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A NOTE ON BLOOD PREFERENCES OF ANOPHELES FARAUTI

by

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Introduction

A total of 702 blood meals from A. farauti females collected on Fergusson Island, New Britain, and Nissan Island, were sent to the Lister Institute, London, under arrangement with the World Health Organization. The results of precipitin tests on these are set out and discussed below.

The aim was to establish a definite figure for the "human blood index"¹ in the villages of the D'Entrecasteaux Islands in the territory of Papua and New Guinea.

Black (1955) and Metselaar (1957) have discussed human blood indices of A. farauti. Metselaar gives a table of blood sources of anophelines of the A. punctulatus group. In a series of 88 A. farauti taken resting out of doors at Lalapipi, New Guinea, the human blood index was only 0.19, with dog at 0.47 predominating over pig at 0.33. At Cairns, Australia, in a series of 81 A. farauti the large domestic animals (horse and cattle) were highest at 0.48, with fowl next at 0.37. No conclusion of practical value for local conditions can be drawn from these results, or from the original observations on which the table is based.

Black (1955) found in the Trobriand Islands that almost all the A. farauti collected by him resting indoors in the daytime had fed on man; whereas of those taken resting out of doors only about one half had fed on man and the remainder on pigs and dogs. He also points out that native villagers keep their pigs, dogs, cats and fowls in their houses at night, so that any anopheline entering the house has a choice of animals for its blood meal. While this is generally true of

¹ "Human blood index" is suggested by the World Health Organization (1959) as a better term for the closeness of relationship of vector to man than "anthropophilic index", and is defined as the proportion of freshly fed Anopheles giving a positive precipitin reaction for human blood.

New Guinea villagers who possess domestic animals, in the D'Entrecasteaux Islands at the present time domestic animals are not very numerous; many houses have none at all. This introduces a possible source of error into sampling. In our collections we tried to include mosquitos from a majority of the inhabited houses within a given village: the four villages sampled were typical of the small hamlets characteristic of the D'Entrecasteaux Islands.

Peters (1960) draws attention to a similar preponderance of human beings over pigs, cats, dogs and fowls, in the Maprik area of New Guinea. For this reason he assumed a human blood index in A. farauti of 0.70, which is higher than the value of 0.60 postulated by Metselaar (1957).

It appears from our results that the value relating to hamlet areas in the D'Entrecasteaux Islands should be in the vicinity of 0.75, if the human blood index of outdoor resting anophelines collected in the vicinity of hamlets is that most nearly likely to be correct.

Day-time outdoor resting series

Generally speaking, it is not easy to find numbers of freshly fed A. farauti females resting outdoors by day. We had most success where long grass and secondary bush closely bordered small villages sited near permanent breeding places. Out of 848 adults collected on Fergusson Island resting outdoors by day, 34.4% were males, 56% of the females had fed, and a smaller number again were freshly fed. We were able to send a total of 130 blood meals to the Lister Institute for testing. The blood indices obtained by precipitin analyses were human, 0.75; dog, 0.16; pig, 0.04; and negative reaction, 0.05.

TABLE I. PRECIPITIN TESTS ON BLOOD MEALS OF
A. FARAUTI IN FERGUSON ISLAND (1959)

A. Day-time collections outdoors

Locality	Date	Number tested	Number positive for			Negative
			Man	Dog	Pig	
Bwalalea I	29.VI	16	14	0	2	0
	21.VII	8	6	1	1	
Bwalalea II	1-3.III	24	18	0	0	6
	29.VI	47	32	15	0	0
	21.VII	8	4	4	0	0
Taupolo	20-25.VI	27	24	1	2	0
Totals		130	98	21	5	6
Blood indices		-	0.75	0.16	0.04	0.05

B. Night collections beneath houses and on outsides of houses

Locality	Date	Number tested	Number positive for			Negative
			Man	Dog	Pig	
Bwalalea II	8-30.V	10	7	3	0	0
Bwabwadana	7-10.VII	119	115	4	0	0
Totals		129	122	7	0	0
Blood indices		-	0.95	0.05	0	0

C. Night collections in houses and in outlet window-traps

Locality	Date	Number tested	Number positive for			Negative
			Man	Dog	Pig	
Taupolo (on walls)	1.VI	56	56	0	0	0
Bwabwadana (on walls)	7-10.VII	205	175	30	0	0
Bwabwadana (in window-traps)	7-10.VII	52	43	9	0	0
Totals		313	274	39	0	0
Blood indices		-	0.88	0.12	0	0

These blood meals came from three different villages, on four different occasions (see Table IA). Conditions in the three villages were similar and did not vary much from one occasion to another. The ratio of human inhabitants to domestic animals is representative of village conditions on Fergusson and the other islands of the D'Entrecasteaux group - with people predominating over dogs, and dogs over pigs. The human blood index varied in these collections between 0.89 and 0.69, according to the relative numbers of human beings and domestic animals. The overall average was 0.75, which may be regarded as a reasonable figure for Fergusson Island and for the D'Entrecasteaux Islands generally.

As may be seen from Tables IB and IC, the human blood index in night-time collections from beneath houses and from the outside walls averaged 0.95. In collections from inside houses and from outlet window-traps it ranged from 0.83 at Bwabwadana to 1.00 (100%) at Taupolo, with an average value of 0.88. The proportion of people to dogs at each of the villages was as follows: Taupolo, 42 : 3; Bwabwadana, 25 : 9; Bwalalea I, 17 : 4; and Bwalalea II, 13 : 7.

Early in 1960 limited collections of A. farauti blood meals were made at the Raulawat Plantation, Rabaul, New Guinea, and at two isolated houses on Nissen Island. At the former place an indoor day-time collection on 25 January 1960 gave 18 smears positive for man, one for dog and one for unidentified mammal. Outdoor day-time

collections from 22 January 1960 to 23 February 1960 comprised 25 positive for man, seven for dog and four for unidentified mammal. On Nissen Island 14 smears collected outdoors by day comprised six positive for man, one for dog and seven negative in reaction (i.e., blood of unidentified wild animals).

Discussion

The above results indicate that, within the D'Entrecasteaux Island villages, the human blood index mainly depends upon the relative numbers of people and dogs. Dogs normally sleep with families. Deviation to pigs is a feature only in a few villages which have big pig communities. It is quite possible that pigs may maintain their own anopheline fauna in the bush.

A feature of the ecology of the D'Entrecasteaux Islands, and of this territory in general, is the relative scarcity of mammals other than man. Relatively few domestic animals are kept - a few pigs, cats, dogs and fowls - and there is no real animal husbandry except for pigs in some areas such as the Highlands. The absence of cattle and large animals in general is noteworthy.

Another feature of villages in the D'Entrecasteaux Islands is that there are usually no structures within the village for sheltering animals. All structures are those directly used by man for his own shelter, or such activities as cooking. There are not even pig pens although enclosures for pigs are occasionally seen below houses: the pigs often sleep in the bush, especially if not fed by their owners. Fowls roost in the bush around the village.

Black (1955) found a pig blood index of 0.51 in the Trobriand Islands in a series of 96 blood meals from outdoor-resting A. farauti. The females were collected around the edges of the village clearing. It seems likely, therefore, that where pigs are numerous, and live closely associated with their owners, the pig blood index may rise at the expense of the human blood index: this may have its application in the D'Entrecasteaux Islands in certain places.

In most countries where bloodmeal indices in anophelines have been studied, pig, dog and cat have been found to be unimportant as hosts of these mosquitos (WHO, 1959). Exceptions are A. implexus in French West Africa (pig blood index 0.91) and A. tessellatus in Indonesia (pig blood index 0.42, among 28 smears collected).

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