

## **Blood Parasites of Mammals from Papua New Guinea**

Author: Anderson, T. J. C.

Source: Journal of Wildlife Diseases, 26(2) : 291-294

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-26.2.291>

---

BioOne Complete ([complete.BioOne.org](https://complete.BioOne.org)) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at [www.bioone.org/terms-of-use](https://www.bioone.org/terms-of-use).

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

---

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

## Blood Parasites of Mammals from Papua New Guinea

T. J. C. Anderson,<sup>1,2</sup> <sup>1</sup> London School of Hygiene and Tropical Medicine, Keppel St., London, United Kingdom WC1E 7HT. <sup>2</sup> Present address, Department of Biology, University of Rochester, Rochester, New York 14627, USA

**ABSTRACT:** Thin blood smears were collected from 126 mammals representing four genera of marsupials and six genera of murid rodents. A species of *Hepatozoon* was discovered in the New Guinea spiny bandicoot (*Echymipera kalubu*), trypanosome infections were found in three genera of rodent hosts and the prevalence of a rickettsial parasite of the genus *Grahamella* was recorded in rodents from the genera *Rattus* and *Melomys*. Dried blood samples also were taken and screened serologically for antibodies to arenavirus infection but with negative results.

**Key words:** Bandicoot, murid rodents, trypanosomes, *Herpetosoma* spp., *Hepatozoon* sp., *Grahamella* sp., arenavirus, immunofluorescent antibody test (IFAT), survey.

The blood parasites and diseases of mammals from Papua New Guinea (PNG) have received scant attention in the literature. In a review Ewers (1973) listed only two protozoan parasites from the blood of PNG's mammal fauna. Here I describe the parasites found in the course of work on the ecology of mammals in the Western Highland Province of PNG in 1985 (Anderson et al., 1988; Berry et al., 1987).

Mammals were live trapped at two sites: (1) in lowland and lower montane forest at the Baiyer River Sanctuary (144.10°E, 5.35°S; 1,200 m above sea level) and (2) in montane and moss forest around the village of Rogut (144.15°E, 5.50°S; 2,200 m above sea level) in the Tulman Valley near Mt. Hagen. At Rogut collections were supplemented with animals supplied by villagers.

Thin blood smears were prepared in the field using peripheral blood from the tip of the tail; these were air dried and fixed with absolute methanol within 2 hr of collection. The slides were stored in the dark and stained with Giemsa within 3 mo of collection. Slides were examined under oil immersion at 1,000× magnification for 10 min and observed parasites were measured using a calibrated ocular micrometer

(Bausch and Lomb, Rochester, New York 14692, USA). The intensity of parasitemias were measured by surveying an estimated 10,000 erythrocytes. The results of the survey are summarized in Table 1.

Collection of blood samples for serology was carried out as follows. Blood from each animal was absorbed onto glass fiber discs (Whatman grade GF/B, Whatman International Ltd., Maidstone, England), air dried and stored at 4 C. Later, at the London School of Hygiene and Tropical Medicine (LSHTM, London, England), blood proteins were eluted from the glass papers into 400 µl PBS-A and screened for arenavirus group antibodies using an indirect immunofluorescent antibody test (IFAT) (Howard, 1986). Previous results indicate that IFAT is a sensitive assay for detecting arenaviral antibodies (Howard, 1986). Sera were pooled in groups of 10 and incubated with acetone fixed Vero Clone 1 cells infected with lymphocytic choriomeningitis virus (LCMV). The presence of arenavirus specific antibody was detected using a secondary anti-mouse antibody-FITC conjugate or Protein A-FITC conjugate (Organon Teknika Corporation, Cappel Division, Durham, North Carolina 27704, USA). For all tests LCM virus antibodies at a dilution of 1:100 were used as positive controls and showed bright fluorescence.

Gamonts of a hemogregarine of the genus *Hepatozoon* were found in the erythrocytes of 41% of *E. kalubu* from Baiyer River (Table 1). There was no significant difference in the prevalence of infection between sexes ( $\chi^2 = 1.768$ ,  $P > 0.05$ ). A similar parasite was found in one *E. kalubu* from Rogut which suggests that this *Hepatozoon* sp. is widespread in populations of this bandicoot in the area around Mt. Hagen. The intensity of parasitemias (defined as the number of parasites per 100 erythrocytes) were low ranging from 0.01%

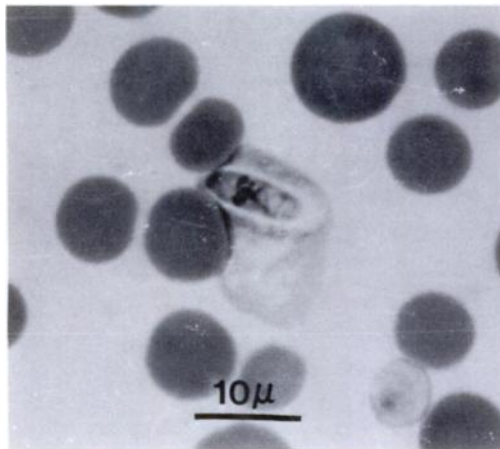


FIGURE 1. Gamont of *Hepatozoon* sp., a parasite of *Echymipera kalubu*, in a distorted erythrocyte.

to 0.44% (mean = 0.079%; median = 0.02%). Ten parasites were measured. The gamonts were rod shaped (7 to 8  $\mu\text{m}$  long  $\times$  2.5 to 3.0  $\mu\text{m}$  wide). The nuclei, which measured up to 3.0  $\mu\text{m}$  across and had a dark beaded appearance, varied in their position within the cell (Fig. 1). Normal erythrocytes had diameters of 6.5 to 7.5  $\mu\text{m}$  but infected cells were highly distorted measuring up to 20  $\mu\text{m}$  across and staining pale pink. In five smears extracellular gamonts, measuring 9 to 10  $\mu\text{m}$   $\times$  3.0  $\mu\text{m}$ ,

were also observed. It is possible that this parasite was *H. peramelis* which has been found in two bandicoot species (Mackerras, 1959) in Australia but is previously unreported from the genus *Echymipera* or from any other bandicoots from PNG. The parasites found in this study morphologically resembled those described by Mackerras (1959) although they were marginally smaller. However *Hepatozoon* spp. are highly host restricted and further studies of the parasite from *E. kalubu* may show it to be taxonomically distinct from *H. peramelis*.

Trypanosomes of the subgenus *Herpetosoma* were found in single specimens of *Melomys rufescens*, *Pogonomelomys ruemmleri* and *Uromys anak* (Table 1). Trypanosome infections have not been reported previously from these three host genera. All three species of these rats belong to the *Uromys* group of the subfamily Murinae (Tate, 1951), although the taxonomic status of *P. ruemmleri* is at present unclear and it may be transferred to a new genus in the near future. (Menzies and Dennis, 1979).

The trypanosomes from all three rat hosts were *T. lewisi*-like in morphology. Ten trypanosomes from each host species were

TABLE 1. Summary of mammals examined from Baiyer River (BR) and Rogut (R) in Papua New Guinea and blood parasites found.

Host species	Location	Prevalence	Parasite
<i>Echymipera kalubu</i>	BR	16/39 (41)	<i>Hepatozoon</i> sp.
	R	1/1 (100)	<i>Hepatozoon</i> sp.
<i>Peroryctes raffrayanus</i>	BR	0/1 (0)	
<i>Phalanger gymnotis</i>	R	0/1 (0)	
<i>Murexia longicaudata</i>	BR	0/1 (0)	
<i>Uromys anak</i>	R	1/1 (100)	<i>Herpetosoma</i> sp.
<i>Pogonomelomys ruemmleri</i>	R	1/4 (25)	<i>Herpetosoma</i> sp.
<i>Melomys rufescens</i>	BR	1/49 (2)	<i>Herpetosoma</i> sp.
	BR	6/49 (12)	<i>Grahamella</i> sp.
<i>Melomys platyops</i>	BR	1/4 (25)	<i>Grahamella</i> sp.
<i>Melomys</i> spp.	R	1/2 (50)	<i>Grahamella</i> sp.
<i>Rattus</i> spp.	BR	7/14 (50)	<i>Grahamella</i> sp.
<i>Rattus</i> spp.	R	2/4 (50)	<i>Grahamella</i> sp.
<i>Mallomys rothschildi</i>	R	0/2 (0)	
<i>Parahydromys asper</i>	BR	0/2 (0)	

\* Number infected/number examined, (%).

measured and means are presented with one standard error. The trypanosomes in the blood of *M. rufescens* and *P. ruemmleri* were very similar, having overall lengths of  $25.93 \pm 1.26 \mu\text{m}$  and  $26.21 \pm 0.94 \mu\text{m}$ , and free flagellae measuring  $7.16 \pm 0.35 \mu\text{m}$  and  $6.30 \pm 0.41 \mu\text{m}$ , respectively. The nuclei were oval ( $2.3 \times 1.4 \mu\text{m}$ ) and situated in the anterior third of the cell; the posterior ends were sharply pointed with round ( $1 \mu\text{m}$  diameter), or occasionally oval kinetoplasts situated 2 to 3  $\mu\text{m}$  from the tip. In comparison the parasites from *U. anak* were shorter ( $24.14 \pm 1.12 \mu\text{m}$ ), less slender and more variable in morphology; characteristic of a trypanosome population entering the reproductive phase (Molyneux, 1976). The flagellae of the trypanosomes from *U. anak* were significantly shorter ( $6.18 \pm 0.40 \mu\text{m}$ ) than those from the parasites in *M. rufescens* ( $t = 1.765$ ,  $P < 0.05$ ). No other statistical differences in morphology were found between the three parasite populations. In all three hosts the intensity of parasitemias were  $<0.1\%$ .

The subgenus *Herpetosoma* contains a large assemblage of species which are host restricted at the generic level in both the mammalian host and the insect vector (Molyneux, 1976), but which cannot be differentiated on the basis of bloodform morphology (Davis, 1952). As a result it is often assumed that *Herpetosoma* sp. from new host genera are themselves new species. However, descriptions of trypanosomes from single blood films are, on their own, an insufficient basis on which to describe new species (Hoare, 1972). In one recent study iso-enzyme analysis was used to differentiate between *Herpetosoma* spp. from six rodent species (Mohamed et al., 1987). The detailed phylogenies generated by further use of this technique also might shed some light on the evolutionary affinities of host mammals such as *P. ruemmleri*.

Rodents of the genera *Rattus* and *Melomys* from both trapping sites harboured infections of *Grahamella* sp., a common

rickettsial parasite of rodent erythrocytes. At Baiyer River 12% of *Melomys rufescens* and 50% of *Rattus* spp. were infected (see Table 1). In both host genera the intensity of parasitemias were low ranging from  $<0.01\%$  to  $0.36\%$  (mean =  $0.049\%$ ; median =  $0.01\%$ ).

The serological tests gave no evidence of arenaviral infection in any of the blood samples. Rodents infected with arenavirus have been found in both the New and the Old World and for a number of arenavirus species (e.g., Lassa fever virus, Junin virus) they serve as reservoirs for human infection (Howard, 1986). Evidence of arenaviral infection has not yet been found in mammals from Australasia.

I would like to thank Andrew Berry, Nevil Amos and James Cook as well as Roy and Margaret Mackay and the people of Rogut for their assistance in the field, and John Williams, Mark Salter, Colin Howard and Michael Miles for their help at the LSHTM. The project was carried out on an Oxford University Expedition which was funded by grants from the Explorers Club, New York; Sir Samuel Scott of Yews Trust; British Ecological Society; Royal Geographical Society; Twenty-Seven Foundation; Wellcome Trust; Oxford Society; Alexander Allen Paton Fund; Gilchrist Trust; Barbinder Trust; Poulton Fund and Booker Agricultural International, Ltd. The Expedition was affiliated to the Biology Department of the University of PNG.

#### LITERATURE CITED

- ANDERSON, T. J. C., A. J. BERRY, J. N. AMOS, AND J. M. COOK. 1988. Spool-and-line tracking of the New Guinea spiny bandicoot (Marsupialia, Peramelidae). *Journal of Mammology* 69: 114-120.
- BERRY, A. J., T. J. C. ANDERSON, J. N. AMOS, AND J. M. COOK. 1987. Spool-and-line tracking of giant rats in New Guinea. *Journal of Zoology (London)* 213: 299-303.
- DAVIS, B. S. 1952. Studies on the trypanosomes of some Californian mammals. *University of California Publications—Zoology* 57: 145-250.
- EWERS, W. H. 1973. A host-parasite list of the protozoan and helminth parasites of New Guinea

- animals. *International Journal of Parasitology* 3: 89-110.
- HOARE, C. A. 1972. *The trypanosomes of mammals*. Blackwell, Oxford, England, 749 pp.
- HOWARD, C. R. 1986. *Arenaviruses*. Elsevier Science Publishing Co., Amsterdam, The Netherlands, 254 pp.
- MACKERRAS, J. E. 1959. The Haematozoa of Australian mammals. *Australian Journal of Zoology* 7: 105-135.
- MENZIES, J. I., AND E. DENNIS. 1979. *Handbook of New Guinea rodents*. Wau Ecology Institute, Handbook No. 6, Wau, New Guinea, 68 pp.
- MOHAMED, H. A., D. H. MOLYNEUX, AND C. M. SCOTT. 1987. Isozyme characterization of trypanosomes of the subgenus *Herpetosoma*. *Parasitology* 94: 39-48.
- MOLYNEUX, D. H. 1976. Biology of trypanosomes in the subgenus *Herpetosoma*. In *Biology of the Kinetoplastida*, W. H. R. Lumsden and D. A. Evans (eds.). Academic Press, New York, New York, pp. 285-325.
- TATE, G. H. 1951. The rodents of Australia and New Guinea. *Bulletin of the American Museum of Natural History* 73: 183-430.

*Received for publication 2 November 1988.*