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On the Occurrence and Significance of Hydatid Cysts in the Ceylon Sambhur *Rusa unicolor unicolor.**

by

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(With three Text Figures & one Plate)

IN August 1960 we reported the finding of *Echinococcus granulosus* from the small intestine of the Ceylon jackal (Paramananthan and Dissanaike, 1960 and Dissanaike and Paramananthan, 1960). This animal was encountered in the course of an investigation into the problem of sylvatic hydatid infection in this country. Since then we have made repeated attempts at demonstrating the intermediate hosts in this jungle cycle and have examined the lungs and livers of several wild animals particularly herbivores like the deer and sambhur. We have so far examined 10 spotted deer, 4 sambhur and 1 barking deer. On the 14th August 1961 we found three relatively large fertile hydatid cysts in the lungs of a sambhur (*Rusa unicolor unicolor*) shot in the jungle of Kalukalawa in the Manampitiya area of the North Central Province.

Description of cysts

Three unilocular cysts were found in the lungs of the animal—2 in the left and 1 in the right lung (Fig. 1). These cysts were at the base of each lung bulging out from the pleural surface antero-ventrally. The cysts in the left lung measured 2.1 inches by 2 inches and 1.6 inches by 1.3 inches respectively. The cyst in the right lung was 2.2 inches by 2 inches. On incising these cysts the characteristic laminated layer was seen. It was noticed that many of the brood capsules contained several hundreds of scoleces (Fig. 2) and as many as 354 scoleces were seen in one of the brood capsules. Figs. 3 and 4 show sections of one of the cysts from the sambhur.

Discussion

Hydatid cysts represent, as you know, the larval stages of the tapeworm *Echinococcus granulosus*. The life cycle is represented in the diagram (Text Fig. 1). In the domestic cycle the definitive host is the dog and the adult worms are found in the small intestine. The usual intermediate hosts are domestic herbivores which get infected with the hydatid cysts by accidentally swallowing the eggs. The hydatid cysts usually develop in the liver or in the lungs. Man can act as accidental intermediate host. The infection is transmitted direct from the dog to man but indirect transmission via foodstuffs and water is a real danger. It takes about six weeks for the worms to mature in the dog and they are believed to lose the infection in about six months. These facts are important.

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Life cycle of Echinococcus granulosus

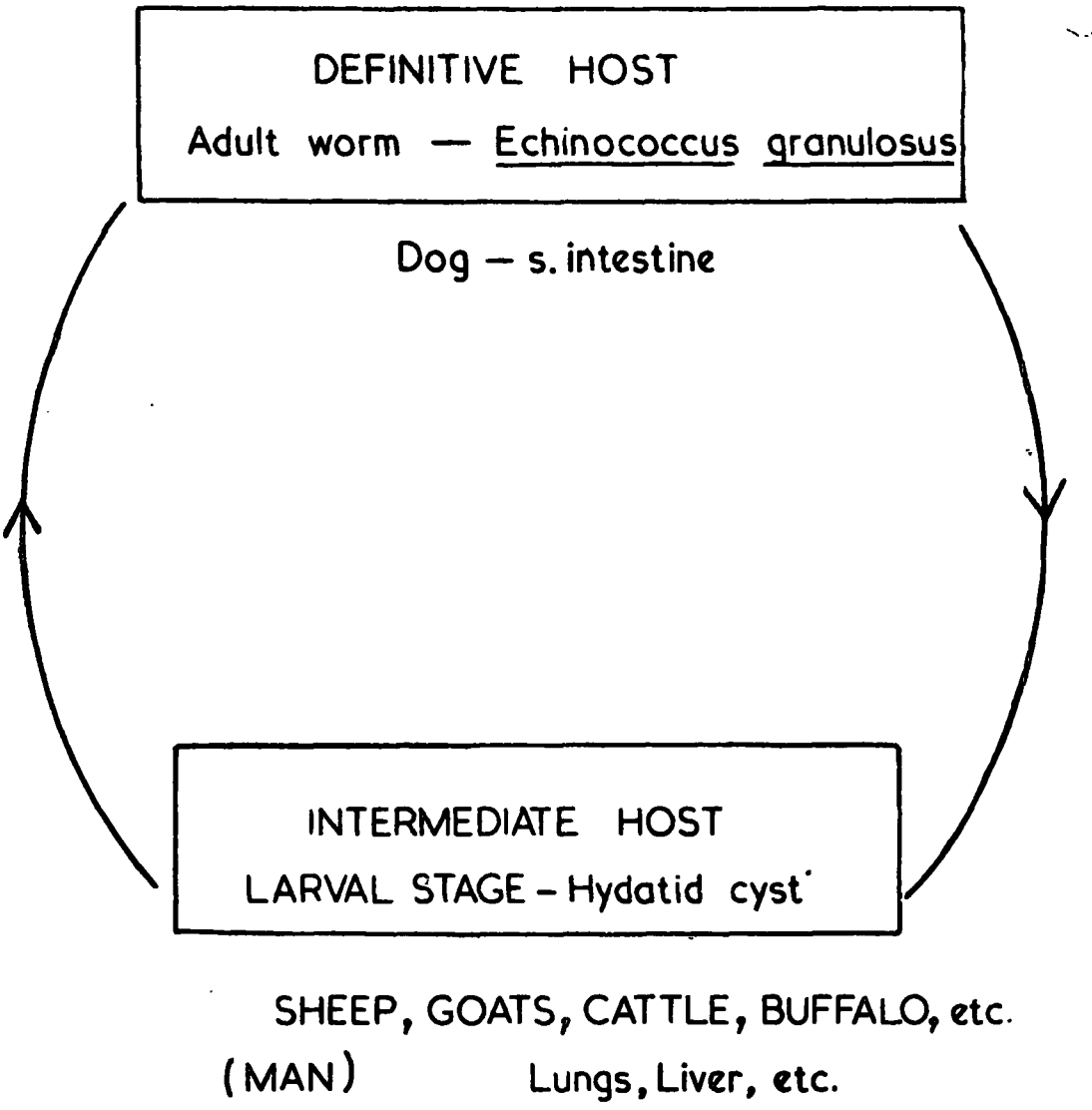

FIG. 1

This is usually what happens in the domestic cycle but, wild animals can be involved in part or whole of the cycle when it is referred to as a "sylvatic cycle". In this instance the cycle goes on between wild herbivores like deer etc. and wild carnivores like the jackal, wolf etc.

A hydatid cyst is a unilocular cyst and its structure is diagrammatically represented in Text Fig. 2. The cyst wall is said to consist of three layers which used to be known as the pericyst, ectocyst and endocyst. The 'pericyst' is, in fact, a fibrous tissue or adventitious layer contributed by the host, while the 'ectocyst' and the 'endocyst', which easily peel off, belong to the parasite. The former is a laminated, hyaline structureless layer which is elastic, and about a millimetre in thickness, and closely adherent to its inner surface is the germinal layer or the 'endocyst'. This is a nucleated layer about 10μ—20μ in thickness from which all the other structures develop. The brood capsules are the important structures in a hydatid cyst and they are usually about 1 mm. in diameter and said to contain about 20 to 40 scoleces. In addition to these a large number of calcareous corpuscles are also found. Usually in hydatid cysts of man and rarely in cysts of animals, a large number of daughter cysts develop. These have the same structure as the mother cyst except that they have no 'pericyst'.

An interesting feature of the brood capsules of the cysts from this sambhur was the large number of scoleces within them. One of us (Paramananthan, 1961) has already pointed out that the brood capsules of local animals, particularly goats, contain many hundreds of scoleces. This may be a special characteristic of the hydatid cysts in this country, since we have not noted it in the literature from elsewhere.

Hydatid cysts have been reported from a number of domestic herbivores in Ceylon such as cattle, goats and even horses (Southwell, 1912, Seneviratna, 1955 and Dissanaike, 1957). The fact that most of these animals came from the Northern and North Central Provinces of the Island pointed to a jungle cycle as the source of infection. Later (Dissanaike, 1958) hydatid cysts were reported from a Toque monkey and it was then suggested that there was strong evidence for a sylvatic cycle of hydatid infection in Ceylon, the cycle probably taking place between the jackal on the one hand and wild herbivores on the other.

The next step was the finding of the adult worms in the small intestine of a jackal shot in the jungle at Mankulam in the Northern Province (Dissanaike and Paramananthan, 1960) and it was then pointed out that a search for the intermediate hosts in the sylvatic cycle should be made in such herbivores as the deer, sambhur, wild buffalo etc. The present finding more or less proves this although it is not unlikely that the sambhur is not the only intermediate host in this sylvatic cycle.

The possibility of hydatid cysts occurring in the indigenous population has already been stressed (Dissanaike, 1957 and Dissanaike and Paramananthan, 1960 and Dissanaike, 1960). It is therefore not out of place here to discuss the significance of these findings in relation to hydatidosis in this country. The diagram below illustrates the situation with regard to this zoonosis in Ceylon (Text Fig. 3).

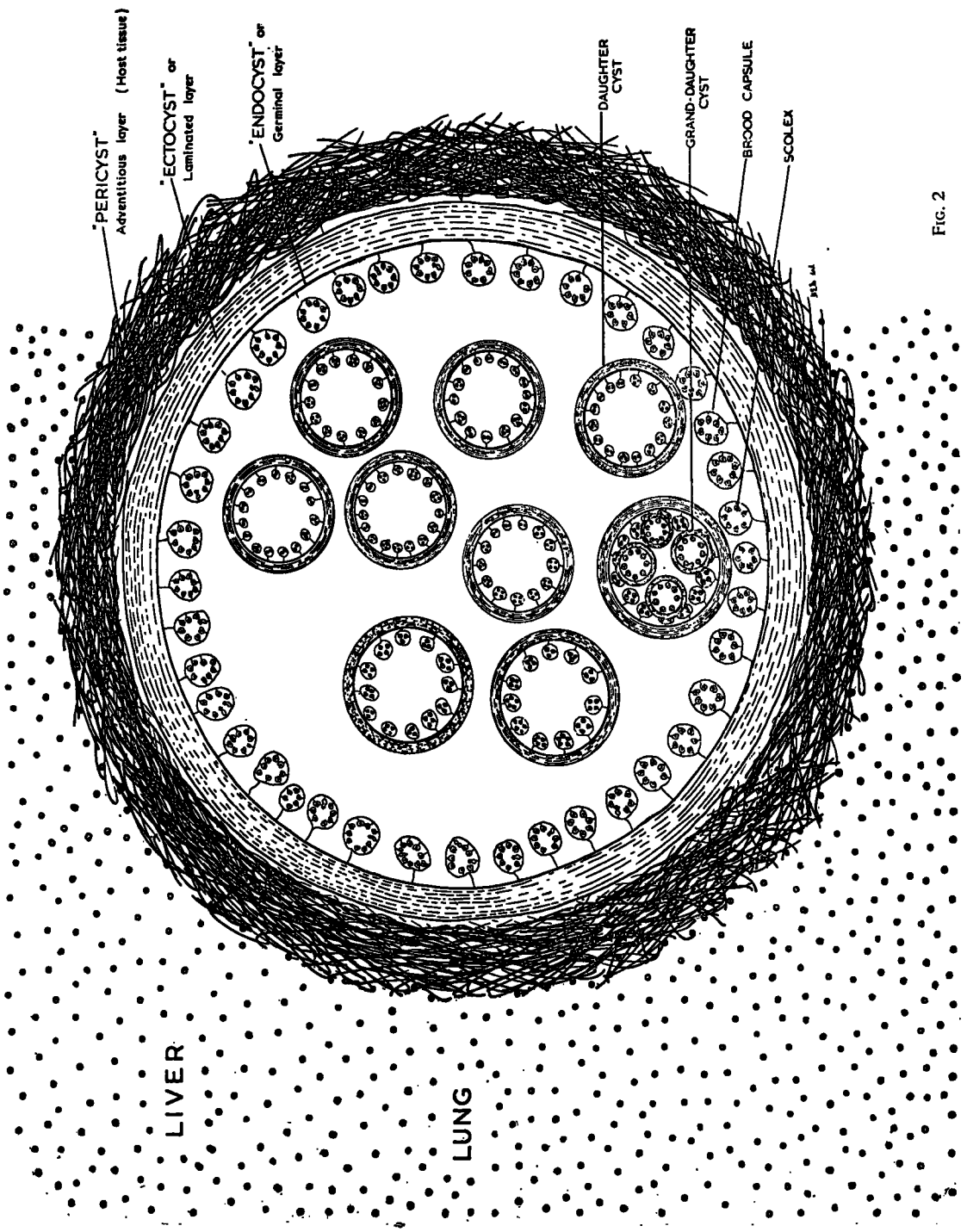
"PERICYST"
Adventitious layer (Host tissue)
"ECTOCYST" or
Laminated layer
"ENDOCYST" or
Germinal layer
DAUGHTER CYST
GRAND-DAUGHTER CYST
BROOD CAPSULE
SCOLEX
LIVER
LUNG

FIG. 2

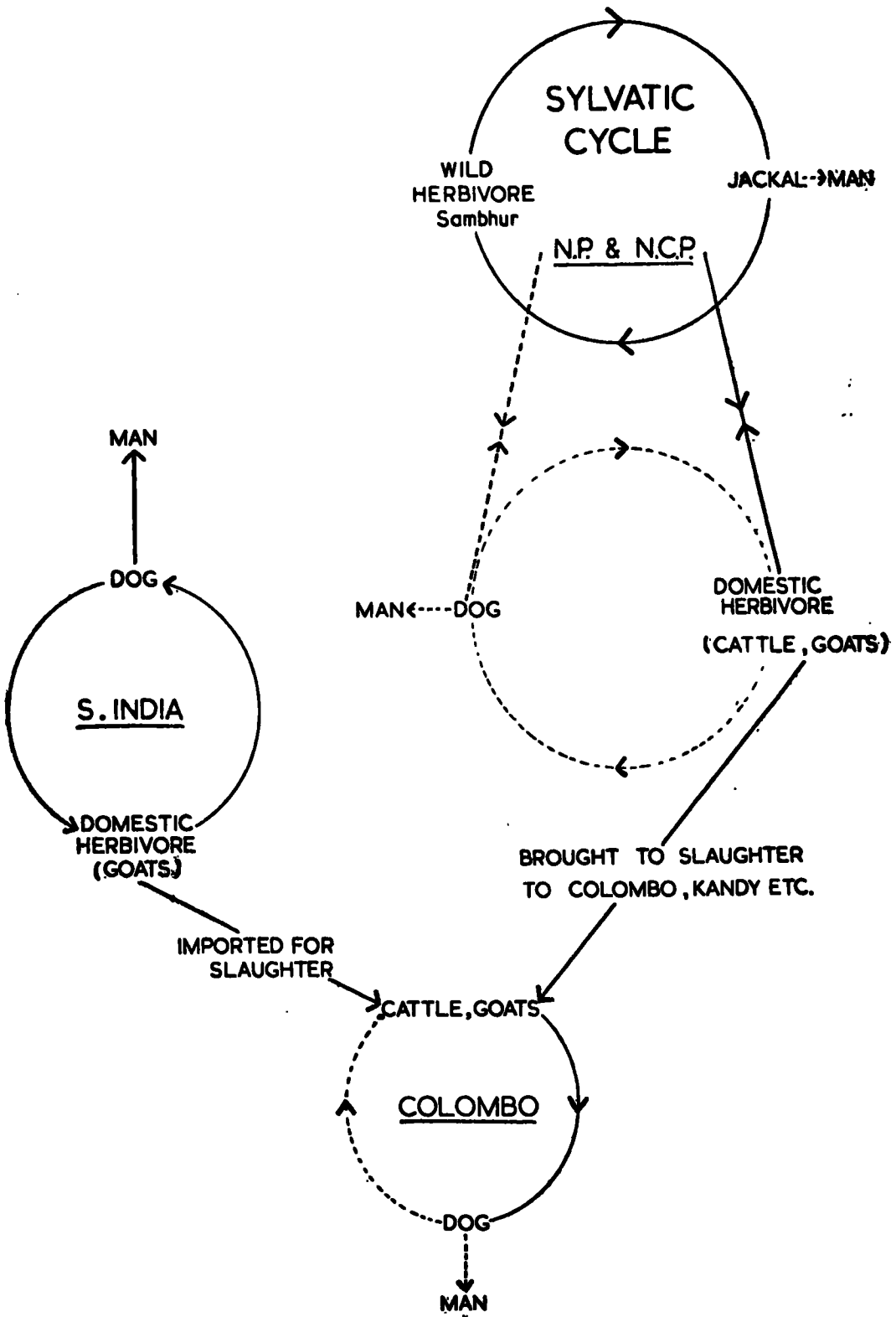
SYLVATIC CYCLE
WILD HERBIVORE Sambhur
JACKAL→MAN
N.P. & N.C.P.
MAN
DOG
S. INDIA
DOMESTIC HERBIVORE (GOATS)
IMPORTED FOR SLAUGHTER
MAN←DOG
DOMESTIC HERBIVORE (CATTLE, GOATS)
BROUGHT TO SLAUGHTER TO COLOMBO, KANDY ETC.
CATTLE, GOATS
COLOMBO
DOG
MAN

FIG. 3

The first recorded case of hydatid cysts from man in Ceylon was in 1887 when a case under the care of Dr. J. D. Macdonald of the General Hospital, Colombo, was reported by his clinical clerk Mr. A. H. Bawa. This cyst was unilocular and contained daughter and granddaughter cysts. It was peculiar in that it did not develop in connection with any of the abdominal organs but was behind the parietal layer of the peritoneum somewhere along the right side of the spinal column. The patient was a Malabar estate labourer. The next case on record was by Chalmers (1905) of a Boer prisoner-of-war treated at the Diyatalawa camp by Dr. Garvin, Senior Surgeon in the General Hospital, Colombo at that time. Since then only a handful of cases have been reported (Paul and Fernando, 1957, Paul, 1957, Gabriel, 1957) and these have all been from South Indians or Indian Tamils. It appears then that human infection is not uncommon in South India. We must assume that there is a domestic cycle going on in South India, and that man gets infected from the dog. We have proof of this domestic cycle in the number of fertile hydatid cysts that we come across in goats imported from there. These animals, as well as the local cattle and goats slaughtered in Colombo and Kandy, must then be a potential source of infection to dogs. The question then arises "Is there a domestic cycle going on, for instance, in Colombo ?" One of us (Dissanaike, 1957) found a single infected dog from the Dog Pound in 1957 and in September last year we (Dissanaike and Paramananthan, 1960) came across 3 infected dogs from the Dog Pound two of which were heavily infested. We personally do not think there is a domestic cycle in the City but feel that from time to time dogs have access to the offal of infected animals and that they get infected and become a source of infection to man.

That takes us to the sylvatic cycle, which we have now shown to take place between the jackal and sambhur or other herbivore. It is seen from the diagram (Text Fig. 3.) that cattle and dogs can get infected in these areas of the Northern and North Central Provinces (bordering the jungles) by accidentally swallowing eggs from jackal faeces. They can then bring back the infection to a domestic cycle in these areas. Another possibility is that dogs, especially hunting dogs taken into the jungles, or fed on offal from game animals, can either be responsible for a domestic cycle or can be a direct source of infection to man. Thus we see that man in these jungle areas is in danger of infection either from a domestic cycle, which we have yet to establish, or from dogs or jackals directly bringing the infection from the jungles. It is possible that a few cases of hydatid cysts in man from these parts may have been undetected in the past.

We would like, in conclusion, to stress once again that although the possibilities may appear somewhat remote, there is every likelihood of our coming across a case of hydatid cysts in a local person infected from the various sources we have just pointed out.

Summary

1. Three fertile hydatid cysts from the lungs of a sambhur (*Rusa unicolor unicolor*) are described.
2. A sylvatic cycle of hydatid infection in Ceylon is more or less established.
3. The significance of these findings in relation to human infection in Ceylon is discussed.

Acknowledgements

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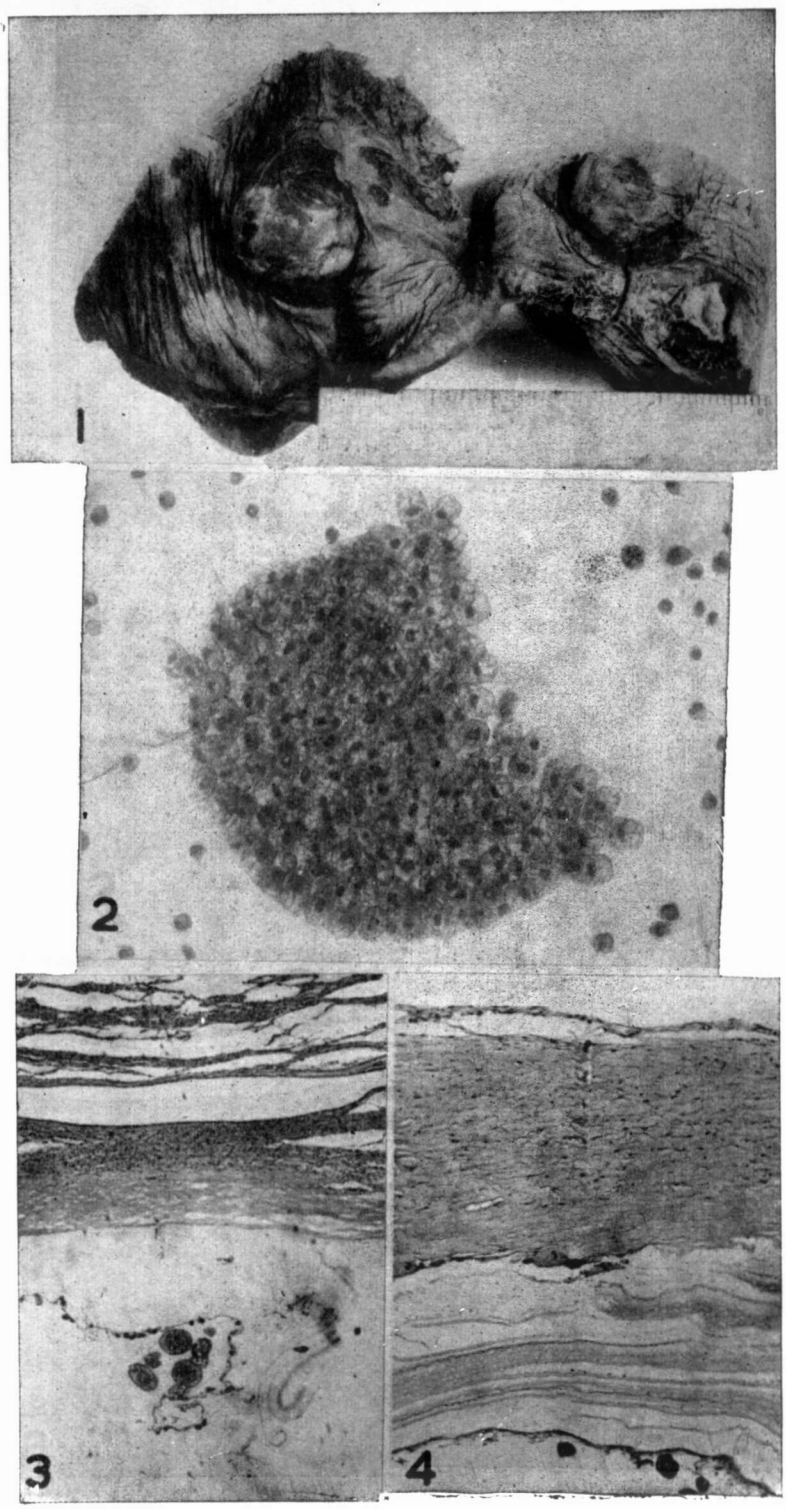
EXPLANATION OF FIGURES IN PLATE

Figure 1.—Right and left lung of Sambhur showing the hydatid cysts.
Figure 2.—A brood capsule from one of the cysts cleared in lactophenol showing large number of scoleces. (X 30).
Figure 3.—Section of one of the cysts showing a brood capsule (X 42).
Figure 4.—Section of the cyst showing the various layers and calcareous bodies (X 106).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