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THE PREVALENCE OF *ECHINOCOCCUS GRANULOSUS* INFECTION IN DOGS AND THE PARASITIC RISK IN LIBYA

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ABSTRACT

The parasites causing cystic echinococcosis (CE) are transmitted to man and domestic animals either directly or indirectly from dogs. The role of the dog as a definitive host for a number of zoonotic parasites has been widely studied and recognized as being a significant public health problem worldwide, especially in developing countries and communities that are socioeconomically disadvantaged. In these communities, poor levels of hygiene and overcrowding, together with a lack of veterinary attention and zoonotic awareness, exacerbates the risk of disease transmission. The distribution of *Echinococcus* in 151 dogs was studied in 14 localities that differ in socio-economic status in Libya. One hundred and fifty one stray male and female dogs in different age groups were studied and their small intestines examined for *Echinococcus granulosus*. Forty two (27.8%) harbored several E. *granulosus* in their intestinal content. The prevalence rate was higher in females (29.6%) than in males (25.7%). The prevalence of infestation was generally higher in the coastal area. The infestation was 1 to 200 worms in 24 infested dogs in the areas that were low rated and 201-1000 worms in 10 infested dogs in areas moderately rated while it was over 1000 worms in eight infested dogs in highly rated areas. The maximum recorded numbers of worms was 1282 in a four year-old dogs. We also noticed that the rate of infestation differed with the age of dogs in which it was 12.5 %, 36.6 %, 19.3%, 44.2 % and 14.3. in dogs that aged up to one year, 2 years old , 2 to 3 years old , 3 to 4 years old and over 5 years old, respectively.

INTRODUCTION

Public-health problems caused by the impact of dogs on humans are both direct and indirect, e.g. environmental pollution, contact injuries, and zoonosis **(Baxter, 1984).** Dogs are associated with more than 60 zoonotic diseases **(Dar and Taguri, 1979)** among which, parasitosis and, in particular, helminthosis, can pose serious public-health concerns worldwide **(Rubel and Wisnivesky, 2005).** Many canine gastrointestinal parasites eliminate their dispersion elements (eggs, larvae, oocysts) by the faecal route.

The quantity of canine faeces deposited on public and private property in cities worldwide is both, a perennial nuisance and an important health issue **(Matter and Daniels, 2000).** Public sites such as playgrounds, parks, gardens, public squares, and sandpits may be an important source of human infection **(Rubel and Wisnivesky, 2005).** High levels of human infection have been frequently described in sheep-rearing areas of the world, where the infection cycles between dogs and sheep through the use of working dogs and the feeding of sheep offal to dogs **(Hayward, 2004)**.

Echinococcus granulosus, the Hydatid Tapeworm, is a tiny parasite of the small intestines of dogs, dingoes, foxes, and also wolves, jackals, coyotes, and African Lions **(Thompson, 1982),** causing no disease and no symptoms, even in massive numbers.Each worm produces about 1,000 eggs every two weeks, and dogs can carry up to 300,000 worms, although domestic dogs do not usually carry such large numbers.Dingoes, on the other hand, and wild dogs infected with the "sylvatic strain" of *Echinococcus*, commonly carry heavy burdens **(Thompson et al., 1985; Bryan and Schantz, 1989)**. Passage of large numbers of eggs in the faeces of dogs, especially mobile dogs, results in widespread contamination of pasture, bush land etc. Eggs are spread over wide areas by wind, insects, birds and the like, and a single dog could infect up to 30,000 hectares **(Jenkins and Morris, 1991)**. Eggs are susceptible to desiccation, but are very cold tolerant, and may survive in the field for at least a year **(Dunsmore and Shaw, 2000)**. They are immediately infective. So, the aim of work was to evaluate the prevalence of infection with *Echinococcus* spp. in dogs in 14 areas of Libya and describe the role of dogs as a definitive host for the transmission of the parasite in Libyan society.

MATERIALS AND METHODS

Study area

Fourteen sites in different localities in Libya were chosen for the study from the period of October 2008 to March 2009.

Collection of dogs

Six months or over five years old male and female dogs were killed by shooting or were baited with strychnine. The killed animals were sent to

the laboratory for further processing. The animals were dissected under complete aseptic condition to get the small intestine then the intestine was tied off and removed. The parasite material was removed within 24 hours after the death of the host, cleaned from the host tissue as much as possible, and stored in 70% ethanol.

Parasitological examination

Examination of the intestine and tape worm count**.** Necropsy and examination of the intestines was carried out following strict safety precautions as described by **Deplazes and Eckert (1996)** (e.g. separated laboratory, protective clothes, deepfreezing of intestines at -80oC for at least 4 days). Two techniques were performed. The intestinal scraping technique (IST) was done as described by **Deplazes and Eckert (1996)** using 15 deep mucosal scrapings which were taken from equally distributed sites of the small intestine. The intestinal sedimentation and counting technique (SCT) was performed as described by **Rausch et al. (1990)** with modifications.

Briefly, the small intestine was incised longitudinally and cut into 5 pieces of approximately the same length. These pieces were transferred to a glass bottle containing 1 liter of 0.9% NaCl-solution. After shaking the bottle vigorously for a few seconds, the pieces of intestine were removed and the superficial mucosal layer stripped by means of pressure between thumb and forefinger to dislodge any attached helminths. After sedimentation time of 15 min the supernatant was decanted and the bottle refilled with physiological saline solution. This procedure was repeated 2-6 times until the supernatant was clear. The sediment fraction was examined in small portions of about 5-10 ml in square Petri dishes in transmission light under a stereomicroscope at a magnification of 120 xs.

The whole sediment was checked if up to 100 worms were found; if higher numbers were present the total worm burden was calculated from the count of 1 subsample. A random sample of the total worms collected were mounted on slide for confirmation of their identification .*Taenia* specimens were submitted to Common Wealth Institute of Parasitology if the identification was in doubt.

RESULTS

Out of 151dogs from the 14 localities, only 42 were infected with E. granulosus (27.8 %) (table1). The prevalence of infestation was generally higher in the coastal area. The infestation was 1 to 200 worms in 24 infested dogs in the areas that were low rated and 201-1000 worms in 10 infested dogs in areas moderately rated while it was over 1000 worms in eight infested dogs in highly rated areas. The maximum recorded numbers of worms was 1282 in a four year-old dogs. the rate of infestation differed with the age of dogs in which it was 7.1 %, 9.5 %, 26.2%, 54.8 % and 2.4 in dogs that aged up to one year, 2 years old, 2 to 3 years old, 3 to 4 years old and 5 years old, respectively (table 2). The prevalence rate was higher in females (29.6%) than in males (25.7%).

Table1. The prevalence of E. grsnulosus in the gastro-intestinal tract of the infected dogs.

The locality	Total No. of infected animals	Low prevalence(1-200)	Medium prevalence (201-1000)	High prevalence (more than 1001)
Benghazi	2	-	1	-
Garian	4	3	-	1
Khomes	2	2	-	-
Hon	1	1	-	-
Miarata	4	3	-	1
Naloot	1	1	-	-
Sebha	1	-	-	1
Sirte	3	2	1	1
Tripoli	11	8	2	1
Tubruk	8	1	5	2
Turhuna	5	3	1	1
Gdames	-	-	-	-
Socna	-	-	-	-
Ghat	-	-	-	-
Total	42	24	10	8

Table 2. Water quality measures during the mass mortalities event compared to the average normal values.

Water quality Parameter	Values during the mortalities event	Normal values (Average)
Water temperature	28 ºC	25 ºC
Total Ammonia Nitrogen (TAN)	1.5 PPM	0.3 PPM
Water pH	9.5	8.1
Water dissolved oxygen (DO)	6.00 PPM	9.8 PPM

DISCUSSION

An overall incidence of *E.granulosus* of 27.8 % in dogs in Libya confirms that this disease is a serious problem. The infection rate is much higher than that seen in Egypt where in Cairo, the highest incidence was reported as only 3.4% **(Moch et al., 1974)** while the prevalence rates in different areas of Algeria have been recorded as 6% **(Senvet, 1951)** to 41 % **(Pampiglione, 1965);** and up to 85.8% in Morocco **(Chentoufi, in press).**

The situation in Libya is very serious in some areas as example, Tripoli where 11 out of 42(26.2 %) of the dogs examined were infected. The possible reasons for this level of infection may be due to local animal husbandry practices, inadequate availability and utilization of abattoir facilities, frequent domestic slaughtering of sheep and other intermediate hosts and the feeding of raw offal to dogs. Possible factors responsible for the increasing number of people at risk were use of local people as herders, the existence of community herds, and specific dog management practices. Determinants such as trailing sheep between seasonal pastures, association of sheep men from several counties on winter range, and sheep marketing practices undoubtedly influence distribution of infections in dogs and sheep these data was in accordance with **(Crellin, 1984; Hayward, 2004)**.

The incidence of Echinococcosis in southern areas of the country was quite low, as in Sebha, one out of 42(2.4%) falling to nil in Gdames,

Socna and Ghat. The most significant relevant factors were the very low number of dogs, the neglicable number of the stray dogs, the more efficient use of good abattoir facilities, and the hostile climatic and topographical environments beside that the mainly hot and dry weather in these areas is unsuitable for the long term survival of *Echinococcus* eggs **(Baxter, 1984).**

It is of interest that the Infection rates increased gradually with age in which only three were infected in the youngest group of dogs and 23 of the infected dogs were of three to four years old. This probably indicates a steady challenge of the role played by the environment and the continuous shedding of the eggs of the parasite in dog's feaces together with the lack of immunity in the young age this is in accordance with that reported by **Bryan and Schantz (1989)**; **Matter and Daniels (2000)** and against the result of those recorded by **Ugochukwu and Ejimadu (1985)** who said that Juvenile dogs from three weeks to one month of age were more commonly infested than adult dogs (24 months).

Infection rates were marginally higher in bitches than in male dogs. This point could usefully be investigated in different localities in which significant differences could be related to some factors such as different scavenging and other behavioral changes as guard dogs, and domesticity. This observation is in agreement with that of **Barriga and Al-Khalidi (1991)** who mentioned that the parasites were significantly more numerous in females than in the males

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REFRENCES

BARRIGA, O.O., N.W. AL-KHALIDI. 1991. Effect of Host Sex and Litter on the Population Dynamics of Echinococcus granulosus in Dogs. J. Parasit. 77(6): 927-930.

BAXTER, D.N. 1984. The deleterious effects of dogs on human health: dog associated injuries. Community Med. 6: 29–36.

BRYAN, R.T., P.M. SCHANTZ. 1989. "Echinococcosis (hydatid disease). J. Amer. Vet. Med. Assoc. 195 (9): 1214-1217

CRELLIN, J. R., F.L. ANDERSEN, P.M. SCHANTZ, S.J. CONDIE. 1982. Possible factors influencing distribution and prevalence Of *Echinococcus granulosus* in Utah. Amer. J. Epid. 116(3): 465- 474.

DAR F.K., S. TAGURI. 1979. Epidemiology and epizootiology of hydatidosis in the Libyan Jamahiriya and recommendations for a programme of surveillance and control of the disease. Garyopunes Med.J. 2: 11-15.

DEPLAZES, P., J. ECKERT.1996. Diagnosis of the *Echinococcus multilocularis* infection in final hosts. Appl. Parasit.37: 245-252.

DEPLAZES, P., S. GLOOR, C. STIEGER, D. HEGGLIN. 2002. Urban transmission of *Echinococcus multilocularis*. In: Craig, P. and Z. Pawlowski (Eds.): Cestode Zoonoses: Echinococcosis and Cystercosis. IOS Press: 287-297.

DUNSMORE, J.D., S.E. SHAW. 2000. Clinical Parasitology of Dogs. Review No 31 Post Graduate Foundation in veterinary Science, University of Sydney.

ECKERT, J., P. DEPLAZES, D. EWALD, B. GOTTSTEIN. 1991. Parasitologische und immunologische Methoden zum Nachweis von *Echinococcus multilocularis* bei Füchsen. Mitt Österr Ges Tropenmed Parasitol. 13: 25–30.

HAYWARD, M. 2004. Risks of Zoonoses from Dogs on Sporting fields. Zoonoses Sport Fields CCAC.doc

JENKINS, D.J., B. MORRIS. 1991. Unusually heavy infections of Echinococcus granulosus in wild dogs in south-eastern Australia. Aust.Vet. J. 68 (1): 36-7

MATTER, H.C., T. J. DANIELS. 2000. Dog ecology and population biology. In: Meslin, F. X., A. I.Wandeler, and C. N. L. Macpherson (eds.), Dogs, zoonoses, and public health. London: CAB International.

MOCH, R., D.G. FAICHILD, B.A.M. BOTROS, I.S. BARSOUM. 1974. Echinococcosis in Egypt .II .Prevalence of canine infections in Cairo area .J. Trop. Med. Hyg.7: 163-164.

RAUSCH, R.L., F. H. FAY, F.S.L. WILLIAMSON. 1990. The ecology of *Echinococcus multilocularis* (Cestoda: Taeniidae) on St. Lawrence Island, Alaska. II. – Helminth populations in the definitive host. Annales de parasitologie humaine et compare. 65: 131-140.

RUBEL, D., C. WISNIVESKY. 2005. Magnitude and distribution of canine faecal contamination and helminth eggs in two areas of different urban structure, Greater Buenos Aires, Argentina. Vet Parasitol.133: 339–347.

Senvet, G. 1951. .Epidemiologie du cyste hydatique en Afrique du nord, Archives, International Hydatid. 12: 113-120.

THOMPSON, R.C. 1982. The susceptibility of the European red fox (Vulpes vulpes) to infection with Echinococcus granulosus of Australian sheep origin. Ann. Trop. Med. Parasit. 77(1): 75-82.

THOMPSON, R.C.A., W.L. NICHOLAS, M.J. HOWELL, LM KUMARATILAKE. 1985. Echinococcus granulosus in a fox. Aust.Vet. J. 62 (6): 200-1

UGOCHUKWU, E.I., K.N. EJIMADU.1985. Studies on the prevalence of gastro-intestinal helminths of dogs in Calabar, Nigeria. Int. J. Zoonoses. 12(3):214-8.