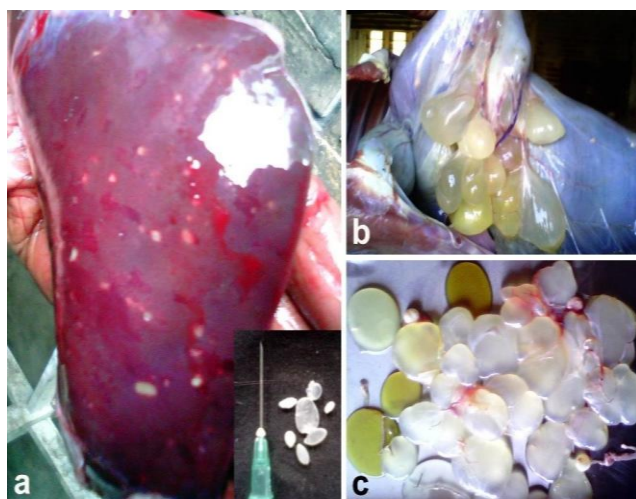


Fig 2: Extensive scarring of the liver (a) of a lamb, apparently caused by the emergence of *C. tenuicollis*, in a case of subacute hepatic cysticercosis. Some of the cysts recovered from the mesentery (inset below), compared to a standard 1 inch hypodermic needle. At this stage, all the cysts revealed the presence of the characteristic armed rostellum (inset above). Chronic cysticercosis in a hogget showing the presence of *C. tenuicollis* cysts (b) attached to the mesentery like bunches of grapes. Mature cysts (c) of *C. tenuicollis*, some with the scolex protruded, collected from the peritoneal cavity of the hogget.

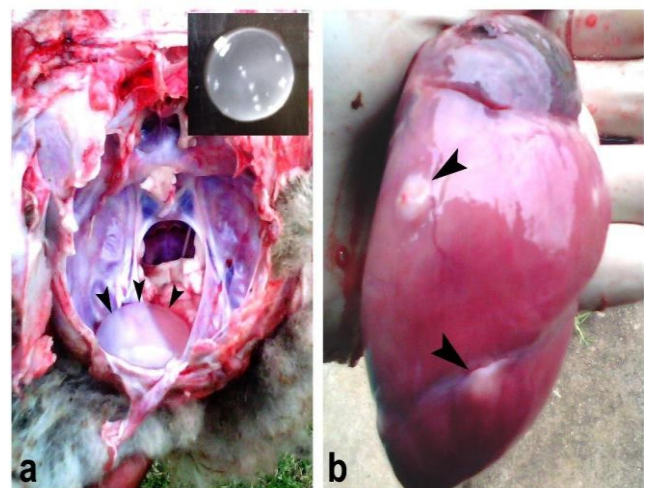


Fig 3: Cranial cavity of a ewe (a) with a single cyst of *Coenurus cerebralis* (arrowheads) in the occipital region. The isolated cyst (inset) shows the presence of numerous scolices. (b) Heart of a ewe with circular, creamy white cysts (arrowheads), apparently of *Cysticercus ovis*, embedded in the muscles

Conclusions

Metacestode disease of canine Taeniid tapeworms can cause economic loss even in sheep from organized sheep farms. Measures to restrict access of wild and domestic canids to the

pasture areas are necessary to control loss due to death and condemnation of meat as well as to prevent the spread of zoonotic diseases to humans. Fecal pats of domestic dogs should be removed from areas grazed by lambs to prevent fatal cysticercosis.

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References

1. Borji H, Parandeh S. The abattoir condemnation of meat because of parasitic infection, and its economic importance: results of a retrospective study in north-eastern Iran. *Annals of Tropical Medicine and Parasitology*. 2010; 104(8):641-647.
2. Dalimi A, Sattari A, Motamedi G. A study on intestinal helminthes of dogs, foxes and jackals in the western part of Iran. *Veterinary Parasitology*. 2006; 142(1-2):129-133.
3. Sorvillo F, Wilkins P, Shafir S, Eberhard M. Public health implications of cysticercosis acquired in the United States. *Emerg Infect Dis*. 2011; 17:1-6.
4. Desouky EA, Badawy AI, Refaat RA. Survey on coenurosis in sheep and goats in Egypt. *Veterinaria Italiana*. 2011; 47(3):333-340.
5. Soulsby E JL. Helminths, Arthropods and Protozoa of domesticated animals. London: Bailliere Tindall, 1982.
6. Dewolf BD, Peregrine AS, Jones-Bitton A, Jansen JT, Mactavish J, Menzies PI. Distribution of, and risk factors associated with, sheep carcass condemnations due to *Cysticercus ovis* infection on Canadian sheep farms. *Veterinary Parasitology*. 2012; 190(3-4):434-441.
7. Georgi JR. Tapeworms. *Veterinary Clinics of North America: Small Animal Practice*. 1987; 17(6):1285-1305.
8. Hasslinger MA, Weber-Werrighen R. Fecal surveys in pastured sheep and the occurrence of *Cysticercus tenuicollis* in slaughtered sheep. *Angew Parasitol*. 1988; 29(4):227-234.
9. Hughes DL, Harness E, Doy TG. Failure to demonstrate resistance in goats, sheep and cattle to *Fasciola hepatica* after infection with *Cysticercus tenuicollis*. *Research in Veterinary Science*. 1978; 25(3):356-359.
10. Irshadullah M, Nizami WA, Macpherson CN. Observations on the suitability and importance of the domestic intermediate hosts of *Echinococcus granulosus* in Uttah Pradesh, India. *Journal of Helminthology*. 1989; 63(1):39-45.
11. Mahadevan A, Dwarakanath S, Pai S, Kovoor JM, Radhesh S, Srinivas HV *et al*. Cerebral coenurosis mimicking hydatid disease - report of two cases from South India. *Clinical Neuropathology*. 2011; 30(1):28-32.
12. Pathak KM, Gaur SN, Sharma SN. The pathology of *Cysticercus tenuicollis* infection in goats. *Veterinary Parasitology*. 1982; 11(2-3):131-139.
13. Sreekumar C, Kirubakaran A, Venkataramanan R, Selvan P, Anil Kumar R, Iyue M. Spontaneous primary intrathoracic, extrapulmonary hydatid cyst in a broiler rabbit. *Helminthologia*. 2010; 47(3):193-195
14. Varcasia A, Tanda B, Giobbe M, Solinas C, Pipia AP, Malgor R *et al*. Cystic echinococcosis in Sardinia: farmers' knowledge and dog infection in sheep farms. *Veterinary Parasitology*. 2011; 181(2-4):335-340.