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Parasitology

Survival Rate of Protoscoleces under Different Constant Temperatures

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Abstract **Original Research Article**

Cystic echinococcosis (CE) is a cosmopolitan disease caused by the dog tapeworm Echinococcus granulosus. The disease is difficult to diagnose, treat, and control and is responsible for considerable human morbidity and mortality globally. This study was conducted in Tambool area, and was carried out on cysts collected from infected camels in Tambool market. Cysts were divided into fertile cyst (fluid with scoleces) or sterile (clear fluid). Fertility of collected cysts was determined by placing 1 drop of each hyadatid fluid on slide and covered with cover glass. The slide was examined under the light microscope using X10 objective lens. This study was carried out to determine the survival rate of protoscoleces under different constant temperatures 4c, 25c, 37c and 45c. Cysts were examined for fertility, and then incubated at different constant temperatures. The viability of protoscoleces was determined by using eosin stain, which stains only the dead protoscoleces. The examination was done 1 day, 2 days, and 3 days up to 10 days, post incubation. The result showed that the maximum survival rates observed with protoscoleces kept for 1 day at 4c, 25c and 37c were 92%, 78% and 70% respectively. Since the beginning, no survival was observed in those kept at 45c. In those kept at 25c and 37c, the viability was 0% at the 5th day and 3rd day respectively. With 4c, the protoscoleces remained viable with varying rates till it reached 8% on day 9 and 0% on day 10.

Keywords: Cystic echinococcosis, Echinococcus granulosus, protoscoleces.

INTRODUCTION

Echinococcosis is a zoonotic parasitic tapeworm infection caused by the larval stage of several species belonging to the genus *Echinococcus*. There are four main species of *Echinococcus* affecting man and animals, and they include *Echinococcus granulosus, E. multilocularis, E. oligarthrus, and E. vogeli. Echinococcosis* has been termed as emerging/reemerging disease [1, 2]. The life cycle of the tapeworm *Echinococcus granulosus* is sustained between the definitive hosts, which are dogs and exhibit canine echinococcosis, and herbivores, the intermediate host in which cystic hydatid disease occurs. Echinococcosis has been identified as a zoonosis in rural livestock-raising areas where humans cohabit with dogs fed on raw livestock offal's [3]. Feeding dogs with raw viscera of infected animals contributes to perpetuating this cycle [4]. Humans get infected by accidental ingestion of eggs from tapeworm-infected dogs and develop cystic lesions, principally in liver and lungs, after several years [5]. It also results in significant economic loss to the meat industry through condemnation of infected organs in food animals [6]. *Echinococcus* species are of major public health importance and are responsible for virtually all the human and animal burden of the disease causing human cystic echinococcosis (CE) and alveolar echinococcosis (AE), respectively [7]. *E. granulosus* has a worldwide geographic distribution and occurs in all continents. High parasite prevalence is found in parts of Eurasia, Africa, Australia, and South America [8]. Cystic echinococcosis is regarded as a global public health concern and is endemic in many parts of the world [9]. *Echinococcus granulosus* is a small tapeworm (2 to 6 mm in length). It has three segments and other morphological characteristic which are important in diagnosis [10].

The disease is prevalent in Sudan and many camels and cattle are infected. The butchers throw infected organs in the ground exposed to stray dogs and thus continue the life cycle of the parasite and consequently increase the prevalence of disease.

The aim of this study was to determine the survival rate of protoscoleces under different constant temperatures which may help in the control of the disease in Sudan. Diagnosis is by a combination of imaging and serology. The standard diagnostic approach for cystic echinococcosis involves imaging

techniques, predominantly ultrasonography, computed tomography (CT), X-ray examination. These techniques are confirmed by detection of specific serum antibodies by immunodiagnostic tests. ELISA test using hydatid cyst fluid has high sensitivity (<95%) [11].

METHODOLOGY

Study design

It is an experimental study

Study area

The study was conducted in Tambool area in south eastern Sudan.

Study population

The study was carried out on cysts collected from infected camels in Tambool market.

Sampling

Investigation on camels

Camels in Tambool market were thoroughly inspected for the presence of hyadatid cysts

Parasitological examination

Cyst stage: Cysts were divided according to the stage into

a. Fertile cyst (fluid with scoleces) b. Sterile cyst (clear fluid)

Fertility of collected cyst was determined using the following method:

One drop of each hyadatid fluid was placed on slide and covered with cover glass. The slide was examined under the light microscope using X10 objective lens.

Survival rate of protoscoleces under constant temperatures: Hyadatid cysts from infected camels were brought to the laboratory and fluid of fertile cyst was aspirated and kept at constant temperatures of 4c , 25c , 37c, 45c.The viability of protoscoleces were detected by using eosin stains, Which stains only the dead protoscoleces? The fluid was examined after 1 day, 2 days, and 3 days up to 10 days.

RESULTS

The result showed that the maximum survival rate was observed with protoscoleces kept for 1 day at 4c, 25c and 37c (92%, 78% and 70 respectively). Since the beginning, no survival was observed in those kept at 45c. In those kept at 25c and 37c, the viability was 0% at the 5th day and 3rd day respectively (table 1).

For those kept at 4c, the viability rate of protoscoleces remained with varying rates till day 9 (8%) and dropped to 0% at day 10 (table 1).

Table-1: Survival rates of protoscoleces kept under different constant temperatures

Days	4c	25c	37c	45c
1	92	78	70	0
2	82	51	30	
3	71	28	0	
4	60	7		
5	49	0		
6	38			
7	28			
8	17			
9	8			
10	0			

DISCUSSION

Survival rates in vitro

From the results, the protoscoleces survival rate was in its highest with the 4c and started to decline gradually till the 9th day and became nil on the 10th day while with the 25c and 37 c became nil on the 5th and 3rd day respectively. No viability was observed with the protoscoleces kept at 45c.

Our findings agree with the work of Saad *et al.* [12] who reported that the scoleces were viable for more than 5 days at 4c.

Ekram [13] reported that the survival rates of scoleces was highest with 4c till the 3rd day and started to decline gradually till reached 3% in day 20. The 25c and 37c remained viable for 6th and 4th days respectively (18% and 51%) and declined to the 0% on the 7th and 6th days respectively.

From the study, it is worth mentioning that offal's of slaughtered camels are thrown away in the ground. They are left unattended till the next market without being properly disposed. In our opinion, this constitutes a great potential of transmission of the parasite to the always roving dogs around the slaughter house and thus continuous transmission to man and animals as well, putting into consideration the 9 days survival rate of protoscoleces in cold weather 4c,4 days in 25c and 3 days in hot weather (37c).

CONCLUSIONS

- Low temperature (4c) and moderate (25c) have proved suitable for the survival of protoscoleces for several days.
- At high temperature (37c) , the scoleces can survive for only 2-3 days, however still to be considered
- Very high temperature (45c) is detrimental to the scoleces.

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