FASCIOLIASIS
IN
PENINSULAR MALAYSIA

DEPARTMENT OF VETERNITARY SERVICES
MINISTRY OF AGRICULTURE MALAYSIA
1996

Technical Report
No,19

FASCIOLIASIS IN PENINSULAR MALAYSIA

DEPARTMENT OF VETERINARY SERVICES
MINISTRY OF AGRICULTURE MALAYSIA
1996

ACKNOWLEDGEMENTS

We wish to record our thanks to a number of people who assisted us in gathering the information for this technical report especially all the State Directors of Veterinary Services, district veterinary officer and staff, the staff of the various Regional Veterinary Laboratories, farm directors and staff, and abattoir directors and staff. We also acknowledge the assistance given to us by the herd health unit at the VRI who were most helpful in the survey done in Perak state especially in the Kinta district and on our trials with triclabendazole. The Chemistry Department, Ipoh, Perak was most helpful in analysing the many water samples for minerals. We wish to thank Mr. Liew Sin Wah for the excellent photographs. Thanks also to Ms. Annie Huam for typing the manuscript and Mr. Mohd. Daud bin K. Othman for his help in the publication of this technical report. This study was supported by IRPA (R & D) funds made available to the Senior authors through the 5th and 6th Malaysia Plans.

TABLE OF CONTENTS

FASCIOLIASIS IN PENINSULAR MALAYSIA

Prepared by

C. RAJAMANICKAM T.S. CHEAH, P. CHANDRAWATHANI
Y. HASNAH AND M. ADNAN
Veterinary Research Institute
Ipoh, Malaysia.

INTRODUCTION

Faciola gigantica (Cobbold, 1885) for which the intermediate host is Lymnaea rubiginosa, a fresh water snail is the cause of fascioliasis in several species of domestic liverstock in Peninsular Malaysia. The disease seems to be endemic in the country and the snail *L. rubiginosa* is found widely distributed in such areas.

During the period 1988 - 1992 a study was undertaken in Peninsular Malaysia on the occurrence of both *Fasciola* eggs in the feaces of cattle and buffaloes and on the presence of the intermediate host snail, *L. rubiginosa* from all states in Peninsular Malaysia.

Associated studies included the analysis of water samples for certain chemical parameters form *Lymnaea* positive as well as *Lymnaea* negative areas; the haematological and biochemical parameters of *F.gigantica* infested and non-infested cattle, as well as the use of triclabendazole on cattle naturally infested with *F.gigantica*

Information was obtained by questionnaire on the use of flukicides by various states in Peninsular Malaysia; on liver fluke infestion in government livestock farms and on cases of liver fluke infestation from the major abattoirs in the country.

The information presented in this technical bulletin hopefully provides base-line data for future researchers in the control of the disease.

PREVALENCE OF FASCIOLIASIS

Fascioliasis was found to be present in all states of Peninsular Malaysia with Johore having only one district (Segamat) positive for *Fasciola.* The Langkawi islands were negative to *Fasciola* infection (see Figure A). Abattoir surveys for the years 1988 - 1992 shows the incidence of liver fluke due to condemnation of livers in Penang, Ipoh, Shah Alam and Malacca. Johor showed a negative incidence to this parasite. Cattle, buffaloes and goats seem to be commonly

infected with the incidence in sheep being seen only at the Ipoh abattoir. Government cattle, goat and sheep farms revealed the absence of liver fluke at post mortem except for one case from cattle at Kluang and another at Tersat, Trengganu (Table 1). These were probably in animals brought from outside the farm since feacal examinations were negative to *Fasciola* in the farm animals and the lymnaead snails were absent.

Fasciola gigantica seems to be the only liver fluke observed at post-mortem or from abattoir samples. However *Fasciola hepatica* has at various times been reported in this country. These were usually in imported cattle brought into the country from Australia and other endemic places. As such it is presumed that *F.gigantica* is the only liver fluke present in Peninsular Malaysia. It would be interesting to find out whether the larval stages of *F.hepatica* are able to develop in the snail *L.rubiginosa*

Figure A : THE PREVALENCE OF FASCIOLIASIS AND THE DISTRIBUTION OF THE INTERMEDIATE HOST, LYMNAEA RUBIGINOSA IN PENINSULAR MALAYSIA

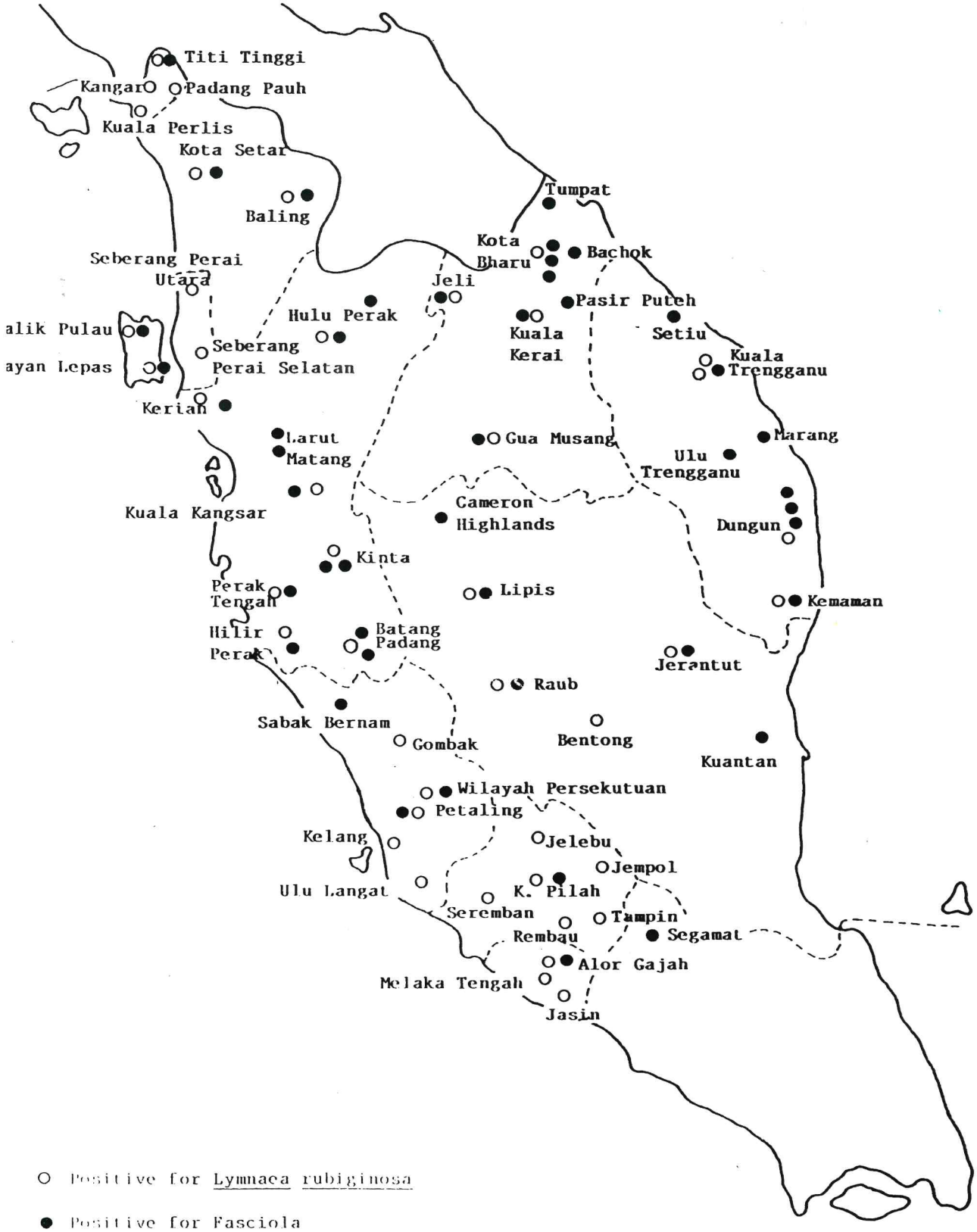


TABLE 1
POSITIVE CASES FOR LIVER FLUKE INFECTION IN DVS FARMS FROM 1988 - 1992

No.	Farm	from feacal sample 1988 - 1992		From Post-mortem 1988 - 1992		Remarks
		Cattle	Buffalo	Cattle	Buffalo	
1.	Ranc. Daging Penusu, Jelai Gemas.	0	none	0	none	Cattle only
2.	Ranc. Daging Penusu, Kluang.	0	0	1	0	
3.	Ranc. Daging Tersat.	0	0	0	1	
4.	Pusat Ternakan Haiwan, Sisek.	0	0	0	0	
5.	Ranc. Daging Penusu, Ulu Lepar.	0	0	0	0	
6.	Pusat Tenusu Batu Arang.	0	0	0	0	
7.	Pusat Ternakan Haiwan Pantai Timor, Tanah Merah.	no data	no data	0	0	
8.	Institut Haiwan Kluang	0	0	0	0	
9.	Ranc. Daging/Penusu, Padang Hijau	0	none	0	none	Cattle only
10.	Ranc. Daging Penusu, Behrang Ulu	0	0	0	0	No data for 1988 - 1989
		Goat	Sheep	Goat	Sheep	
11.	Pusat Pembiakan Kambing/Bebiri Kg. Kuala Pah, Jelebu.	0	none	0	none	Goat only
12.	Pusat Pembiakan Lembu Baka, Ijok	none	0	none	0	Sheep only

PREVALENCE OF *LYMNAEA RUBIGINOSA SNAILS*

The distribution of the snail *L.rubiginosa* as seen in figure A was from all states of Peninsular Malaysia except Johore. It is rather strange that the lymnaead snail was not found in Johore state and an explanation as to this phenomenon is at present no possible. It is also possible that more intense investigations may reveal the presence of *L.rubiginosa* snail in the state.

HABITATS

The snail *L. rubiginosa* is found commonly in:

i) rice growing areas especially where there are artifical drainage and irrigation canals

ii) in slow running streams and ponds near limestone outcrops

iii) clear or slightly turbid water where there are water plants such as *Ipomoea* sp (kangkong) and *Eichornia crassipes* (water hyacinth).

Oil palm estates and rubber estates apparently do not harbour these snails. In almost all instances except one the snails were found in the water or attached to plants on the side of streams or ponds. The exception was in a partially dry rice field where the snails were found in the moist surface soil still alive. Whether aestivation occurs in the case of *L. rubiginosa* is doubtful.

Several water samples from *Lymnaea* positive and negative areas were sent to the Chemistry Department in Ipoh for analysis, and these are shown in Table 2. Calcium (Ca^{++}) was high in *L. rubiginosa* positive water samples (mean: 15.3 mg/1) as compared to water samples negative for *L. rubiginosa* (mean: 4.6 mg/1) and the pH was almost neutral (6.7) whereas it was on the acidic side for *L. rubiginosa* negative water samples (5.1).

TABLE 4
POSITIVE CASES OF LIVER FLUKE (FASCIOLA GIGANTICA) INFECTION FROM 1988 - 1992 IN ABATTOIRS

Abattoir	Cattle						Buffalo						Goat						Sheep					
	1988	1989	1990	1991	1992	Total	1988	1989	1990	1991	1992	Total	1988	1989	1990	1991	1992	Total	1988	1989	1990	1991	1992	Total
P. Pinang	61	123	124	148	154	610	55	86	62	78	62	343	288	155	226	262	250	1121	0	0	0	0	0	0
Ipoh	283	460	505	420	303	1971	106	124	135	139	102	606	432	438	479	557	509	2415	3	13	17	20	1	54
Shah Alam	178	188	168	170	271	975	2	6	4	4	17	33	1	4	0	1	0	6	0	0	0	0	0	0
Melaka	76	145	131	161	106	619	20	47	27	26	5	125	0	21	4	0	1	26	0	0	0	0	0	0
Johor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	598	916	928	899	834	4175	183	263	228	247	186	1107	661	618	709	820	760	3568	3	13	20	20	1	54

Figure 1
Habitats of *Lymnaea rubiginosa*

(a) Pond with water lily *Nymphaea sp.*

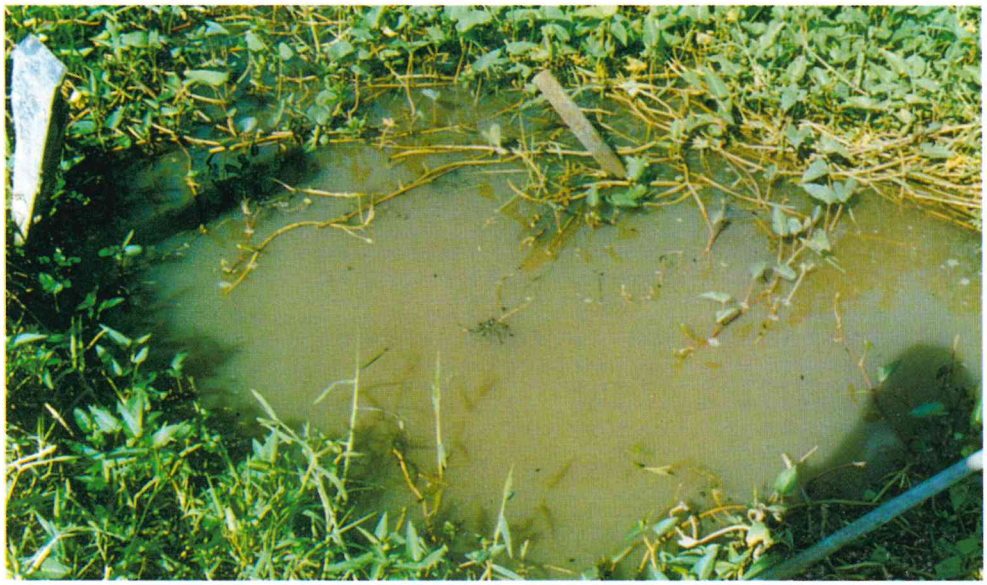
(b) Pond with water lily *Nymphaea sp.* close-up view

(c) Close-up of *Lymnaea rubiginosa* snails

(d) Rice field after irrigation

(e) Drain behind cattle shed

(f) Slow moving stream with vegetation



(g) Cleared area of pond with *Ipomea sp.* (kangkong)

(h) *Ipomea sp.* showing *Lymnaea rubiginosa*

Figure 2: Adult *Lymnaea rubiginosa* - nota size variation

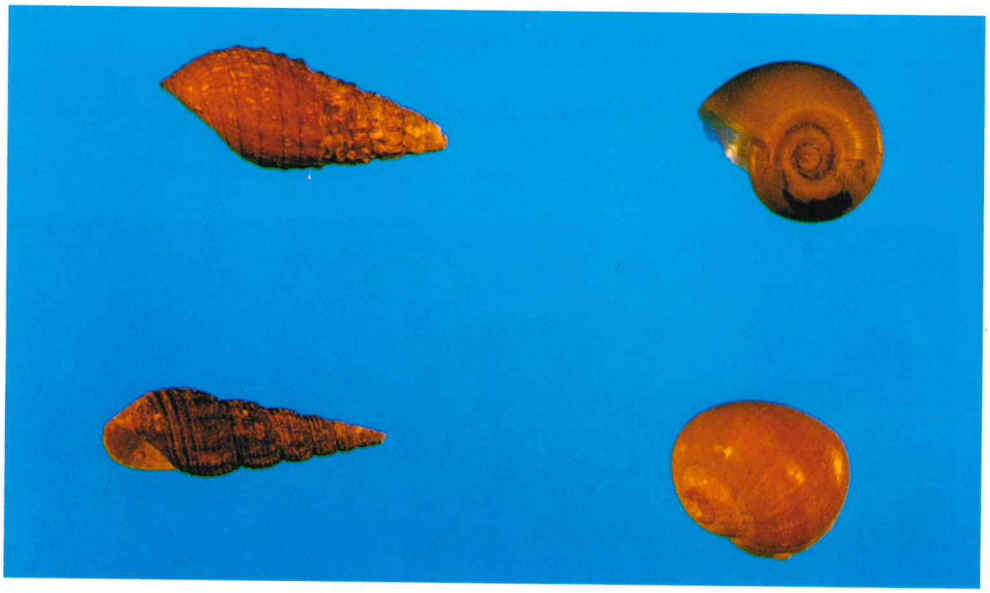


Figure 3: Common fresh-water snails

Figure 2: Adult *Lymnaea rubiginosa* - nota size variation

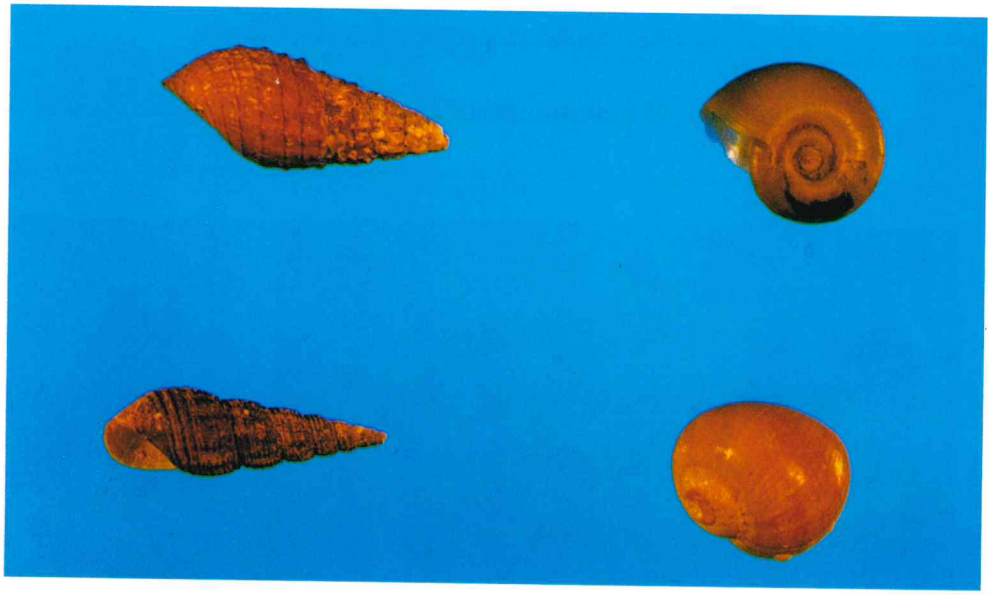


Figure 3: Common fresh-water snails

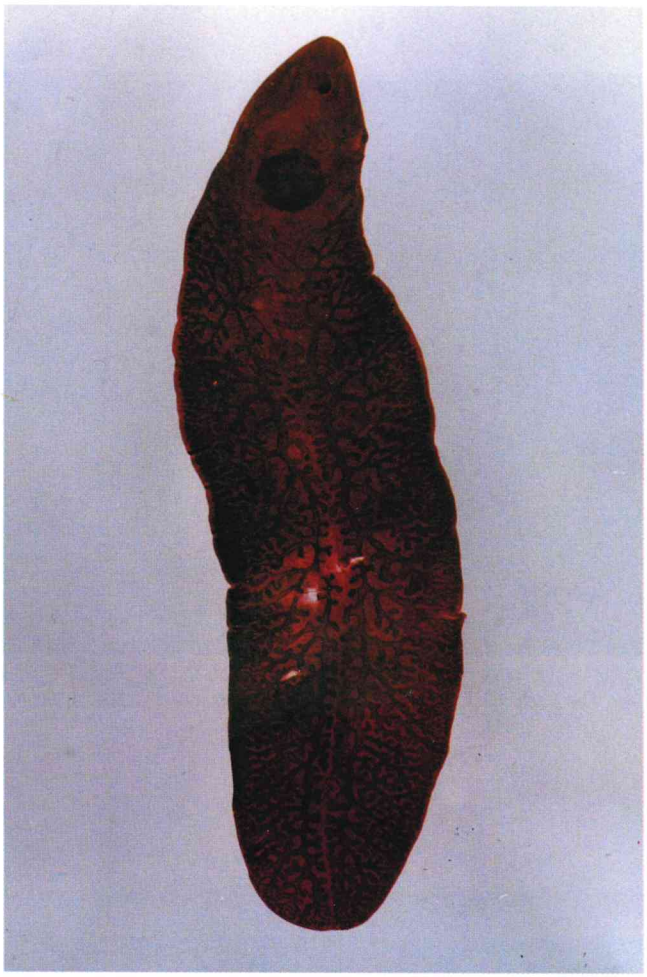


Figure 4: Whole mount of *Fasciola gigantica*

Figure 5: Section of cattle liver to show *Fasciola gigantica adult* (▸)

USE OF FLUKICIDES BY STATES

Seven states in Peninsular Malaysia reported using flukicides on a routine basis for the treatment of fascioliasis (Table 5). During the years 1988 to 1992 a total of RM278,201.70 was spent by these states. Perak showed the highest, spending RM107,777.70 and Johor the lowest at RM5,022.00. A total of 120,140 doses were given during this period.

TABLE 5
FLUKICIDE USAGE FROM 1988 TO 1992

State	Dose				Total Doses	Total Cost (RM)
	Flukiver	Nilzan	Zanil	Others		
Perlis	200	23,090	0	0	23,290	18,527.50
P. Pinang	0	8,903	0	2,907	11,810	28,344.00
Perak	290	16,200	1,350	25,520	43,360	107,777.70
Selangor	1,200	150	0	27,537	28,887	55,768.02
Negeri Sembilan	300	4,050	450	0	4,800	23,135.66
Pahang	1,200	3,242	0	590	5,032	39,626.82
Johor	2,740	10	0	211	2,961	5,022.00
	5,930	55,645	1,800	56,765	120,140	278,201.70

FIELD STUDIES OF *F. GIGANTICA* INFECTIONS

The results of the study on haematological and biochemical parameters of cattle infested with *Fasciola gigantica* (Rajamanickam et. al 1987) showed that certain haematological parameters such as eosinophil numbers, total red blood cell counts and haematocrit values together with biochemical determinations of serum activities of sorbitol dehydrogenase (SDH), glutamate dehydrogenase (GLDH) and gamma glutamyltransferase (GGT) can be valuable indicators of liver fluke infestation and liver damage in chronic fascioliasis (see Tables 6 and 7). A study on the use of the drug triclabendazole (Fasinex) showed it was a highly effective and safe flukicide (Rajamanickam et. al. unpublished). A similar study in Indonesia by Suhardano et. al. (1991) showed that *Fasciola* feacal egg count in treated animals was significantly reduced ($P < 0.01$) to almost zero at all observations.

TABLE 6
SOME HAEMATOLOGICAL PARAMETERS OF CATTLE NATURALLY INFESTED WITH FAMCIOLA GIGANTICA AND NON-INFESTED CONTROLS

Haematological parameters	Non-infested cattle		Infested cattle		'T' value	Significance level (P)
	Number	Mean ± S.E.	Number	Mean ± S.E.		
Haemolglobin (g/dl)	26	10.65 ± 0.38 (8.2 - 15.3)	117	10.22 ± 0.15 (6.1 - 14.5)	1.163	NS
Red blood cells (x 10^6/ul)	26	6.42 ± 0.22 (4.06 - 8.8)	117	5.75 ± 0.10 (2.9 - 7.9)	2.909	< 0.01
Packed cell volume (%)	26	31.50 ± 1.19 (23 - 47)	117	29.95 ± 0.44 (19 - 41)	2.183	< 0.05
Mean corpuscular volume (um^3)	26	49.44 ± 1.40 (37.2 - 66.5)	117	52.63 ± 0.51 (42.5 - 70.0)	1.724	NS
Mean corpuscular haemoglobin (pg)	26	16.71 ± 0.47 (13.3 - 23.4)	117	17.95 ± 0.18 (13.4 - 24.4)	2.750	< 0.01
Mean corpuscular haemoglobin concent (g/dl)	26	33.90 ± 0.34 (30.6 - 37.3)	117	34.13 ± 0.16 (29.2 - 38.0)	0.646	NS
Total Leucocytes count (x 10^3/ul)	26	13.89 ± 0.69 (7.9 - 23.2)	117	12.33 ± 0.54 (5.4 - 40.1)	2.487	< 0.05
Neutrophils (%)	26	21.57 ± 1.47 (10 - 37)	117	27.84 ± 0.96 (6 - 60)	2.494	< 0.05
Lymphocytes (%)	26	66.0 ± 1.81 (46 - 80)	117	53.0 ± 1.31 (19 - 86)	8.304	< 0.01
Monocytes (%)	26	3.57 ± 1.01 (1 - 28)	117	2.54 ± 0.30 (0 - 31)	1.829	NS
Eosinophils (%)	26	9.65 ± 0.77 (3 - 16)	117	16.72 ± 0.77 (2 - 39)	3.936	< 0.01
Basophils (%)	26	0.19 ± 0.08 (0 - 1)	117	0.15 ± 0.04 (0 - 3)	0.403	NS

NS - The difference between the two groups is not significant, i.e. P > 0.05

values in parenthesis refer to range of observed values

* Table extracted from Kajian Veterinar 19 (2) : 143-152 (1987)

TABLE 7
SOME BIOCHEMICAL PARAMETERS OF CATTLE NATURALLY INFESTED WITH *FASCIOLA GIGANTICA AND NON-INFESTED CONTROLS*

Biochemical parameters	Non-infested cattle		Infested cattle		'T' value	Significance level (P)
	Number	Mean ± S.E.	Number	Mean ± S.E.		
Alanine aminotransferase (U/l)	52	8.19 ± 0.41 (0.96 - 15.64)	92	11.95 ± 0.42 (1.44 - 22.61)	5.439	< 0.001
Aspartate aminotransferase (U/l)	48	34.17 ± 1.70 (20.6 - 66.0)	80	45.73 ± 1.67 (18.7 - 120.0)	4.213	< 0.001
Alkaline phosphatase (U/l)	45	122.06 ± 7.65 (17.0 - 209.0)	79	101.90 ± 7.38 (22.0 - 308.0)	2.152	< 0.05
Cholinesterase (U/l)	46	457.18 ± 86.25 (58.7 - 2463.3)	67	188.26 ± 9.87 (58.7 - 469.2)	3.728	< 0.001
Glutamate dehydrogenase (U/l)	39	6.03 ± 1.32 (0.60 - 39.99)	47	21.45 ± 2.93 (0.40 - 80.57)	4.438	< 0.001
Gamma-glutamyltransferase (U/l)	49	13.98 ± 1.11 (5.79 - 47.0)	75	20.52 ± 1.76 (1.15 - 105.0)	2.676	< 0.01
Sorbitol dehydrogenase (U/l)	43	2.49 ± 0.27 (0.10 - 6.19)	52	6.12 ± 0.68 (0.21 - 16.77)	4.581	< 0.001
Total Protein (g/dl)	51	7.63 ± 0.20 (5.09 - 11.76)	103	8.04 ± 0.09 (5.73 - 10.15)	1.692	NS
Albumin (g/dl)	51	3.69 ± 0.09 (2.32 - 5.53	103	3.42 ± 0.06 (2.35 - 5.05)	2.443	< 0.05
Globulin (g/dl)	47	4.10 ± 0.18 (2.07 - 8.71)	103	4.62 ± 0.10 (1.91 - 7.03)	2.169	< 0.05
A : G ratio	45	0.95 ± 0.05 (0.35 - 1.73)	103	0.78 ± 0.03 (0.36 - 1.81)	3.382	< 0.001

NS - The difference between the two groups is not significant, i.e. P> 0.05

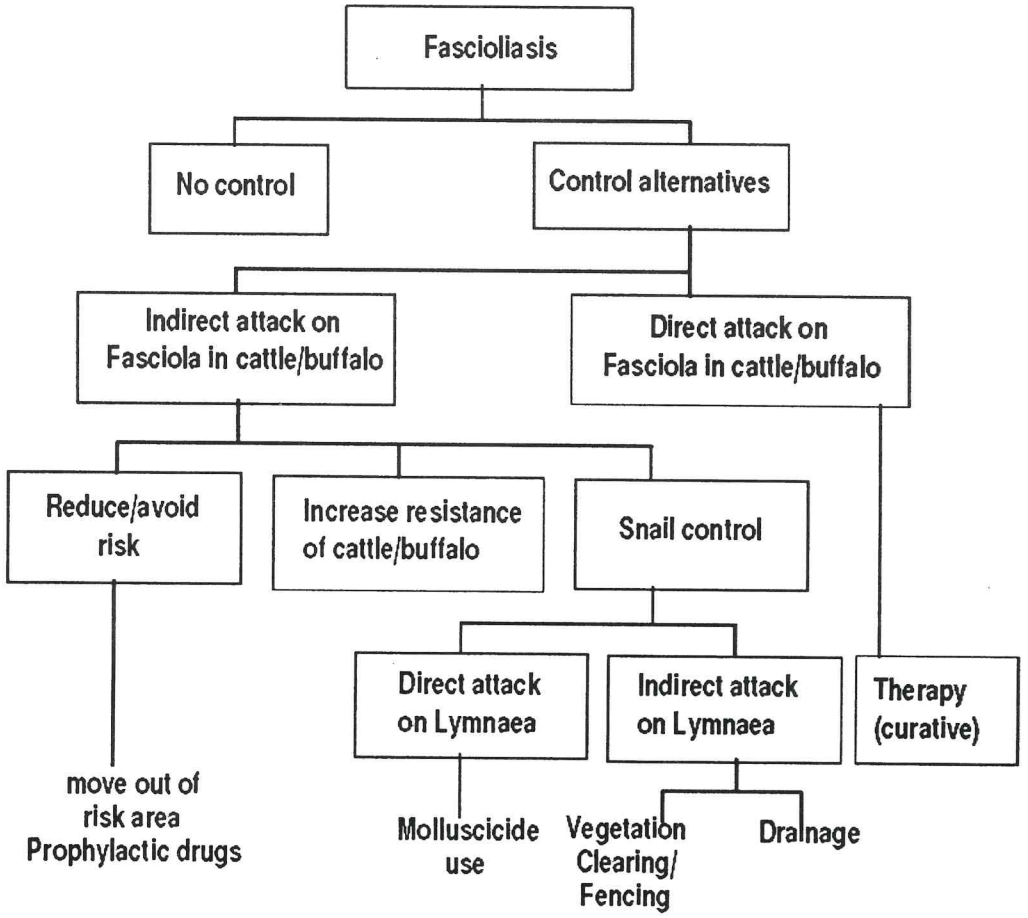
Values in parenthesis refer to range of observed values

* Table extracted from Kajian Veterinary 19 (2) : 143-151 (1987).

CONTROL MEASURES

Traditional methods of control especially of the vector snail are still valid today. This is especially so with regards to fascioliasis in farm situations. However when it comes to the control of fascioliasis at the district level or in the field where cattle/buffaloes are kept in small herds in a large area, the control measures are difficult to apply successfully. A diagrammatic representation of the control of fascioliasis in the Malaysian context is given below (figure 6):

FIGURE 6
DIAGRAMMATIC REPRESENTATION OF THE DISEASE CONTROL ALTERNATIVES IN MALAYSIAN FASCIOLIASIS



Fasciolasis control is feasible where we are able to control the movement of cattle and keep them in a confined area, such as in a cattle farm. By restricting the introduction of cattle or by treating infected cattle before they are brought into a farm it ils possible to use several of the methods listed under snail control and thereby control or eradicate fascioliasis. In an extensive situation the best solution would be to treat infected cattle/buffaloes regularly and prevent reinfestation by avoiding known risk areas. This would minimise the spread of fascioliasis in the herd.

The use of molluccicides is generally discouraged because of its effects on other fresh-water life including fish. Till safer molluscicides are available the usage should be limited to closed farms.

Studies by Alicata (1938) and Grigoryan (1959) as cited by Boray and Enigk (1964) have shown that metacercariae of *F. gigantica* survive for between 63, 122 and 180 - 300 days respectively in stagnant water, running water and on wet grass in temperatures between 16°C - 24°C. *F. gigantica* metacercariae were able to survive 114 days at 30°C and 21 days at 35°C in the laboratory (boray and Enigk, 1964). Such lenghty survival periods make it difficult to control fascioliasis due to *F. gigantica* by grazing management alone.

FUTURE CONTROL

The possibility of using a vaccine based on irradiated metacercariae of *Fasciola gigantica* is feasible once we have overcome the technical problems of producing large numbers of metacercariae. The irradiator which is to be used for the production of sterile screw worm flies could also be used to irradiate metacercariae. This irradiated metacercariae vaccine can be used in cattle and sheep which are introduced to highly infected fasciola areas to protect them from severe fascioliosis (S.A Younis et. al. 1986). Other vaccines based on antigenic material from the liver fluke may also be available in the not too distant future for the control of fasciolosis.

REFERENCES

1. Boray, J.C. and Enigk, K. (1964)
Laboratory studies on the survival and infectivity of *Fasciola hepatica* and *F. gigantica* metacercariae. *Z. Tropenmed. Parasit.* 15 : 324-331.

2. Mohd. Fadzil, Y. (1977).
The economic importance of parasitism in food animals in Peninsular Malaysia. Proceedings of the Joint Conference on Health and Production of local and Australian cattle in Southeast Asia. Bulletin No. 146 Ministry of Agriculture, Malaysia. Eds. Ahmad Mustaffa Haji Babjee, Mohd. Fadzil Yahaya, Abdul Latif bin Ibrahim and S. Thamotaram.

3. Rajamanickam, C., Muniandy, N., Mahadi Yahya, Cheah, T.S., and S. Paramasvaran (1987)
Haematological and biochemical parameters of cattle naturally infested with *Fasciola gigantica* in Perak, Malaysia. *Kajian Veterinar*, 19 : 143-151.

4. Rajamanickam, C., Cheah, T.S., Chandrawathani, P., Hasnah, Y. and Adnan, M. (1992)
The prevalence of fascioliasis in Peninsular Malaysia. pp 34-35 Proceedings of the national IRPA (Intensification of research in priority areas) seminar (Agriculture section Vol. II), Ministry of Science, Technology and Environment, Malaysia. Eds. Y.W. Ho, Dr. K. Vidyadaran, Norhani Abdullah, M.R. Jainudeen, and Abd. Rani Bahaman.

5. Suhardono, S., Widjajanti, P., Stevenson, P. and Carmichael, I.H. (1991).
Control of *Fasciola gigantica* with triclabendazole in Indonesian cattle. *Trop. Anim. Hlth Prod.* 63 : 217-220

6. Younis, S.A., Yagi, A.I., Haroun, E.M., Gameel, A.A. and Taylor M.G. (1986)
Immunization of zebu calves against *Fasciola gigantica*, using irradiated metacercariae. *Journal of Helminthology*, 60 : 123-134.