

previously received from India, are long in Sri Lanka and very long in Malaya. *P. argentipes* has been reported from Sabah, but we found none on cattle at dusk near Sandakan.

*Other insects.* *Simulium* larvae, but no biting adults, were found near Kuala Lumpur. Some tabanids (*Chrysops*, *Tabanus* and *Haematopota*), collected there and identified by Mr. H. Oldroyd, were shown, and these, mosquitoes and land leeches were the only obvious pests encountered.

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## PARASITOLOGY

### The effect of a milk diet on *Babesia microti* and *B. hylomyisci* infections in mice

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Suppression of development in some malaria parasites when the host is kept on an exclusive milk diet has already been demonstrated (MAEGRAITH et al., 1952). In the piroplasms BAFORT et al. (1970) noticed a similar phenomenon with *B. hylomyisci*.

In comparative experiments using *B. microti* and *B. hylomyisci* 20 mice were kept on a milk diet for a week before inoculating 10 of them with *B. microti* and 10 with *B. hylomyisci*. Each species was used to inoculate 10 mice kept on normal diet to act as controls. Precautions against *Eperythrozoon* infections were taken using the method of KREIER and RISTIC (1968).

Prolonged incubation periods and suppressed development were shown by *B. microti* in mice kept on milk diet. *B. hylomyisci* behaved as detected by BAFORT et al. (1970).

Folic acid added to the milk was found to restore normal development to some extent, but an almost normal parasitaemia was shown by *B. microti* when *p*-aminobenzoic acid (PABA) was added to the milk. Sulphaquinoxaline added to the milk accentuated the suppression of *B. microti*, markedly suppressed the development and improved the survival rate in *B. hylomyisci* infection.

It was found that after continuous passage in mice kept on milk diet, *B. microti* showed a tendency to return to its usual parasitaemia. The shift to the normal being progressively more marked after the 25th passage. Thereafter with passage of the parasite to mice on a normal diet, further suppression of the parasitaemia was seen.

The experiments showed the dependence of both species on a dietary supply of PABA to synthesize folic and foinic acids. *B. microti* being more dependent on such a source than *B. hylomyisci*.

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### Developmental stages of *Polychromophilus* sp., a parasite of insectivorous bats from the Congo-Brazzaville, in the nycteribiid fly *Penicillidia fulvida* Bigot 1889

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In various cave-dwelling insectivorous bats (Microchiroptera) in caves in the Congo Republic we have found a parasite that we attribute to the genus *Polychromophilus*. *Miniopterus minor minor* Peters 1866, *Rhinolophus clivosus sylvestris* Aellen 1959, *R. landeri* Martin 1838, *R. adami* Aellen and Brosset 1968 and *Hipposideros caffer* Sundewall 1846 were all infected. The prevalence of infection was about 50% in *M. m. minor* and in the *Rhinolophus* spp. but *Hipposideros* was rarely infected. Although we have found infections mixed with

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*Hepatocystis* in only 2 *Rhinolophus*, others may also have been doubly infected but with infections too low for us to detect. Gametocytes of *Polychromophilus* were seen throughout the year in *Miniopterus* and *Rhinolophus* which are permanently infested by the nycteribiids *Penicillidia fulvida* Bigot 1885 and *Nycteribia schmidlii scotti* Falcoz 1923. These bats are also fed upon by other blood-sucking arthropods. Numerous dissections of the cavernicolous *Anopheles caroni* Adam 1961 and *A. hamoni* Adam 1962 have only revealed sporogonic stages of *Plasmodium atheruri* and *P. voltaicum*. No Haemosporidan infections were detected in *Phlebotomus gigas* Parrot and Schwetz 1964, *P. mirabilis* Parrot and Wanson 1939, nor in the strebliids *Raymondia simplex* Jobling 1954, *R. seminuda* Jobling 1954 or *Raymondoides leleupi* Jobling 1954.

100 specimens of *Nycteribia schmidlii scotti* (Nycteribiidae) were teased out completely in normal saline but none was found infected. On the other hand a similar examination of only a small number of *Penicillidia fulvida* revealed sporozoites which we attribute to *Polychromophilus*.

*P. fulvida* is an ubiquitous species that lives on numerous species of frugivorous and insectivorous bats (Megachiroptera and Microchiroptera). It is never abundant even on its commonest host, *Miniopterus*, and on the average only 1 was found on every 4 bats; it is even rarer on *Rhinolophus* and *Hipposideros*. *P. fulvida* was found throughout the year. It readily leaves its host and passes from one animal to another among a group of resting bats in a colony. The infection rate and infection density of the *P. fulvida* we dissected was high: 1 out of 1 positive in September 1967 (captured on *M. m. minor*); 2 out of 3 in November 1967 (on *R. landeri*); and 4 out of 9 in October 1970 (on *M. m. minor*). Every positive fly was heavily infected.

The mean length of the sporozoites was 13  $\mu\text{m}$ . They were sluggish, thick organisms with blunt extremities. In histological sections of the vector they were abundant in the salivary glands and ducts. Although no oöcysts were found in fresh preparations, in serial sections of nycteribiids we observed them mainly lying between the epithelium and basement membrane of the midgut. Some were lying in the haemocoel adhering to the gut or, rarely, were seen within the epithelium. The smallest oöcyst was rounded, and measured 31  $\times$  10  $\mu\text{m}$ . Mature oöcysts were ovoid, reaching 57 by 47  $\mu\text{m}$ , with a regular or irregular outline, and were surrounded by a distinct membrane. They contained numerous sporozoites lying in parallel or helicoidal bands. They had small, rounded, nuclei of uniform size which stained bright red against the pale rose colour of the cytoplasm. Several irregular dense "chromatin" granules were seen in the oöcyst but not in the residual cytoplasm that was visible in the younger forms.

These sporogonic stages are similar to those of *Polychromophilus deanei* described by GARNHAM, LAINSON and SHAW (1971).

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#### Two types of schizonts of *Hepatocystis* sp., a parasite of insectivorous bats in the Congo-Brazzaville

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The microchiropteran bats in caves in the Kindamba region of the Congo-Brazzaville are hosts of 2 haemoproteids which we have identified as belonging to the genera *Polychromophilus* and *Hepatocystis*. To *Polychromophilus* we have assigned gametocytes observed in the blood of the bats throughout the year, as well as sporogonic stages found in nycteribiid flies collected from infected bats (see other demonstration): to *Hepatocystis* we have assigned gametocytes of particular morphology seen in 2 specimens of *Rhinolophus* collected in February, 1972, and schizonts in livers and lungs of 2 *Miniopterus m. minor* collected in February, 1967, and 2 *Rhinolophus* sp. collected in February, 1972.

The tissue forms differed greatly from those seen by MER and GOLDBLUM in bats infected with *Polychromophilus murinus*. Two types of schizonts were present both in the liver and lungs: