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# PULMONARY HYDATIDIOSIS IN DOG

(With 13 Figures)

By

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## مرض الأكياس المائية الرئوي في الكلب

***رفعت محمد احمد خليفة ، محسن ابراهيم عرفة***
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لدراسة الأسباب الطفيلية لنفوق عدد من الكلاب البوليسية التابعة لمديرية أمن أسيوط تم فحص مسحات دموية من تلك الحيوانات حيث تبين أن سبب نفوق ثلاثة منها هو الإصابة بطفيل البابيزيا كانيس وبأجراء الصفة التشريحية لتلك الحيوانات تبين وجود أحد الأكياس المائية في الرئة اليمنى لاحد الكلاب كما تبين بواسطة الفحص الهيستوباثولوجى وجود العديد من الرؤيسات الأولية داخل الأنسجة الرئوية المختلفة نتيجة انفجار كيس آخر بينما كانت نتيجة الفحص البكتريولوجى والمسحات الدموية لذلك الكلب سلبية مما يشير ألي أن السبب الرئيسي لنفوقه هو الصدمة العصبية الناتجة من انفجار أحد الأكياس المائية في الرئة. وتعتبر هذه هي المرة الأولى لتشخيص أكياس مائية أولية من رئة الكلاب في مصر.

## SUMMARY

For studying the parasitic causes of death of some dogs related to Assiut Security Administration, blood smears were examined: three dogs were positive for *Babesia canis*. The necropsy of these animals revealed presence of a single intact hydatid cyst in the right lobe of lung in one dog. Its internal organs were congested and its lungs were edematous. The histopathological examination of the affected lung revealed the presence of several protoscolices in different lung tissues denoting rupture of another cyst. In this dog blood smears and bacteriological examination of various organs were negative. Rupture of one hydatid cyst resulting in anaphylaxis was incriminated as the cause of death. According to the available literatures the present case is the first case of **primary** hydatid cysts in the lung of a dog in Egypt.

***Key words:*** *Dog, Babesiosis, echinococcosis, hydatid cysts.*

## INTRODUCTION

Foreign breeds of dogs have been imported from different areas of the world for security reasons. Many parasitic diseases can affect the health of these animals causing direct or indirect losses.

Babesiosis is a highly pathogenic protozoal disease in most hosts. In dogs *Babesia canis* in some localities is comparatively highly pathogenic for both young and old dogs (Levine, 1985). *Babesia canis* is the most widespread and pathogenic *Babesia* species for dogs in Europe, Africa, Asia and America (Urquhart *et al.*, 1994)

Hydatid cyst is the larval stage of *Echinococcus granulosus* and it causes hydatid disease in several herbivorous animals and human allover the world (Craig *et al.*, 1996). Hydatidosis is known to be an economic disease in Middle East (FAO, 1993). Hydatid cyst can be detected in various internal organs, specially lung and liver of intermediate hosts (Soulsby, 1982). It is mostly detected in post-mortum while anti-mortum diagnosis is not usually easy (EL-Bihari, 1985). Hydatidosis is responsible for great threat to human health (Belschner, 1976). In Egypt, hydatid disease was detected in man and herbivorous animals by several authors (Hamdy *et al.*, 1984; Bebars *et al.*, 1987; Rahman *et al.*, 1992, Mansour, 1994 and Yones, 2002). The aim of the present work was to find out of the probable parasitic causes of death in some dead dogs provided by Assiut Security Administration.

## MATERIAL and METHODS

Carcasses of 13 foreign breed dogs (7-11 years old) were presented for necropsy to Animal Health Research Institute (Assiut) in the period from January 2000 to December 2003. These dogs were imported from European countries and admitted to Assiut Security Administration for exploration of drugs. Ivomic was adminstered for these animals periodically every three months.

Blood smears were taken from unclotted heart blood and stained with Geimsa and examined for the existence of blood parasites according to Soulsby (1982).

A single cyst was detected in right lobe of lung of one dog. The dimensions of the cyst were measured with the ruler. As aspiration of the cyst content was difficult, the cyst was cut into two halves, the germinal layer was scraped and scrapings were examined for brood capsules or protoscolices. When found, protoscolices were stained by eosin to test

for scolex vitality (Smyth and Barrett, 1980). As protoscolices were invaginated, light finger pressure was used to evert them under cover slip in order to visualize the characteristic rostellar hooks (Sweatman and Williams, 1962).

Gross pathological changes of this dog were reported. Samples from lungs, liver, kidney, heart, spleen, and gut were fixed in 10 % neutral buffered formalin. Fixed tissues were dehydrated in a series of alcohols and processed for paraffin embedding technique. Sections were stained with Haematoxyline and Eosin (H&E) (Bancroft and Stevens, 1982).

Portions of the internal organs were taken immediately for bacteriological examination. Culturing was done on liquid media (nutrient broth & brain heart broth) and solid media (5% sheep blood and MacConkey agar media) according to Cowan and Steel (1965).

## RESULTS

***Babesia canis:***

Examinations of 13 blood samples of dogs revealed that three of them(23.08 %) were positive for *Babesia canis*. It was ovoid shape mostly single or multiple. It had one marginally-located chromatin mass in addition to presence of central vacuole. It measured 3.5-4.5 µm in length by 2-2.8 µm in width (average 3.9X2.4 µm)(Fig. 1).

**Hydatid cyst:**

A single hydatid cyst was detected in the right lobe of the lung of one dog. This cyst was oval in shape measuring 2X1.5 cm. It was surrounded by dark tissue zone. The hydatid content appeared jelly-like and grayish in colour. No other cysts were found in other organs of the dog.

The necropsy of this dog revealed congestion of internal organs, edema and congestion of the lungs. The liver was friable and there was accumulation of bloody fluid in peritoneal cavity.

Scraping of the cyst wall revealed presence of protoscolices which indicated fertility of the cyst. The measurements of these protoscolices ranged from 70x100-90x120 µm. Each protoscolex consisted of a large ovoid or spherical body with outer homogenous wall deeply stained with Eosin denoting loss of vitality (fig. 2). In the top view of the protoscolex after light finger pressure it possessed a variable number of rostellar hooks arranged in two rows (fig. 3).

The cyst wall consisted of three layers (germinal, laminated and fibrous layers). The germinal layer appeared as a thin membrane measuring15 $\mu m$ formed from heavily nucleated cellular layer, their nuclei were arranged in different levels. It was firmly attached to the laminated layer. The brood capsules appeared as a small vesicles attached to the germinal layer (fig. 4). The laminated layer measured 1.5 mm appeared as homogenous and eosinophilic layer with H&E stain (fig. 5). The fibrous layer was formed of connective tissue layer infiltrated with few numbers of lymphocytes. It was surrounded by cellular layer composed of macrophages, lymphocytes, plasma cells and eosinophils. Several protoscolices which had hooks and suckers were observed in cross sections of lung tissue(fig. 6, 7). The adjacent lung tissue showed atelectasis of the alveoli with prominent epithelization of their septa which were infiltrated with lymphocytes and macrophages (fig. 8, 9). Some bronchioles and alveoli contained protoscolices surrounded by numerous inflammatory cells composed mainly of mononuclear cells and eosinophils (fig. 10). Some of other alveoli were filled with faint eosinophilic material. The interstitial tissue and alveolar septa were infiltrated with mononuclear cells and eosinophils (fig. 11).

Liver showed presence of edematous fluid intermixed with destructed erythrocytes resulting in disruption of hepatic cords. Kupffer cell proliferation was also observed (fig. 12)

Kidney showed diffuse necrosis of the cortical tubular epithelium. The tubular lumina contained cell debris and erythrocytes. Peritubular haemorrhages were also observed in focal areas (fig. 13).

No remarkable lesions were observed in other organs. No blood parasites were detected in blood smears and the bacteriological examination of various organs was negative.

## DISCUSSION

The incidence of *Babesia canis* in the present work was 23.08% of the examined dogs. This result was higher than that reported by Sakla (1975) and Mohamed (1979) in native breeds of dogs. The foreign breeds and aged dogs are highly susceptible for *Babesia* infection (Urquhart *et al.*,1994 and Cabannes *et al.*, 2002)

Regarding hydatid disease, toxic byproducts, and/or the mechanical effect of the parasite may be responsible for inflammatory reactions observed in the adjacent parenchyma (Hamdy *et al.*, 1984). However rupture of the hydatid cyst may be the most harmful effect leading to sudden release of its content and spreading of their

protoscolices causing allergic reactions ranging from mild to fatal anaphylaxis (Bryan and Schantz, 1989; Kammerer and Schantz, 1992 and Amman and Eckert, 1995). In the present case, the presence of eosinophilic material and protoscolices in the alveoli may be indicative of hydatid cyst rupture into the bronchial tree. The necropsy findings and histopathological changes particularly those observed in the liver and kidney were identical to those described in anaphylactic shock (Maxie, 1993) so it might be assumed that anaphylaxis from ruptured hydatid cyst was the cause of death.

Although the dog is the main final host of *E. granulosus* (Soulsby, 1982), in the present case it acts as an intermediate host and this was the first report at least in Egypt according to the available literatures. The dog is only rarely to be an intermediate host because of the nature of the dog bile which usually kill the egg of *E. granulosus* (Smyth and Smyth, 1964). For which we suggest that the infection of the dog in the present study must occurred by inhalation of *E. granulosus* eggs. The presence of the hydatid cysts in lung tissue only might intensify our opinion.

In general, the larval stage of *E. granulosus* develops in internal organs of ruminants (Smyth and Smyth, 1964). However, **primary** hydatid cysts have been occasionally reported from carnivorous animals. Deve, (1949) reported a piece of *Echinococcus* material from the peritoneum of cat and cyst from the spleen of a lion. Mendheim (1955) also reported a cyst from a lion in Bavaria. Dogs were never recorded to be inhabited by a **primary** cyst. On the other hand, naturally occurring **secondary** cysts were rarely encountered in cats and dogs. Whitten and Shortridge (1961) reported 21 **secondary** cysts from the peritoneal cavity of a bitch. These cysts were 2-2.5 cm in diameter and several cysts contained brood capsules and protoscolices. They also reported over 80 secondary cysts in the peritoneal cavity of a 7 years old female cat. **Primary** cyst was in the form of an irregular mass in the mesentry. Moreover McDonald and Camphell (1963) have described similar **secondary** infection in a cat with a **primary** in the omentum. During the present study, the two hydatid cysts encountered in the dog lungs seemed to be **primary** cysts a condition described for the first time from Egypt and probably from the world. The dog, being unsuitable host, the development of the cyst was abnormal and the protoscolices were rare in a jelly-like matrix in agreement with Raush and Schiller (1956) and Yamashita *et al.* (1958)

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## EXPLANATION OF FIGURES

**Fig. 1:** Double ovoid shaped *Babesia canis* in a blood smear (arrow), Gemisa (X1000).

**Fig. 2:** Protoscolices of hydatid cyst stained with Eosin (X200).

**Fig. 3:** A protoscolix with clear two rows of hooks stained with Eosin. (X400).

**Fig. 4:** Brood capsule attached with germinal layer (X1000).

**Fig. 5:** Cross section in a hydatid cyst showing its three layers (X100).

**Fig. 6:** Lung micrograph showing several protoscolices inside alveoli (arrows) (H&E. X40).

**Fig. 7:** Protoscolices inside alveoli with their characteristic hooks and neck (X200)

**Fig. 8:** Micrograph showing fibrous wall of the hydatid cyst composed of connective tissue layer infiltrated with few numbers of lymphocytes and surrounded by cellular layer. The alveolar septa infiltrated with inflammatory cells (H&E. X250).

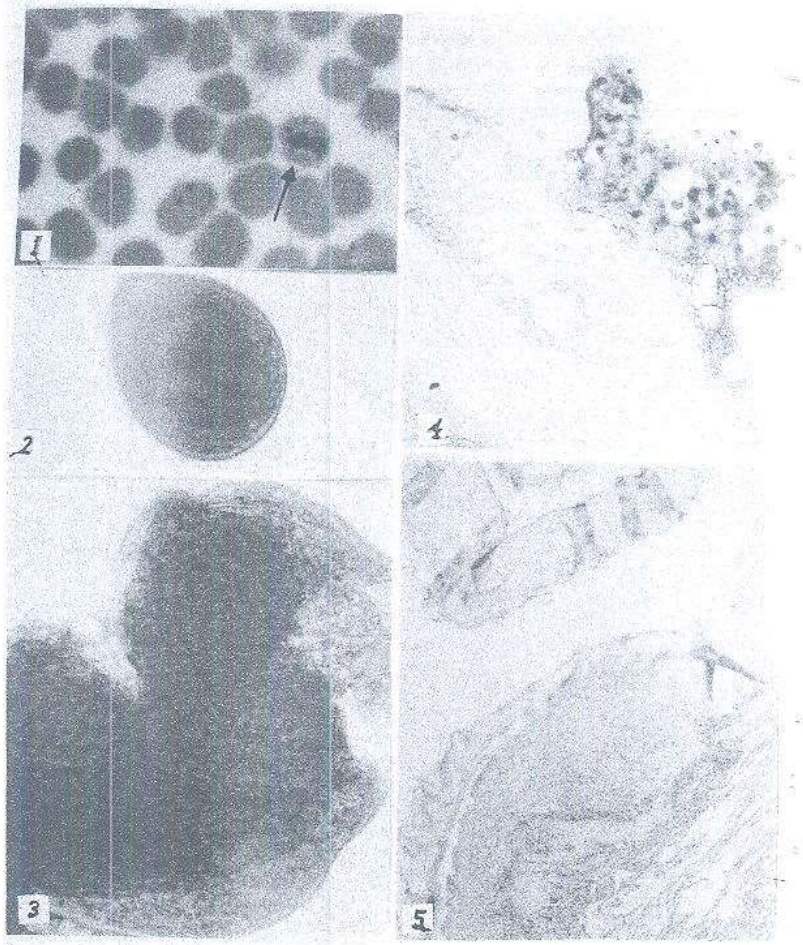
**Fig. 9:** Outer cellular layer of hydatid cyst wall infiltrated with macrophages, lymphocytes, plasma cells and eosinophils. The adjacent alveoli showing atelectasis, prominent epithelization and their septa infiltrated with lymphocytes and macrophages (H&E. X400).

**Fig. 10:** Lung micrograph showing presence of protoscolices within alveoli (arrow) surrounded by numerous amount of inflammatory cells (H&E. X250).

**Fig. 11:** Micrograph showing that alveoli adjacent to the hydatid cyst filled with faint eosinophilic material. The interstitial tissue infiltrated with mononuclear cells and eosinophils (H&E. X250).

**Fig. 12:** Liver micrograph showing presence of edematous fluid intermixed with destructed erythrocytes in-between hepatic cords with Kupffer cell proliferation (H&E. X250).

**Fig. 13:** Kidney micrograph showing necrosis of the renal tubular epithelium, the tubular lumina containing cell debris and erythrocytes and focal interstitial haemorrhages (H&E. X250).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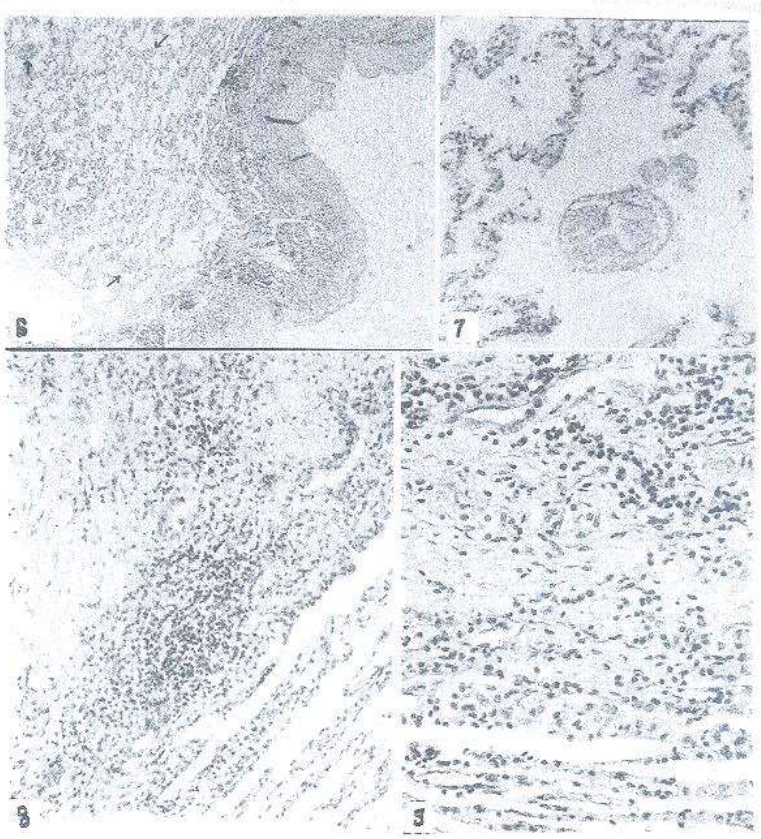

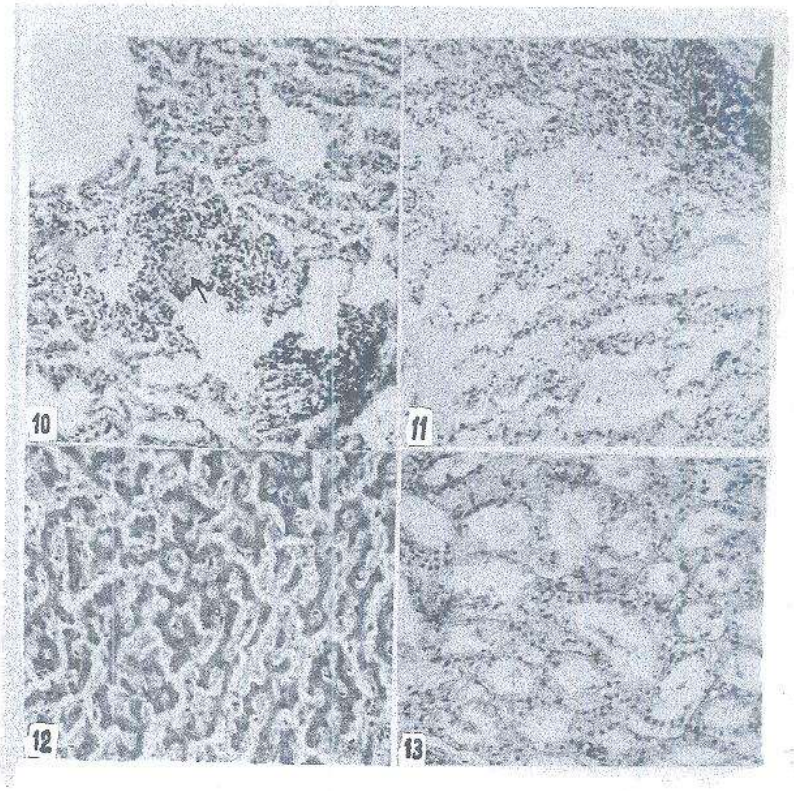
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