



CHARACTERIZATION OF CAMEL (*CAMELUS BACTRIANUS*) ECHINOCOCCOSIS FROM SOUTHERN MONGOLIA

B.Chinchuluun^{1*}, S.Lkhagvatseren¹, Ch.Nominchuluun¹, Ts.Munkhjargal¹, A.Altanchimeg¹,
U.Nyamdolgor¹, D.Temuulen², T.Yanagida³, A.Ito⁴, Z.Batsukh¹

¹Institute of Veterinary Medicine, Mongolian University of Life Sciences, Ulaanbaatar, Mongolia

² Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia

³Yamaguchi University, Yoshida 1677-1, Yamaguchi, 753-8515, Japan

⁴Asahikawa Medical University, Midorigaoka Higashi 2-1-1-1, Asahikawa 078-8510, Japan

*Corresponding author: chin.dvm@gmail.com

ABSTRACT

A total 22 (30.5%) camels were infected with 34 echinococcal cysts out of 72 slaughtered camels in Khurmen soum of Southgobi province. The prevalence of infection in camels between 5-7 years (14/22) was 18.2-22.7% and 8 years camels (6/22) were 27.3%. The fertile cyst rate was 40.9% and sterile cyst rate was 22.7%. Camel cystic echinococcosis cyst status was fertile, sterile, abscessed and calcified. Most of the cysts were located in the lungs 54.5%, liver 27.3% and lung-liver 18.2% and were spherical in shape, unilocular and 1-3 cysts located in lung and liver of one camel, cyst diameter was 2-10 cm and with cyst fluid ranging from 1 to 200 ml. Camel echinococcal cysts status and appearance were revealed as age dependent, as older camels echinococcal cysts were revealed as calcified statistically significant ($p=0.0458$). Histologically, leucocyte infiltration and mild hepatocellular degeneration and infiltration in the liver were noticed. In lungs, there was proliferation of fibrous connective tissue and infiltration of mononuclear cells.

KEY WORDS: Cystic echinococcosis , necropsy, cyst status

INTRODUCTION

Cystic echinococcosis caused by the metacestode *Echinococcus granulosus*. Echinococcus cyst development in lung, liver or other organs and it is difficult to diagnose in livestock. Echinococcal cyst have laminated and germinal layer and filled fluid with protoscolices. Cysts size and status are depending its development period. Russian scientist E.E. Shumakovich (1934-1936) first time identified

echinococcal cyst in camel, Mongolia. Udev T (1953) reported 76.1% liver, 70.4% lung, 8.5 % spleen infected with echinococcal cyst out of 105 slaughtered camels at abattoir in Ulaanbaatar. Sharhuu G (1982) reported infection rate of camel echinococcosis 48.5% in Khovd, Bayan-Ulgii, Zavkhan, Govi-Altai provinces [8].

MATERIALS AND METHODS

The study was carried out in Khurmen soum of Southgobi province in Mongolia December, 2013. In total 72 camels were slaughtered at outside. While recording the number of infected organs, cyst count, other information on the carcass, is including its sex, age. Hydatid cyst characterization: The infected organs from each positive animal were collected and recorded including the cyst location, morphology and volume of the fluid contents. Of the collected samples, individual cyst was carefully, opened and

examined to identify whether it was a hydatid cyst, whether it was a fertile, sterile or calcified. After opening, the cyst fluid was aspirated by using 1-20 ml syringe to measure the volume of the cyst fluid. A drop of the cyst fluid was placed on the microscope with x10 to x40 objectives. For clear vision a drop of 0.1% aqueous eosin solution was added to equal volume of cyst fluid on microscope slide with the principle that viable protoscolices should completely or partially exclude the dye while the dead ones take

it up. Infertile cysts were further classified as sterile or calcified. Sterile hydatid cysts were characterized by their smooth inner lining usually with slightly turbid fluid in its content with dead or without protoscolices. Typical calcified cysts produced a gritty sound feeling up on incision [4]. Percentage of recorded data and the relation between age and infected organ and relation between age and cyst

status which are presented in the results were analyzed using Epi Info version 7 statistical software. We achieve histopathological examinations 2 livers and 2 lungs with cystic echinococcosis fixed at 10% formaldehyde that is integrated with paraffin sections were stained with haematoxylin and eosin stain for routine histopathology (Luna 1968) and examined under the microscope.

RESULTS

A total 22 (30.5%) camels were infected with 34 echinococcal cysts out of 72 slaughtered camels in Khurmen soum of Southgobi province. The prevalence of infection in camels between 5-7 years (14/22) was 18.2-22.7% and 8 years camels (6/22) were 27.3%. The fertile cyst rate was 40.9% and sterile cyst rate was 22.7%. Camel cystic

echinococcosis cyst status was fertile, sterile, abscessed and calcified (Figure 1-4). Most of the cysts were located in the lungs 54.5%, liver 27.3% and lung-liver 18.2% and were spherical in shape, unilocular and 1-3 cysts located in lung and liver of one camel, cyst diameter was 2-10 cm and with cyst fluid ranging from 1 to 200 ml (Table 1).

Table 1

List of camel with echinococcal cyst in Khurmen soum of Southgobi province

No. of infected camels	Organs	Age (years)	Sex	No. of cyst	Diameter (cm)	Cyst status	Cyst fluid volume (ml)
Cml 1	Lung	5	Female	1	3	Fertile	1.5
Cml 2	Lung	5	Male	1	3	Fertile	1.5
Cml 3	Lung	5	Male	1	4	Fertile	2.5
Cml 4	Lung	5	Male	1	3	Abscessed	None
Cml 5	Lung	6	Male	1	3	Fertile	1
Cml 6	Lung	6	Female	1	3	Abscessed	None
Cml 7	Lung	6	Male	1	4	Abscessed	None
Cml 8	Lung	7	Male	1	6	Abscessed	None
Cml 9	Lung	7	Male	2	7; 8	Abscessed	None
Cml 10	Lung	7	Male	1	5	Sterile	100
Cml 11	Lung	8	Male	2	6; 5	Sterile	120
Cml 12	Lung	8	Female	2	8; 9	Sterile	200
Cml 13	Liver	5	Male	1	3	Fertile	1
Cml 14	Liver	6	Male	1	2	Fertile	1
Cml 15	Liver	6	Male	1	4	Fertile	2
Cml 16	Liver	7	Female	2	2	Fertile	0.5
Cml 17	Liver	8	Male	1	10	Calcified	None
Cml 18	Liver	10	Male	2	8; 7	Sterile	180
Cml 19	Lung, liver	8	Male	2	8; 6	Fertile	150
Cml 20	Lung, liver	8	Female	3	5; 4; 6	Calcified	None
Cml 21	Lung, liver	9	Male	3	8; 6; 6	Calcified	None
Cml 22	Lung, liver	8	Male	3	9; 8; 6	Sterile	200

Camel echinococcal cysts status and appearance were revealed as age dependent, as older camels echinococcal cysts were revealed as calcified statistically significant ($p=0.0458$).

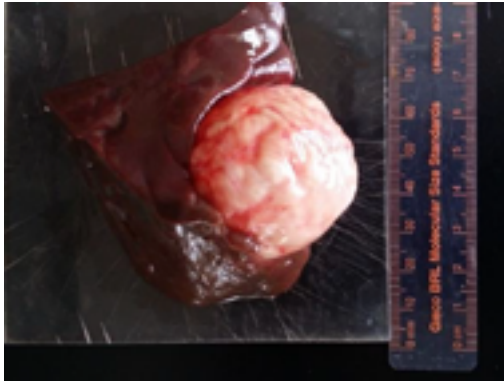


Figure 1. Echinococcal cyst in liver of camel



Figure 2. Calcified cyst in lung of camel



Figure 3. Sterile cyst in lung of camel



Figure 4. Echinococcal cysts in lung of camel

The cysts were surrounded by outer fibrous layer over the inner germinal layer and filled with clear hydatid fluid. Histologically, leucocyte infiltration and mild hepatocellular degeneration and infiltration in the

liver were noticed (Figure 6). In lungs, there was proliferation of fibrous connective tissue and infiltration of mononuclear cells (Figure 5).

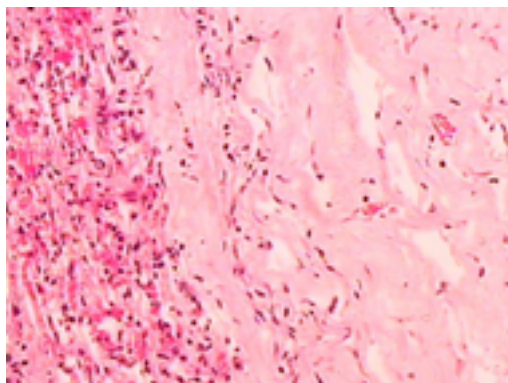


Figure 5. Section of hydatid cyst in lungs of camel (HE x 200)

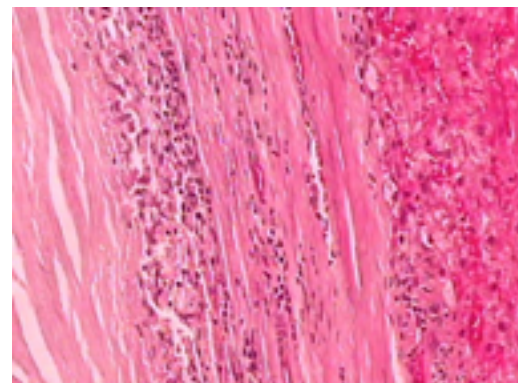


Figure 6. Section of camel liver showing hydatid cyst with laminated wall and hepatic degeneration (HE x 200)

DISCUSSION

Previous studies only reported prevalence rate of camel echinococcosis and species of *Echinococcus* in Mongolia [10]. Both CE and AE have highest prevalence rates in western and northwestern China. Prevalence of CE in camel was 24.6-35% in Inner

Mongolia of China, 2008 [9]. Chai J, (1998) reported *E.garnulosus* infection in *Camelus bactirianus* in North Xinjiang 185 out of 375 camels were positive, the infection rate was 49.3%. The metacestodes parasitized mainly in the liver and lung. The fertile

cyst rate was 39.2%, the fertile cyst-carrying rate of camels was 34.8%. The cyst wall was relatively thin and the cysts located singly on the surface of liver. The average diameter of fertile cysts was 5.6 +/- 2.65 cm in liver and 4.83 +/- 2.03 cm in lung. The percentage of animals harboring calcified cysts was 64.3% [3]. The infection rate of metacestodes of *Echinococcus granulosus* in Bactrian camel was very high in north Xinjiang and the characteristics of infection differ in some aspects from the local sheep and cattle and from dromedaries in Africa as well. [3]. Kazakhstan is highly endemic for echinococcosis. Both *Echinococcus granulosus* and *E. multilocularis* are widely distributed in the country. This followed a rapid increase in the incidence following the dissolution of the Soviet Union. Between 2007 and 2013, 5949 cases were reported in the national surveillance data [1]. Infection rate of Hydatid cysts in camels (*Camelus dromedarius*) was 35.2%

(233/661) at slaughtered in five different regions of Iran. The degree of prevalence between males (34.4%) and females (36.6%) was not statistically significant. The organ distribution of cysts was 49.4% in lungs alone, 30.0% in both liver and lungs, 14.6% in liver only and 6.0% in other organs. Therefore, the lungs were the predominant sites of the hydatid cyst. The range in the number of cysts was 1–48 in infected animals. The majority of the camels had 1–5 cysts, with 21.9%, 11.6% and 5.6% of infected camels having 6–10, 11–20 and 21 or more cysts respectively. There was a direct relationship between the rate and intensity of infection and host age. The fertility rate of lung cysts (69.7%) was higher than that of liver cysts (58.7%) and other organs (50.0%) whilst the viability rate of protoscoleces of liver fertile cysts (80.3%) was significantly higher than that of lung cysts (55.8%) and other organs (57.1%) [2].

CONCLUSION

The current study shows not only the positive relation of camel age and cyst size, but also viability rate of cysts. High fertility rate of liver cyst suggest the

potential better metabolism of liver cells may attract the cysts to be localized in the liver, eventually leads better and faster growth of cysts.

ACKNOWLEDGEMENTS

We sincerely thank farmers of Khurmen soum of Southgobi province and researchers of Laboratory of Helminthology and Protozoology, Institute of Veterinary Medicine, Ulaanbaatar, Mongolia, and Laboratory of Veterinary Parasitology, Joint Faculty

of Veterinary Medicine, Yamaguchi University, Department of Parasitology and NTD Research Laboratory, Asahikawa Medical University, Japan. This work was done by the grant from Mongolian Foundation for Science and Technology

REFERENCES

1. Abdybekova A, Sultanov A, Karatayev B, Zhumabayeva A, Shapiyeva Z, Yeshmuratov T, Toksanbayev D, Shalkeev R, Torgerson PR. (2015). Epidemiology of echinococcosis in Kazakhstan: an update. *J Helminthol.* 2015 Nov; 89(6):647-50. doi:10.1017/S0022149X15000425. Epub 2015 Jul 10.
2. Ahmadi, N. (2005). Hydatidosis in camels (*Camelus dromedarius*) and their potential role in the epidemiology of *Echinococcus granulosus* in Iran. *Journal of Helminthology*, 79(2), 119-125. doi:10.1079/JOH2005279
3. Chai J, Jiao W, Osman I, Qu Q, Wang H (1998). A survey of *Echinococcus granulosus* infection in *Camelus bactrianus* in north Xinjiang. *Zhongguo ji sheng chong xue yu ji sheng chong bing za zhi= Chin j parasitol parasit dis* 16:193–196
4. Ernest E., Nonga H.E., Kassuku A.A., Kazwala R.R. (2009). Hydatidosis of slaughtered animals in Ngorongoro district of Arusha region, Tanzania. *Trop Anim Health Prod* (2009) 41: 1179-1185
5. Hao Wen, Yunhai Wang, Hongxia Zhou, Asian parasitology, Vol.2, Taeniasis/Cysticercosis and Echinococcosis in Asia, *Echinococcus Infections and Echinococcosis in China*, p 185-238, 203
6. Moghaddas, E., Borji, H., Naghibi, A., Shayan, P., & Razmi, G. (2015). Molecular genotyping of *Echinococcus granulosus* from dromedaries (*Camelus dromedarius*) in eastern Iran. *Journal of Helminthology*, 89(1), 100-104. doi:10.1017/S0022149X13000631

7. Mohammad M., Hadi R., Ahmad N., Javad A., (2014). Survey of hydatidosis infection in slaughtered camel (*Camelus dromedaries*) in Tabriz area, Northwest Iran. *J Parasit Dis* (Apr-June 2016) 40(2):444-447
8. Sharhuu G, (1982). "Parasite disease of camel", *J.Sambu's Research Institute of Animal Husbandry, Ulaanbaatar*, p 4-19.
9. Wang Zhenghuan, Wang Xiaoming, Liu Xiaoqing. (2008). Echinococcosis in China, a Review of the Epidemiology of *Echinococcus* spp *EcoHealth* 5, 115–126, 2008 DOI: 10.1007/s10393-008-0174-0
10. Ito A, Budke C.M, The present situation of echinococcoses in Mongolia, *Journal of Helminthology*, (2015) 89, p 680-688