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Fascioloides magna (BASSI, 1875) IN FERAL SWINE FROM SOUTHERN TEXAS*

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Abstract: Between 1971 and 1975, *Fascioloides magna* was found in 46 of 67 (69%) feral swine (*Sus scrofa*) in southern Texas. Flukes were recovered from swine in areas where *F. magna* commonly has been recovered from white-tailed deer and cattle. One to 12 flukes were recovered from each infected animal. Their presence was indicated by black hematin pigment on the liver and various other internal organs. Eggs were not detected in the gallbladder or feces of infected animals although mature flukes and eggs were recovered in the livers suggesting that, like cattle, feral swine can be infected but are aberrant hosts for the parasite and do not disseminate eggs.

INTRODUCTION

Fascioloides magna is a common parasite in deer and cattle in North America[7,8,10,19] and has been reported from a wide variety of other hosts,[4,10,19] including domestic pigs,[16] feral hogs[7,21] and collared peccaries (*Dicotyles tajacu angulatus*).[21]

Feral swine, referred to in this report as feral hogs, have a widespread distribution in the southern United States.[11] Their natural history, ecology, and role as a reservoir for various diseases and parasites have been reported.[5,11,12,13] These studies did not mention *F. magna* infection, although one survey was only 112 km away.[5]

The local feral hogs are descendants of crosses between wild domestic hogs (*Sus scrofa domesticus*) and the European Russian boar (*Sus scrofa cristatus*). They occupy habitats where the intermediate host, *Stagnicola* (*Lymnaea*) *bulimoides*, is present. *F. magna* was found in 38% of 206 cattle in the same area and in 70% of 129 white-tailed deer taken from the same pastures.[7]

The purpose of this paper is to document the prevalence of *F. magna* in two populations of feral hogs in Texas, and to discuss the role of feral hogs in the epizootiology of this fluke.

MATERIALS AND METHODS

This study was conducted between 1971 and 1975 in the gulf coastal region of Texas on the Welder Wildlife Refuge, San Patricio County, and the P. H. Welder Ranch, Victoria County (approximately 96 km north of the Welder Refuge). In both areas, feral hog populations have been determined by aerial observation to be less than 100 animals at any one time (Harrell, 1975, personal communication). Both areas are characterized by Gulf Coast Prairie vegetation, by flat, poorly-drained clay loam and sandy soils, and an average rainfall of approximately 76 cm per year.

The majority of the 69 hogs was collected during the months of January (20), April (19), and May (17). Additional

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hogs were also collected during the months of December (5), February (3), and June (3).

Hogs were hunted and shot, or live trapped and shot, along marshy areas, river bottoms and other areas of high moisture. Trapping was done with large box traps, originally designed for deer.[9] The traps were baited with kernel corn to attract hogs. Bled hog carcasses were weighed, except for a few which were estimated when their weights fell well within one of the 25 kg categories (Table 2).

Livers were removed within one hour of death, cut into 5 mm slices, and examined for parasites. The sliced liver with gallbladder removed was placed in warm water for approximately one hour to allow immature parasites to leave the tissue. After the liver was removed and the supernatant fluid decanted, the sediment was examined under 10X magnification for flukes and fluke eggs. Pieces of liver tissue were collected from selected animals and preserved in 10% formalin for histopathologic examination. Each gallbladder was opened, the contents decanted, and the sediment examined under 10X magnification for fluke eggs. The other internal organs and peritoneal cavity were examined grossly for flukes or fluke lesions. Fecal examinations were conducted on animals harboring flukes and a modified sedimentation technique was used in an effort to demonstrate fluke eggs.[23]

Chi square determinations were used for statistical comparisons. The standard deviation of the mean was calculated for fluke numbers recovered.

Specimens of *F. magna* from feral hogs were deposited as USNM. Helm. Coll. No. 73807, ARS, Beltsville, MD.

RESULTS

F. magna was found in the livers of 46 of 67 (69%) feral hogs collected in the study areas in southern Texas (Table 1). There was no difference in the prevalence of *F. magna* between study areas ($X^2 = 1.38$, $P > .05$) or between years ($X^2_{4df} = 6.88$, $P > .05$). Two of the hogs with flukes in the liver also had 4 and 2 immature flukes free in the peritoneal cavity. A third infected animal had an immature fluke encapsulated in the lungs. The kidney worm, *Stephanurus dentatus*, was also found in 33% of the livers examined.

TABLE 1. Prevalence of **Fascioloides magna** in two populations of feral swine in southern Texas from 1971-1975.

	Welder Wildlife Refuge San Patricio County, Texas			P. H. Welder Ranch Victoria County, Texas					
Year	No. Examined	No. Infected	%	No. Examined	No. Infected	%	Total Examined	Total Infected	%
1971	0	0	0.0	5	2	40.0	5	2	40.0
1972	25	19	76.0	8	4	50.0	33	23	69.7
1973	3	2	66.7	6	3	50.0	9	5	55.6
1974	5	5	100.0	4	4	100.0	9	9	100.0
1975	9	5	55.6	2	2	100.0	11	7	63.6
Totals	42	31	73.8	25	15	60.0	67	46	68.7

The hogs, 38 males and 29 females, ranged in weight from 10 to 148 kg (Table 2). Since most of the animals were collected between December and May of each year, seasonal differences were not examined statistically. There was no difference in the prevalence of *F. magna* between weight groups ($X^2_{4df} = 2.03$, $P > .05$).

The number of flukes recovered from infected hogs averaged less than two per animal (Table 2), although damage to most livers was extensive. A heavily pigmented liver from which two immature migrating flukes were recovered is shown (Fig. 1). The surface of the enlarged liver was bosselated and deeply fissured, to the extent that much of its normal external characteristics was obscured. The black pigment usually was found associated with the liver, lymph nodes, omentum, intestines, kidneys and diaphragm in infected animals.

Fluke eggs were detected in the fibrous capsules containing one or more mature flukes, but were not detected in the gallbladder or feces of animals with mature flukes. Mature flukes were found in all weight groups.

DISCUSSION

The high prevalence of infection (69%) suggests susceptibility of the host species and compares favorably with the 70% prevalence in white-tailed deer examined from the same study areas.[7]

Parasite surveys of feral swine from the Tellico Wildlife Management Area in Tennessee[13] and the Arkansas Wildlife Refuge,[5] approximately 112 km from our study area in Texas, did not reveal *F. magna* although a variety of other parasites was demonstrated.

Similar numbers of flukes were recovered from all weight groups (Table 2), suggesting that infection takes place at an early age. The hogs in group 1, weighing less than 23 kg were probably less than one year old;[5] domestic hogs usually reach this weight before they are 20 weeks of age. Various food studies have indicated that the diet of feral hogs in the southern United States consists mostly of vegetation.[11,14] Since rooting in moist areas is a characteristic behavior of feeding hogs, they probably get maximum exposure to metacercariae in enzootic areas where suitable intermediate hosts exist.

Lesions associated with infection were similar to those in domestic pigs.[16] Migratory tracks resulted in extensive areas of hemorrhage, necrosis, fibrosis and bile duct hyperplasia. The presence of black pigmentation was observed in all infected animals. It has been characterized in deer[3] and cattle[1] as a hematin compound of hemoglobin origin.

TABLE 2. Prevalence and numbers of **Fascioloides magna** grouped according to weights of feral swine.

Weight (kg)	No. Examined	No. Infected	% Infected	Number of Flukes Recovered		
				Total No.	Min.-Max.	Mean ± SD
0-25	24	16	67	26	1-4	1.6 ± .88
26-50	19	13	68	32	1-12	2.5 ± 3.04
51-75	12	8	67	13	1-3	1.6 ± .74
76-100	8	5	63	9	1-4	1.8 ± 1.30
>-100	4	4	100	6	1-2	1.5 ± .58
Totals	67	46	69	86	1-12	1.87 ± 1.77

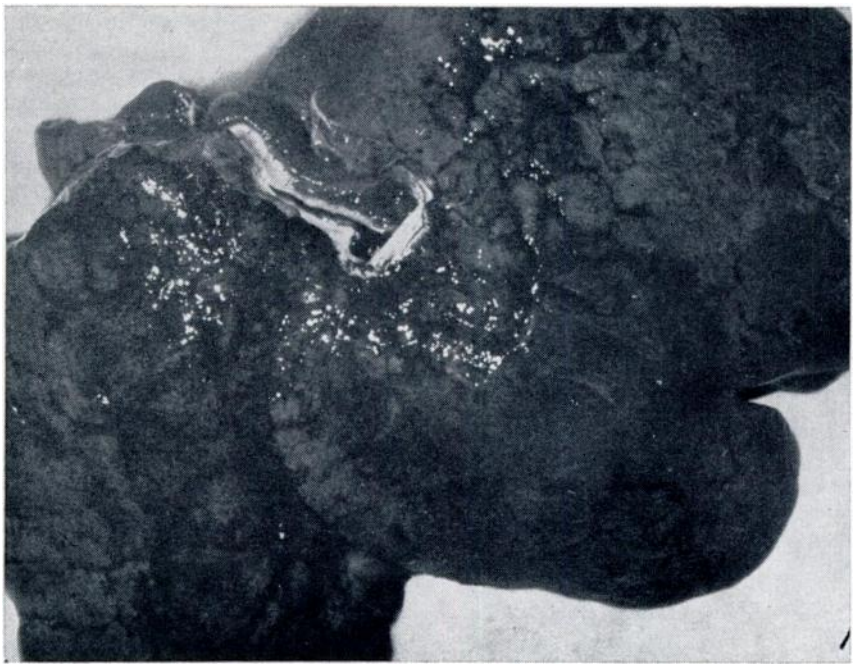

FIGURE 1. Surface of a feral hog liver illustrating bosselations, fissures and black pigmentation characteristic of **Fascioloides magna** infection.

Fluke eggs were not detected in the gallbladder or feces of infected animals. These findings support the observations of Krull,[15] and Migaki *et al.*[16] that eggs are not passed in the manure of infected pigs. Apparently pigs do not disseminate eggs unless severe liver damage occurs, as in the case of cattle. In such uncommon instances, *F. magna* eggs can occasionally get into the bile ducts and be passed in the feces.[8]

Fasciola hepatica was not found in the feral hogs, but was recovered from 12 of 61 cattle originating in the same study areas[7] and has been reported from domestic pigs.[2,19,20] Experimental and natural infections of domestic pigs with *F. hepatica* have demonstrated that they are highly resistant to infection with this fluke.[2,6,17,18,20] A fibroblastic reaction resulting in immobilization and death of the parasite was the general response to infection. Pig liver has abundant interlobular connective tissue, which may act as a physical barrier to migrating flukes. This connective tissue reaction also may help explain the low numbers of *F. magna* found in feral hogs.

Further evidence for resistance of domestic pigs to *F. magna* was obtained in our laboratory. Of seven 10-week-old domestic pigs (mixed breeds), each exposed to 100 metacercariae, flukes were recovered 2-4 months later from only two. One pig had one fluke in the liver and the other had one fluke in the liver and one in the lungs. Krull[15] reported lesions from a pig exposed to 200 metacercariae, but no eggs were found in manure during the trial and no flukes were found at necropsy, 729 days after exposure.

The feral hogs collected for this study probably had maximum exposure to metacercariae because flukes were prevalent in the deer population in both areas, and snail intermediate hosts were abundant in areas where hogs were collected. Snails were frequently collected in hog rootings and wallows. These muddy depressions held water for considerable periods of time and provided an ideal habitat for snails. The high prevalence of infection in these hogs may reflect the large numbers of metacercariae to which they are exposed. The low numbers of flukes recovered from infected animals suggests an innate resistance.

Feral hogs may be more than aberrant hosts in the epizootiology of *F. magna*. By their rooting behavior, hogs also provide and enlarge areas of snail habitat and indirectly enhance the potential for transmission in areas where snail intermediate hosts prevail.

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