Chemical and Biochemical characterization of *Taenia hydatigena cysticerci* in goats

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Abstract

The present study was undertaken to study the chemical, biochemical profiles of the cystic fluid of *Cysticercus tenuicollis* and to assess the pathological changes in the affected organ. Cysts were collected aseptically from the goat carcasses and were subjected to different chemical and biochemical test. Twenty four cyst among them were analyzed for different chemical and biochemical constituents present in their cystic fluid. Showing results as Calcium (12.0-260.0 mg/100ml), Sodium (130.5-424.3 ppm) and Potassium (12.50-52.50 ppm) and biochemicals like Aspartate aminotransferase (0.1310-23.00 U/L), Alanine aminotransferase (1.000-86.17 U/L), Lactate dehydrogenase (10.00- 108.0 U/L) and Alkaline phosphate (18.00-176.0 U/L).
Keywords: *Cysticercus tenuicollis*, Cystic fluid, Histopathology, Zoonosis, Biochemical parameter, Chemical parameter.

Introduction

Cysticercus tenuicollis is the metacestode of *Taenia hydatigena* found on the different visceral organs such as liver, spleen, lung, omentum, kidney, heart etc. of sheep, goat and pig. *Taenia hydatigena* is one of the important cestode of the family Taeniidae affecting mainly dogs and other wild carnivores as its definitive hosts . This tapeworm harbors in the small intestine of the definitive host and is not a major cause of concern to them. There may be only signs of abdominal pain, colic, loss of appetite, emaciation and unthriftiness is seen. (Singh et al., 2003). Mature tapeworm, 75 to 500 cm long, lays eggs which are ingested by the intermediate host such as goat, sheep and pig etc. when they are mixed with the feed materials or during grazing. Eggs hatched in the small intestine become larvae and reach to the liver and other vital organs. *Cysticercus tenuicollis* causes considerable economic losses due to high degree of morbidity and mortality in livestock (Abidi et al., 1989) and condemnation of infected offal or meat (Flisser et al., 1982) and thus is a matter of serious concern for the meat industry. Migration of cysticerci in the liver may cause hepatitis cysticercosa leading to haemorrhagic and fibrotic tracts and serofibrinous peritonitis (Soulsby, 1982., Blazek et al., 1985). In heavy infection the migrating larvae destroy the hepatic cells with eosinophilic infiltration and sever inflammation proves to be fatal. In some cases peritonitis is also seen with the usual consequence like ascites, high temperature and ultimate death.

Materials and methods

Screening of animals

Cysticercus tenuicollis in goats and sheep were collected from slaughterhouse owned by Bhilai municipality at Supela, Bhilai, Chhattisgarh. All the visceral organs such as liver, lung, heart, kidney and spleen including mesentry and omental fat were examined thoroughly for the presence of *C. tenuicollis.*

Collection of cyst

The cysts were collected from the carcasses and were cleaned with normal saline and taken in sterile containers for further examinations. twenty four cysts among them were randomly selected and the outer surface of cyst were cleaned with 70% alcohol and cystic fluid were aspirated using sterile syringes and was to chemical and biochemical tests.

Inorganic Molecules

Inorganic molecules like calcium, sodium and potassium were estimated by different proved methods. Calcium was estimated by the method of calorimetric determination of calcium. (Webster W. W. 1962). Concentration of calcium was expressed in mg/100ml. Likewise sodium and potassium in the fluid is determined by ESICO Microprocessor Flame Photometer Model 1381. The sample fluids taken from different cyst were first digested by digestion mixture. After that the treated samples were subjected to flame

Table-1: Chemical contents of the cystic fluid

Calcium (mg/100ml)		Sodium (ppm)		Potassium (ppm)	
Range	Mean ± SEM	Range	Mean ± SEM	Range	Mean ± SEM
12.0-260.0	80.33 ± 13.70	130.5- 424.3	296.6±16.66	12.50- 52.50	31.70± 2.138

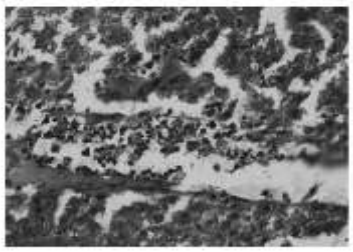

Fig.1. Micrograph of liver affected with *C.tenuicollis* having migratory tract infiltrated with neutrophils and eosinophil (H&E 400)

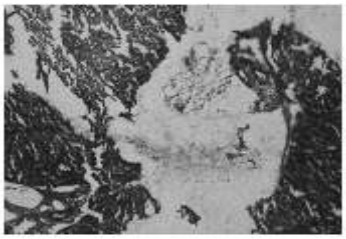

Fig.2. Micrograph of liver with serofibrinous exudation, infiltrated with mononuclear cells (H&E 100)

photometry. Which follows the principle of controlled flame test with intensity of the flame colour quantified by Photoelectric circuitry. The sample is introduced to the flame at a constant rate. Filters were selected, which colours the photometer detects and excludes the influence of other ions. It is a procedure used in chemistry to detect the presence of certain metals ions, based on each element's characteristic emission spectrum. The result came is read in ppm.

Enzymes

Biochemical examination of cystic fluid was done to know the average concentration of different enzymes present in the fluid. Enzymes such as ALT, AST, ALKP and LDH were estimated using commercially available kit (Bayer Diagnostic India Ltd.) on R-A 150 Chem. Semi-autoanalyser as described in literature provided by manufacturer. Enzyme level was expressed in U/L.

Results and discussion

Chemical contents of the cystic fluid

Fluid of the cysticerci was analyzed for the presence of various chemical (Calcium, Sodium and Potassium). These chemicals were present at significant levels. Lowest calcium concentration was 20 mg/100ml and highest was 260 mg/100ml, with an average of 80.33 mg/100ml. Analysis for Sodium concentration revealed a range of 130.5 ppm to 424.25 ppm with the average of 296.5 ppm. Fluid also contained Potassium in measurable quantity, it showed highest of 52.5 ppm and lowest of 12.5 ppm with the average of 31.70 ppm (Table 2).

Concentration of AST (Aspartate aminotransferase), ALKP (Alkaline phosphate) and LDH (Lactate dehydrogenase) were present in considerable amount where as ALT (Alanine aminotransferase) was low in concentration.

Table-2: Biochemical contents of the cystic fluid

Enzyme	Range	Mean ± SEM
AST U/L	0.1310±23.00	5.034±1.164
ALT U/L	1.000±86.17	8.355±3.428
LDH U/L	10.00±108.0	29.63±4.424
ALKP U/L	18.00±176.0	54.99±7.439

Note : values are of twenty-four randomly selected cysts

Biochemical contents of the cystic fluid

Analysis showed that lowest level for AST was 1.607 U/L and highest level for it was 80.17 U/L with the average of 11.12 U/L (Approx). In case of ALKP, the concentration came in the range of 18 U/L to 176 U/L, an average of 55.96 U/L. Examination of LDH concentration in cysticerci fluid result that highest concentration was 108 u/l and lowest concentration was 10 U/L and its average was 29.63 U/L approximately (Table 1). The present study affirms the investigation of Moghaddar et al. (2002) who analyzed the chemical and biochemical composition of the fluid, scolices and membrane of the cysticerci but of sheep origin. Abidi et al. (1989) in his study analyzed the major biochemical components of Taenia hydatigena cysticerci collected from goats and pigs and showed marked differences, particularly in glycogen, protein, lipid and DNA levels. They also detected the levels of cholesterol, triglycerides, free fatty acids and phospholipids profile which were quantitative differences between the two species.

Histopathological analysis

On micrcscopical analysis of the liver lesions, burrowing canals were seen indicating the tortuous migratory paths of the larvae (Fig.1). Liver showed

hepatitis and deposition of serofibrinous exudates revealing the inflammatory response (Fig.2). The center of the lesion was occupied by neutrophils and eosinophils.

The present study was in agreement with Pathak *et al* (1982) who studied the pathology of *Cysticercus tenuicollis* infection on 7, 15, 30 and 60 day of post infection and showed cyst-like channels with a mass of fibrin and erythrocytes. The hepatic cells were mostly degenerated with focal areas of parenchymal destruction. Sinusoids were dilated and the bile ducts revealed degenerative changes.

In another study Darzi *et al*. (2002) on pathological investigation concluded that, the liver showed haemorrhagic tunnels/pools, fibroplacia, and thickening of the Glisson's capsule and the lung on cystic migration showed haemorrhages, congestion, thickening of inter-alveolarsepta and inflammatory reaction in the vicinity of the cyst.

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