STUDY REPORTS

1. Title: Studies on the Epidemiology of Fasciolopsis buski.

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OBJECTIVES

The objectives of this study were to determine (1) the distribution and incidence of Fasciolopsis buski in Thailand, (2) the species and prevalence of snail vectors, (3) the water plants important in the transmission of the disease, and (4) make observations on the intermediate stages of the parasite.

DESCRIPTION

Epidemiological surveys were made in 14 provinces within central Thailand with a total of 6,324 persons being examined. From information gathered in these surveys the area of Pak Hai was selected as a suitable site in which to search for the snail intermediate host(s) and water plants involved in the transmission of F. buski, as over 70% of the people examined were found to harbour the parasite.

Families in this hyperendemic area were selected in which several members were found to be infected. This was used as an indication of active transmission of the disease. At these houses snails and water plants were collected and examined; the plants were scraped for metacercariae and the snails placed in containers where they could be checked for the shedding of cercariae. Many different types of water plants were examined, including those that are neither eaten by humans or livestock. Also each type of plant was examined for the presence of infected snails.

A small pig was purchased and fed 70 metacercariae to (1) obtain supporting evidence that the metacercariae were in fact F. buski, (2) determine the length of the prepatent period, (3) determine the number of adults recoverable and (4) obtain a more accurate estimate of total egg output per day per adult worm.

When the snail vectors had been identified, an experiment was conducted on the effects of distance, from a known source of human infection, on snail infection rates. Three sites were chosen for collection of snails: Group I was collected from within 25 meters of a house where several persons were known to have F. buski, Group II was collected from water plants near the edge of a rice field approximately 300 meters downstream, Group III was collected at approximately 600 meters downstream also on the edge of a rice field. The entire area was under several feet of water with a canal situated about 20 meters from the fields. No other houses were located in the immediate vicinity and thus there was only the one known source of infection. However, there may have been occasions when people working in the fields would defecate into the water.

Several species of snails were collected for experimental infection studies. Eggs of F. buski were incubated and when the miracidia hatched (ca. 18 days) they were placed in small cups with the snails. After several hours of exposure the snails were returned to larger tanks and a number examined at intervals for the presence of the intermediate stages of the parasite. In addition 1840 snails (Polypylis hemisphaerula and Trochorbis trochoides) were dissected and examined for sporocysts, rediae, daughter rediae and cercariae. All stages present in the snails were counted and recorded.

PROGRESS

Infections with F. buski have been found only in the basin region of central Thailand; which includes portions of Suphanburi, Angthong, Ayutthaya, and Nakorn Pathom Provinces. It is estimated that approximately 100,000 persons from the basin region are infected with F. buski at any given time.

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Infected persons were interviewed concerning their eating habits and it was found that not all of them ate the same fresh water plants. There are three plants which are habitually eaten by most of the people, however no plant could be singled out as the only source of infection.

Three species of snails were found that have been either known or suspected intermediate hosts of F. buski. They are: Polypylis (= Segmentina) hemisphaerula, Trochorbis (= Segmentina) trochoides and Gyraulus convexiusculus. Of the three only Polypylis and Trochorbis were found naturally infected. Snails have been collected from various regions in the endemic area and several species other than those listed above have been examined, all with negative results. Infected snails were found in relative abundance around the houses of infected persons, with Polypylis being far more abundant than Trochorbis. Also, a slightly higher percentage of Polypylis were found infected, which would indicate that it is of greatest importance in the transmission of the disease. Experimental infections have been attempted on the laboratory and Polypylis and Trochorbis have both been successfully infected, though the infection seems to develop at a slower rate in Trochorbis, which may indicate that it is not as suited a vector. Gyraulus has never been found naturally infected and never successfully infected in the laboratory.

Infected snails have been found on all species of water plants collected from around the houses of infected families. As the cercariae of F. buski do not travel a great distance before encysting it is likely that all of the water plants are infected, although not all are eaten and cannot be considered important in transmission. Water caltrop (Trapa bicornis), lotus and "Pak boong" (water morning glory) are the only plants eaten by the human population so these are undoubtedly the plants that are of greatest importance epidemiologically. All common water plants that have been examined have been found to have metacercariae on them, however, the metacercariae have never been found to be as numerous as those reported from other countries.

A number of animals have been examined as possible reservoirs of infection including pigs, cows, water buffalos, horses and dogs, with only pigs having been found infected. One dog was found with F. buski like eggs in its stool, however, no attempt was made to collect adult worms for positive identification.

It was originally found that cows and water buffalos had F. buski like eggs in their stools, but when the intestinal contents were examined (at the local abattoirs) no worms could be recovered. In many areas as high as 90% of the cattle examined were infected. We found, from examining the livers, that they were infected with Fasciola gigantica, F. hepatica and perhaps F. indica. This being the case, one would expect to find at least a few human infections. However, from our treatment programs and the results of autopsies from the Suphanburi Provincial Hospital (Dr. Supit Snitwongse, personal communication) no human Fasciola infections have as yet been found. Therefore, we must conclude that if there are human infections with Fasciola they are very rare.

On 13 March 1969, F. buski like eggs first appeared in the stool of the pig that was fed metacercariae. The prepatent period being (from 16 Nov. '68—13 March '69) almost four months. Studies and observations are continuing.

Of the 1840 snails that were dissected, 393 (21%) were found to contain at least one stage of F. buski. The results are shown in Table 1. The results clearly indicate that the proportions of positive and negative snails do vary with size, i.e. young snails are more susceptible to infection than older ones.

Table 3 is a breakdown of the different stages found in the snails and the numbers encountered (393 positive).

The results from the three groups of snails collected at various distances from a known source of human infection are summarized in Table 3. As distance increases from a known source of human infection the infection rate in the snails decreases rapidly. In addition to the larval stages of F. buski a few fork—tailed cercariae and Cercaria ocellata were found; these species have not as yet been identified.

TABLE 1

Prevalence of snails found infected with Fasciolopsis buski.

Snail diameter (mm.)	# Exam.	% Infected
less than 1.0	105	33
1.0--1.5	902	20
1.6—2.0	713	23
2.1—over	120	16

TABLE 2

Intermediate stage of Fasciolopsis buski found in the snails.

Stage	# snails infected with each stage	Number/Infected snail		
		min.	max.	ave.
Sporocysts	95	1	4	1.2
Rediae	211	1	8	2.4
Daughter Rediae	279	1	6	1.9
Cercariae	80	1	17	5.7

TABLE 3

Effects of distance, from a known source of human infection, on snail infection rates.

Group	# Exam.	# Pos.	% Pos.
1 (25M)	490	125	26
2 (300M)	317	27	8
3 (600M)	31	2	6