

## CASE REPORT

### Concurrent Cerebral and Extra-Cerebral Caprine Coenurosis: A Case Report

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#### ABSTRACT

Coenurosis is a zoonotic problem and is occurring worldwide. This report depicts an unusual case of concurrent cerebral and extra-cerebral caprine coenurosis. A crossbred 8-year old male goat manifesting typical nervous signs and demonstrated necropsy lesions of coenurosis. The parasitic cysts ranged from 1mm to 9cm were present in both cranial and extra-cranial tissues. The diagnosis of caprine coenurosis was confirmed based on antemortem nervous signs in conjunction with postmortem examination, histopathology and morphological characteristics of collected parasitic cysts. Variable sized cysts were found in intestinal mesenteries, around the ribs, lungs and in the cerebral cortex. Hemorrhages and liquefactive necrosis were observed in the cerebral cortex. Other affected tissues infiltrated by mononuclear cells and fibrosis. Around fifty scolices were found in a turbid oval amyloid cyst present in the cerebral cortex. In conclusion, the current report presents the first evidence of concurrent cerebral and extra-cerebral caprine coenurosis in Pakistan.

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#### INTRODUCTION

Coenurosis (also known as gid or sturdy), a zoonotic disease caused by *Coenurus cerebralis* is the larval form of *Taenia multiceps* (Huang et al., 2016). The parasite doesn't only infect the wild and domestic animals, but also contributes to parasitic zoonosis in humans (Oryan et al., 2015). Eggs containing larvae are passed in the feces of infected dog and transmitted to intermediate hosts through contaminated food or water (Christodoulopoulos et al., 2016). The oncospheres released in the intestine of the infested animal enter the local vasculature and lymphatic circulation, invade various body parts including gut, lungs and body cavities and eventually lead to cyst formation (Soundararajan et al., 2017). Since, oncospheres have a specific affinity for nervous tissue, thus brain and spinal cord of both intermediate and final hosts are the most common predilection sites of *Coenurus* cysts

(Oryan et al., 2015). Cerebrospinal fluid is the main requirement for growth, differentiation and nourishment of metacestodes and the scolices usually develop from the invaginated outer surface of the wall of metacestode (Soulsby, 2006). However, invasion to other body tissues including muscles and subcutaneous areas and visceral organs like lungs also occurs but in rare cases (Christodoulopoulos et al., 2016; Sami et al., 2014). These relatively uncommon extra-cerebral forms usually remain asymptomatic and cysts are commonly detected after slaughtering (Oryan et al., 2015). Clinical disease is manifested by neurological signs and responds only to surgical intervention (Merbl et al., 2014). The prognosis of clinical coenurosis is usually poor with very high case fatality rate. Condemnation of affected tissues and carcasses results in considerable economic loss to the meat industry. The current report demonstrates the concurrent cerebral and extra-cerebral coenurosis validated based on antemortem anamnesis,

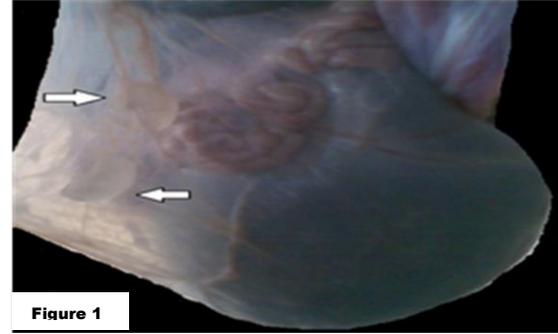
necropsy findings and morphological attributes of collected parasitic cysts in the laboratory. Since, it is the first comprehensive report from Pakistan; therefore, it is presumed that presenting this case would be useful in expanding scarce literature on this disease condition in Pakistan.

### Case presentation

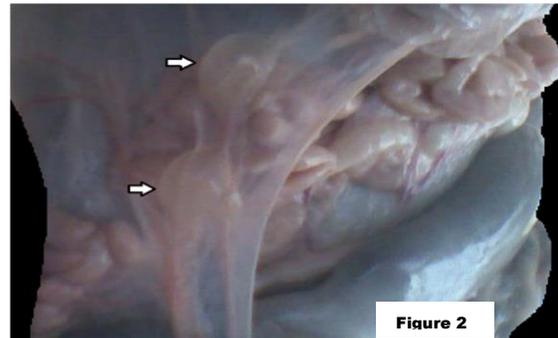
**Case history:** A crossbred 8-year old male goat was presented to the outdoor clinics of College of Veterinary and Animal Sciences, Jhang (Pakistan) with the complaint of loss of appetite, circling movements, head pressing, progressive emaciation, ataxia and incoordinated staggering gait. The animal was in severe condition and died during clinical examination. History from the owner denoted that respiratory rate and body temperature were in normal range before presentation at the clinic.

**Examination and results:** At systematic necropsy, the carcass was carefully examined for grossly detectable pathological lesions such as sunken eyes, presence of frothy exudate in the nasal passage and pale mucous membranes. Upon opening the carcass, tissues of the most affected areas of brain and muscles were processed for histopathology as described elsewhere (Sikandar et al., 2017). Fluid filled cysts of variable sizes ranging from 1mm to 9cm were observed in cerebral hemispheres of the brain and extra-cerebral organs like small intestinal mesenteries (Fig. 1, 2), serosal surface of abomasum, costochondral junction (Fig. 3), lungs, diaphragm and liver. Frontal, parietal and temporal bones of the skull were extremely fragile and could easily be splintered even on application of gentle thumb pressure. Cerebral meninges were found relatively thickened and edematous. Dissection of cranium revealed an identical cyst located in the cerebral cortex. Cerebral cortex exhibited a distinct depressed area of about 8×20cm in diameter, wherein liquefactive necrosis was quite evident (Fig. 4). The cortical surface of the brain was collapsed when the cyst was drooling out from the cavity. Around fifty scolices were then isolated carefully from a turbid off-white, round to oval, amyloid cyst removed from the cerebral cortex (Fig. 5) and examined in the laboratory as reported earlier (Christodouloupoulos et al., 2016; Soulsby, 2006).

On histopathology, capsular and subcapsular focal pale necrotic spots measuring 1-2 cm were observed at the liver surface. Capsules of the cysts attached to the rib cage were much thicker as compared to those of the mesentery and brain. Outer layer of each cyst was found to be composed of a thick, fibrous, grayish capsule while the inner lining was of a thin transparent wall with various white bunches of attached scolices. Due to presence of cyst, the cerebral mass demonstrated considerable pressure atrophy and hemorrhages within the craniodorsal area of cerebral cortex. The affected areas around the cyst



**Fig. 1: Fluid filled cysts in the mesentery above the caecum shown by arrows.**



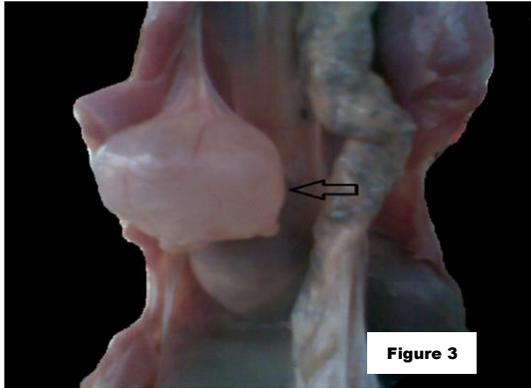
**Fig. 2: Two cysts are present in the mesentery above the jejunum shown by arrows.**

in the brain were infiltrated by mononuclear cells including macrophage, lymphocytes and fibroblasts (Sikandar et al., 2013). Moreover; fibrous connective tissue was highly evident in the affected muscles and visceral tissues.

### DISCUSSION

Although we observed parasitic cysts invading brain, lungs, liver, muscles of diaphragm, mesenteries and costo-chondral area in the medial mediastinum region of the thorax. Similar cysts were also found in the muscles and subcutaneous tissue of thigh and neck regions (Sami et al., 2014). The most severe among these are the cerebral cysts as we found in the current case that have been correlated with depression, head pressing, feet stamping and other neurological signs. In our findings, the left side of the brain was affected, which is consistent with other previous reports (Merbl et al., 2014). Softening of the affected cranial bones observed in this case has been regarded as a pathognomonic clinical sign reflecting the superficial location of coenurosis. Moreover, the presence of hemorrhages in the affected brain in sheep were also reported elsewhere (Soundararajan et al., 2017) and also concurrent coenuri invading liver and central

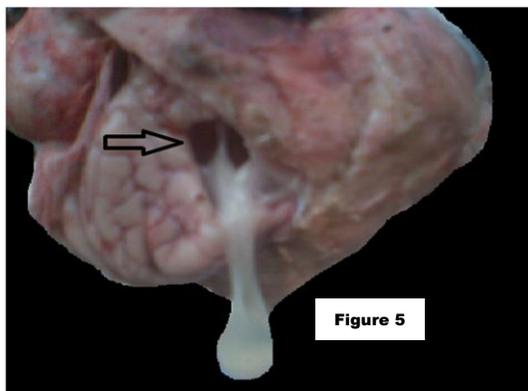
nervous system by others (Christodoulopoulos et al., 2016). Our results reinforce the earlier assumptions regarding the lack of morphological disparity between *C. cerebralis* and *C. gaigeri* (Oryan et al., 2015).



**Fig. 3:** Cyst attached to the diaphragm and costo-chondral junction shown by arrow.



**Fig. 4:** Lateral cerebral hemispheres affected with hydrocephalus (five stars). Each cavity is lined by thick capsular structure.



**Fig. 5:** Hazy bladder like fluid-filled cyst protruding out ventrally from the lateral cerebral hemisphere. The cyst caused pressure atrophy and created a large

**cavity (shown by arrow) apart from the existing cavity of lateral ventricle.**

Considering our study there might be a high prevalence of such zoonotic diseases and it could be correlated with socio-economic status of the local community, as they are mostly poor and illiterate, and are unaware of using anthelmintics (Zaman et al., 2014). Hence, coenurosis should be taken into consideration in case of small ruminants manifesting nervous signs or grossly observable cysts. Moreover, since the stray dogs play a very important role in the dissemination of the current infection, thus the proper deworming of the herd accompanying dogs as well as eradication of stray dogs and cats from the premises of small ruminant's herds and abattoirs is strongly recommended.

Pakistan has a leading livestock population and keeping in view the current insight, this parasitic problem seems to exist and transmit among and within small animal herds. Further studies are suggested to ascertain the prevalence, transmission, life cycle, epidemiology, prevention and control of this zoonotic parasite in view of potential significance pertaining to meat quality and public health.

#### **Author's contributions**

All the authors contributed equally to the study.

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