

EXPERIMENTAL STUDY OF THE PATHOGENICITY OF
SHEEP AND BUFFALO ISOLATES OF *FASCIOLA*
GIGANTICA IN GOATS

A.M. Al-Darraji^{*}, K.I. Altaif^{**} and R.Y.
Al-Kubaisee^{**}, ^{*}Department of Pathology,
and ^{**}Department of Parasitology, College of
Veterinary Medicine, University of Baghdad,
Baghdad, Iraq.

SUMMARY

In an experiment designed to study the pathogenicity of two isolates of *F. gigantica*, one of sheep and the other of buffalo origin, twenty-one, 3-months old goats were divided into 3 equal groups. The first received 5 metacercariae per kg body weight of the sheep strain and the second group has given the same dose of buffalo strain, while the third group was left as control.

The main pathological findings were characterized as: fibrinous perihepatitis, haemorrhagic tracts, haematomas, focal necrosis, hydroperitoneum and in the chronic phase by fibrosis and the typical pipe-stem liver. In animals of the second group, lesions were minor and consisted only of fewer haemorrhagic foci.

The possible explanation of the difference in pathogenicity is discussed.

INTRODUCTION

Fascioliasis is an important disease which is of world wide in distribution. Liver fluke is known to be as a causative agent and a significant pathogen in Iraq. It

causes outbreaks among various animal species (cattle, sheep, goats and camels) associated with large economical losses (Barbars and Coyle, 1960; Boray, 1969; Sinclaire, 1969; Reid and Doyle, 1972; Al-Naamy, 1978; Al-Barwary, 1978; Altaif, 1979; Pizzi *et al.*, 1984).

El-Harith (1977) found that there is a relationship between the species of intermediate host and the degree of pathological changes by flukes in the final host.

The biological and geographical conditions in different areas of the world might lead to the formation of strains, subspecies and species of *Fasciola* (Wright, 1960; Boray, 1969; El-Harith, 1977), of *Schistosoma* (Hsu and Hsu, 1960; Wright and Bennett, 1967), and of nematodes (Dunn, 1978).

Al-Kubaisee (1986) reported that there are differences in the biological behavior between sheep isolate and buffalo isolate of *F. gigantica* in snail intermediate host (*Lymnaea auricularia*) and goats, and mentioned that they might be of two different strains.

The aim of this study is to elucidate whether there is any pathological difference due to different isolate of *F. gigantica*.

MATERIALS AND METHODS

Experimental animals

Twenty-one male, 3-month-old goats were randomly divided into 3 equal groups. Animals of the first group were infected with a sheep isolate of *F. gigantica* (collected from Ramadi abattoir, an area in which buffaloes are not reared) at a dose level of 5 metacercariae per kg body weight. Those of the second group were infected with the same dose of *F. gigantica*

metacercariae from buffalo origin (collected from Hilla abattoir, where buffaloes are reared). Animals of the third group were used as control.

Before infection, animals were treated against lung worms and gastrointestinal nematodes using dl-tetramisole at a dose rate of 15 mg/kg body weight. Furthermore, goats were vaccinated against black disease using 2 ml of *Cl. novyi* toxoid.

Animals were sacrificed and necropsied at the end of the experiment, 26 weeks post infection.

The metacercariae (m.c.) were obtained by standard techniques (Kadhim and Altaif, 1970) and used after 80 days of storage at 4 C°. Viability of m.c. was tested according to the procedure described by Boray (1963).

RESULTS

Lesions in goats infected with *F. gigantica* of sheep origin were consistent and limited to the abdominal cavity mainly to the liver which was enlarged, pale or congested and in one animal was icteric.

Liver lesions were also characterized by grayish colored necrotic foci that were roughly spherical in shape and the largest measured up to 3.8 cm in diameter. However, most of these foci were only few mm. in diameter with greenish centers. The cut section of these necrotic foci revealed a caseous necrotic material and occasionally had encystment of the contents. There were haemorrhagic nodules of variable size (largest being 1.5 cm in diameter) with the haemorrhage being centrally located and some of them contained immature flukes. These nodules were under the liver capsule and within the parenchyma mainly at the free end of the ventral lobe.

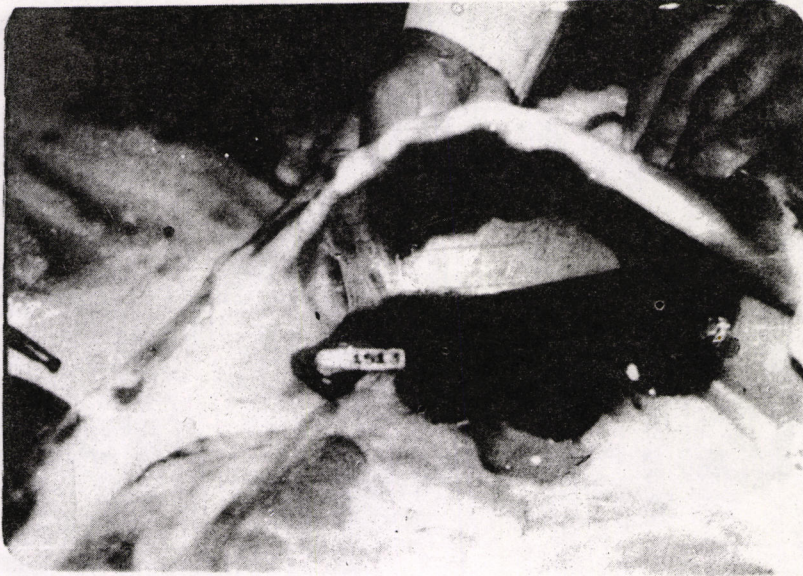


Fig.1: Fibrinous adhesion between the liver and the parietal peritoneum of a goat infected with sheep isolate of *F. gigantea*.

Scattered throughout the liver, there were depressed areas of cicatrization with largest being 5 cm in diameter. One scarred area in one goat has an arborized appearance. The above lesions were seen on both surfaces of liver but mostly on the parietal surface. However, those on the ventral surface were of diffuse nature.

Thin, grayish to pinkish strands of fibrin and occasional, fibrinous sheets were seen on the ventral surface of the liver connecting its lobes. In one goat, the amount of such fibrinous deposit was tremendous and lead to fibrinous adhesions between the liver and the parietal peritoneum (Fig.1).



Fig.2: Ecchymotic haemorrhages and haemorrhagic streaks on the liver of a goat infected with the sheep isolate of the fluke.

Focal haemorrhages (ecchymoses) and haemorrhagic streaks (Fig.2) were seen subcapsularly "Glisson's capsule" and extending deep up to 2 cm into the liver parenchyma.

Typical pipe-stem liver appearance was seen with narrow bile ducts lumena and plenty of periductal fibrosis (Fig.3). Cut section of the ducts revealed oozing of brownish-red viscid bile, containing many flukes. Adjacent to the duct lesions, orange colored foci were seen. In the center of one nodular elevation of bile duct, there were blackish granular firm deposits. Hepatic lymph nodes were congested, edematous and swollen.

In three animals, little amount of blood-tinged fluid was noticed in the abdominal cavity. A similar

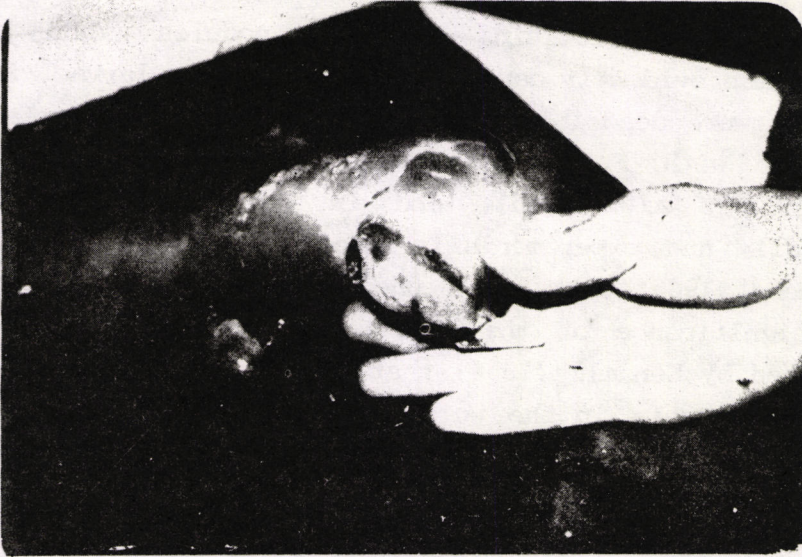


Fig.3: Liver of a goat infected with the sheep isolate. Note the distended and thick-walled bile ducts and the amount of fibrous tissue around it.

straw to clear colored transudate with some fibrin flakes was found in the pericardial sac of two goats. There was a haemorrhagic focus in the middle of the right diaphragmatic lobe of the lung of one goat.

In goats infected with flukes of buffalo origin, lesions were limited to two goats and were quite mild when compared to those caused by sheep isolate. There were only few haemorrhagic foci and linear dark red haemorrhages.

No liver lesions were seen in animals of the control group.

DISCUSSION

The liver lesions that encountered in goats infected with the sheep isolate were basically

haemorrhagic necrotizing foci to nodules mostly as haematomas evidently caused by the migratory larvae. Such lesions were described in livers of goats experimentally infected with *F. gigantica* (Guralp et al., 1964; Al-Darraji et al., 1985), and in the liver of sheep naturally and experimentally-infected with *F. gigantica* (Hammond, 1965; Jubb and Kennedy, 1970). With regard to the significance of the disease in goats, it has been reported by Kendall (1954) that it is impossible to keep sheep and goats in the worst affected areas of Pakistan because of the high mortality.

In sheep, it was found that five or more m.c. of *F. gigantica* per kg live weight cause acute fascioliasis and death in nearly all cases (Grigoryan, 1953). This might explain the high pathogenicity encountered in goats infected with sheep isolate of *F. gigantica*. The lesions of the chronic phase were characterized by the typical pipe-stem liver (a chronic cholangitis with periductal fibrosis) and by Glissonian fibrosis. Such lesions are typical for the chronic disease (Jubb and Kennedy, 1970; Jensen, 1974).

In case of buffalo isolate, only two animals had hepatic lesions (28.5%) and were quite mild when compared to those of the sheep isolate. The only lesion encountered was few focal to linear haemorrhages.

It is possible that exposure of flukes larvae of ovine origin, to intermediate host of variable habitat, may have, somehow influenced it's biology and therefore leading to an increased pathogenicity, where as in the case of the buffalo isolate, snail intermediate host is of an almost constant habitat. What supports our speculation is that El-Harith (1977) found that m.c. of

F. gigantica produced in the snail *L. auricularia* has lesser affinity and pathogenicity for sheep than the m.c. of *F. hepatica* produced in its natural host *L. truncatula*. He also reported that developmental stages of *F. gigantica* in the latter snail gave rise to pathogenicity similar to that of *F. hepatica* in sheep.

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دراسة تجريبية في امراضه عزلي الاغنام والجاموس

لطفيلي الـ *Fasciola gigantica* في الماعز

على محيد الدراجي*، خليل ابراهيم الطيف** رافع ياسين

الخلاصة

صممت هذه التجربة لدراسة امراضه عزلتين لطفيلي الـ *Fasciola gigantica* في الماعز. احدهما مصدرها الاغنام والآخرى مصدرها الجاموس واستعمل فيها ٢١ ماعز بعمر ثلاثة اشهر وقسمت الى ثلاث مجاميع متساوية. جرعت المجموعة الاولى خمس مذنبات مكيسة لكل كغم من وزن الجسم (عزلة الاغنام). اما المجموعة الثانية فجرعت ايضا خمس مذنبات مكيسة لكل كغم من وزن الجسم (عزلة الجاموس) في حين استخدمت حيوانات المجموعة الثالثة كمجموعة سيطرة.

تميزت النتائج المرضية بما يلي: التهاب حول الكبد الليفيني ووجود المسارات النزفية والاورام الدموية والبيور النخرية في متن الكبد اضافة الى موه الخلب. تميزت الحالات المزمنة بوجود التليف وافه "ساق الغليون" المميزة.

اما حيوانات المجموعة الثانية فقد كانت الافات المرضية طفيفة واقتصرت فقط على القليل من البيور النزفية في كبد بعض الحيوانات كما واعطي تفسير لهذه الفروقات في الامراضية.