Detection some chemical and biochemical constituents of *Cysticercus tenuicollis* cyst fluid of Iraqi goat

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**Abstract**

The study was performed to detect some chemical and biochemical constituents in the fluid of *Cysticercus tenuicollis* cysts the larval stage of tapeworm *Taenia hydatigena*. Twenty two cysts were obtained from infected carcasses of Iraqi goat during a period of six months from April to September 2016. Cysts were found attached to the liver, lungs and fat of great omentum. The cysts fluid was collected and subjected to different conventional laboratory methods using commercial kit reagents to analyze and measure the concentration of some chemical and biochemical constituents. The results show that the concentrations of calcium ranged between (2.31-5.70 mg/dl), sodium (81.00-138.00 mmol/l), potassium (6.70-11.40 mmol/l) and phosphorus (0.330-1.460 mg/100ml). Glucose ranged between (16.00-103.00 mg/dl), urea nitrogen (18.00-63.20 mg/dl), uric acid (0.20-28.00 mg/dl) and creatinine (0.180-0.67 mg/dl). Total protein concentration was between (0.60-108.00g/l). Furthermore, cholesterol and triglyceride concentrations were (0.00-17.008 and 20-67.00 mg/dL), respectively. The activity of aspartate aminotransferase was (1.10-3.20U/L), alanine aminotransferase was (1.70-16.00 U/L) and lactate dehydrogenase was (3.00-249.00 U/L). In conclusion the decrease or increase in the chemical and biochemical SE values provide the preventive role of the parasite cyst membrane to exchange these substances. The high rate of SE values of some parameters studied may suggest a various degree of parasitic growth rate or may reflect activity of the cyst’s metabolism which needs to be studied in future.

**Keywords**: *Cysticercus tenuicollis*, fluid, detection, chemical, biochemical constituents, goat

**1. Introduction**

*Cysticercus (C) tenuicollis* is the larval stage of the parasite *Taenia hydatigena* tapeworm belongs to the family Taeniidae [1]. The domestic life cycle of parasite is maintained through definitive host, domestic and wild carnivorous, which harbor the adult *Taenia hydatigena* in the small intestine and a wide range of intermediate host including domestic ruminants and wild ones, pigs, squirrels and humans which are infected with larval stage. The definitive host infection occurs when the offal and meat infected with *C. tenuicollis* is fed raw [2]. While intermediate host acquires infection by ingestion of the eggs of *Taenia hydatigena* during grazing or food contamination [3]. Eggs hatched in the small intestine and the onchospheres penetrate the blood circulation, and then reach to the liver and other vital organs in the peritoneum. In heavy infection when entire tapeworm segments are ingested, a large number of onchospheres migrate to the liver parenchyma to developed into cysticerci leading to destroying the hepatic cells causing hemorrhagic tracts, eosinophilia infiltration and severe inflammation resulting in acute atraumatic hepatitis (cysticercosis). This condition resembles acute fasciilosis and anaerobic condition, which lead to black disease because of generation of *Clostridium novyi* bacteria. Later, fibrotic tracts and serofibrinous peritonitis results in ascites, high temperature and death [4]. The larva *C. tenuicollis* was found attached to different visceral organs such as serous surface of liver, spleen, lung, greater omentum, intestinal mesentery, kidney, heart and unusual location have been described [5]. Cysticercosis is a prevalent disease; causes considerable economic losses due to high degree of morbidity and mortality in livestock and condemnation of infected meat at meat inspection [6]. Cysticercosis is endemic in Iraq. The prevalence of disease has been studied in sheep and goat [7].
However, no work has been done on the analysis of C. tenuicollis cysts fluid in Iraq. Therefore, the present study was undertaken to detect some chemical and biochemical constituents of C. tenuicollis cysts fluid in Iraqi goats.

2. Materials and Methods

2.1. Collection and processing of cyst

Cysticercus tenuicollis cysts were collected from visceral organs liver, lung, great omentum, intestinal mesentery of infected carcasses of Iraqi goats which slaughtered at the main abattoir Alshuala in the south east region of Baghdad city in Iraq during period of six month from April to September 2016. C. tenuicollis was transferred in sterile container in cold box to the laboratory of Parasitology in Veterinary Medicine College of Baghdad University for further examined. Each cyst was processed as an individual isolate, under aseptic condition the surface of cyst cleaned with normal saline then with 70% alcohol. The fluid were aspirated using sterile syringe, transfer to a clean test tubes with normal saline then with 70% alcohol. The fluid were isolate, under aseptic condition the surface of cyst cleaned with normal saline then with 70% alcohol.

2.2. Chemical determination

Sodium, potassium and phosphorus, glucose, urea nitrogen, uric acid, creatinine, total protein, triglycerides, cholesterol, enzyme Aspartate aminotransferase (AST), Alanine aminotransferase (ALT) and Lactate dehydrogenase (LDH) activities were estimated by the colorimetric method of Reitman and Frankel [8] using commercially available kits reagents (w.w.w. Biolabo. Franc) followed manufacturer’s instructions. The concentration of calcium was estimated by the method of CPC (O Cresol followed manufacturer’s instructions. The concentration of commercial kits reagents (w.w.w. Biolabo. Franc) activities were estimated by the enzymatic colorimetric method of Biurat [8] using commercially available kit (www. Biolabo.Franc) followed manufacturer’s instructions. Enzyme level was expressed in U/L.

3. Statistical analysis

Data were analyzed using spss software. Results expressed as Mean-standard (SE) [16].

4. Results of the study

Twenty two Cysticercus tenuicollis cysts were originated from the infected goat carcasses and found in variable sizes attached to the liver, lung and great omentum. The cysts have characteristic features it looks as long necked bladder worm, consisting of one an invaginated scolex surrounded by a transparent membrane with clear fluid filed cyst cavity plate1(A,B,C,D). Fluid of 22 cysticerci was analyzed for detection of some chemical constituents (calcium, sodium, potassium and, phosphorus). These electrolytes were present at significant levels. The data were illustrated in table [1]. The lowest concentration of calcium was 2.31 mg/dl and the highest was 5.70 mg/dl with average of (4.023 mg/dl). Fluid contained sodium in measurable quantity range from the lowest concentration 81.00 mmol/L to the highest concentration 138.00 mmol/L with average of (118.6 mmol/L). Potassium concentration was low range between 6.70 mmol/L to 11.40 mmol/L with average of (9.17 mmol/L). Fluid also contained phosphorus, the concentration was also low ranged between 0.33074mg/100 ml to 1.460 74mg/100 ml with average of (0.74mg/100 ml). Analysis of 22 cystic fluids was done to measure the average concentration of some biochemical constituents. The results were illustrated in table [2] showing that the glucose was found in considerable amount, the lowest concentration was 16.00 mg/dl and the highest reach to 103.00 mg/dl with average of (48.3 mg/dl). Urea nitrogen from lowest 18.00 mg/dl to highest concentration 63.20 mg/dl with average of (43.6mg/dl). The lowest concentration of Urine acid was 0.20 mg/dl and highest was 28.00 mg/dl with average of (4.29 mg/dl). Creatinine ranged 0.67 - 0.180 mg/dl with average of (0.68 mg/dl). Total protein was 0.60 g/l and reached to 108.00 g/l with average of (2.26 g/l). Cholesterol measured between 0.00-17.00 mg/dl with average of (4.9 mg/dl), while Triglyceride was18.20 mg/dl reached to 67.00 mg/dl with average of (24.16 mg/dl). Analysis of enzymes.
5. Discussion

Infection with cysticercosis due to bladder worm *C. tenuicollis* cysts is prevalence in Iraq. The disease in sheep was 14.22% and 16.01% in goat [7]. Morphological, immunological, physiological and some biochemical variation have been described in some Taenid metacestodes, including *T. taeniaeformis*, *T. crassiceps*, *Echinococcus spp* and non-Taenid *Hymenolepis diminuta* [17-21]. In the present study some chemical and biochemical substances have been described as a part of wide study on the *C. tenuicollis* cysts. Chemical substances such as (calcium, sodium, potassium and phosphorus) were found at variable concentration in the studied cysts fluid. These chemical and biochemical substances play definitive role in the physiology, metabolism and immunology of the host, which reflected the relationship between the intermediate host and parasite [20]. The occurrence of calcium ions is important in ATP production and ATPase activities. The means concentration of calcium and Potassium ions was found lower than the mean concentration of sodium, which constituted the major ion in the fluid compared to the mean concentration of phosphate, these findings were agree with [18,22] studies. The cyst membrane is considered as transport border between the *Cyst fluid and host serum*. Thus, the quantity of chemical composition probably related to species not to cyst location [20]. The environment of the infectious stages of parasite is the host and the only way by which macromolecules absorption in immature stage is endocytosis, more important route supporting data comes only from studies on *Taenia crassiceps* [21]. The parasite in its intermediates hosts has various degree of metabolism in various colonized organs and the biochemical parameter is reflecting the quantitative differences in the metabolism of the cyst in respect to the site of parasitism [22]. In this study, the dominant preferred site of *C. tenuicollis* in goats was the liver, lung and great omentum. The concentration of glucose was found in considerable amounts. Rosen et al., (1994) [19] mention that the glucose indicate the presence of glycolysis and glycogenesis cycles related to energy production with parasite cyst. It has been shown that glucose is absorbed by transport system found in mammals in the external cyst wall of *T. solium* neurocysticeri, and also in the apical membrane of the tegument of adult tapeworm [24]. Metacestode parenchymal tissues contain numerous gap junctions to uptake glucose [24]. Larval cestodes generally show a more constant glycogen content than the corresponding adults [24], this may reflect the more stable intermediate host environment, usually the coelomic cavity or tissues [25]. Dixon et al (1973) [26] isolated the glycoprotein from the fluids of cysts, which contain about 7-7% heterosaccharide consisting of glucose, galactose, mannose, fructose, neuraminic acid and glucosamine. It was
suggested that glycoprotein appears to be derived from the parasite, and functions as the osmotically active macromolecule in the cyst fluid maintaining the turgidity of the cyst.

Urea and Uric acid occurrence refer to the presence the urea cycle, which is essential to eliminate the toxic level of ammonia through amino acid and nucleotide metabolism [27]. Creatinine level reflects ammonia metabolism and energy production [27]. The occurrence of cholesterol in the present study is related with its function as a structural component and to colonization site of parasite because it is increased in the liver more than in lung disorder [18]. Triglyceride appearance in high concentration is expected as it the most abundant sterol molecule within parasite, also as an energy source with physical protection role. It is probable that these lipids play a vital role in the establishment and development of the parasite [18].

Among enzymes AST, ALT and LDH exhibited activities in the cyst fluid of C. tenuicollis. However, the concentrations of LDH were present in considerable amounts. Abidi et al. (1989) [20] 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 levels, cholesterol and triglycerides conclusion that the cysticerci of goat and pig origin probably represent two different strains. In conclusion the decrease or increase in the chemical and biochemical SE values provide the preventive role of the parasite cyst membrane to exchange these substances. The high rate of SE values of some parameters studied may suggest a various degree of parasitic growth rate or may reflect activity of the cyst’s metabolism which needs to be studied in future.

6 References

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