DISTRIBUTION OF PLASMODIUM OVALE IN THE EASTERN, WESTERN AND NORTHERN REGIONS OF UGANDA

by

E. Onori

INTRODUCTION

The first case of Plasmodium ovale infection in Uganda was reported by Manson-Bahr & Muggleton (1937). To the best of our knowledge this is the only case which has been reported in the medical literature, although the infection has been recognized occasionally at Mulago Hospital, Kampala (Wilks, pers. comm.). In the Medical Annual Reports of the Uganda Ministry of Health, P. vivax and P. ovale are not differentiated and they appear under the same heading of "tertian malaria". Recently, in an extensive review on the areas of distribution of P. ovale in Africa, Lacan (1965) mentioned that six cases were found in 1963 in Uganda presumably in the Kigezi district in the course of the malaria eradication pilot project.

In 1964 the malaria pre-eradication programme (PEP) started to carry out malariometric surveys throughout the country with the view of gaining more knowledge on malaria distribution and its vectors. At the end of 1966 the surveys had covered the Eastern, Western and Northern Regions of the country. The Central Region. The Buganda Kingdom, remained temporarily excluded because of emergency regulations existing in that part of the country. During the same period, longitudinal surveys on the study of the annual cycle of malaria were carried out

1 WHO Malarologist, malaria pre-eradication programme, Uganda.
in the Busoga district (Onori & Benthein, 1967) and the Karamoja district (Onori, 1967), and slides continued to be collected from the Kigezi district where a malaria eradication pilot project had been in operation from 1959 to 1963 (Zulueta et al., 1961; Zulueta et al., 1964).

The examination of 128,016 slides collected by all these different activities showed evidence of 251 *P. ovale* infections. They are the subject of the present study.

1. METHODS

Spleen and blood-film surveys were carried out in localities selected according to geophysical conditions in order to assure a fair coverage of the area under investigation. School surveys were often alternated with mass surveys. In the Busoga district slides were also collected from fever cases and infants attending the medical units by the medical assistants in charge of the centres. In the Kigezi district slides came from different sources: from the medical units of the district, whose personnel had been requested to take blood-films from all fever cases attending for treatment, from active and passive case detection activities in operation in the northern part of the district, from mass blood examinations carried out in northern Kigezi where an epidemic had flared up in 1965 and from malirometric surveys carried out in 1965.

A thick and a thin blood smear were taken on the same slide from each patient examined. Thick films were pre-treated with a methylene blue phosphate solution at the time of collection and both thick and thin films were then stained with a Giemsa solution at the central haematological laboratory at Jinja. At least two hundred microscopic fields were examined in each thick blood film. Diagnosis was always confirmed by a senior official working in the laboratory; *P. ovale* and *P. vivax* were always confirmed by the author in the thin film.

Entomological surveys were carried out in localities where high malaria rates had been found. The main technique used during these surveys was the spray-capture in different type of structure, with identification of blood digestion stages and dissection of salivary glands. Night-catches on human and animal baits were occasionally carried out.
2. RESULTS

2.1 Distribution of *P. ovale* infections

Table 1 shows the parasite rate and prevalence rate of infections in the three regions of Uganda where the investigations were carried out. It is worth-while noting here that the 8.1% parasite rate found in the Kigezi district might lead to an erroneous interpretation. As already pointed out, the blood films were collected from different sources: medical assistants quite often selected clinically suspected malaria cases and patients living in an area affected by a malaria epidemic. The prevalence of the disease in Kigezi, therefore, is much less than the parasite rate reported in the table might suggest; in malariorientic surveys carried out in March 1965 the prevalence rate found among 2417 subjects examined in different localities of the district was 0.95%.

More interesting is the parasite prevalence rate found in the course of the present study. Table 1 shows that *P. falciparum* was always the most prevalent species; second in prevalence was *P. malariae*, followed by *P. ovale* and *P. vivax*. *P. ovale* had a country-wide, although scanty, distribution and was encountered, though in different frequency, in thirteen out of fourteen districts; its presence in Bukedi might have been detected, had a higher number of slides been examined there.

Fig. 1 shows the distribution of the 251 *P. ovale* infections found during the investigation. From Table 1 and Fig. 1 it can be seen that cases of *P. ovale* were more often encountered in Lango, Bunyoro, West-Nile, Madi and Acholi districts.

2.2 Infection rate and prevalence rate of *P. ovale* among different age-groups

Table 2 shows the infection rate and prevalence rate of *P. ovale* among different age-groups for each of the fourteen districts. It appears that *P. ovale* was detected more often among infants and adolescents than in older children and adults. The over-all prevalence of this infection was in fact 1.5% in infants under one year (4616 examined), 2.6% in 12-23 months (4559 examined) and 2-4 years (9842 examined), 0.7% in 5-9 years (18 562 examined), 0.3% in 10-14 years (15 828 examined), 0.3% in 15-19 years (7604 examined) and 0.7% in 20+ years (29 737 examined).
In Bunyoro district, where the highest indices of *P. ovale* were detected, the prevalence of this Plasmodium in respect of other species was 9.5% in infants (201 examined), 18.0% in 12-23 month old children (165 examined), 5.5% (465 examined), 3.2% (915 examined), 1.5% (871 examined), 0.0% (301 examined) and 0.9% (895 examined) in the respective age-groups of 2-4, 5-9, 10-14, 15-19 and 20+ years.

2.3 Distribution of vectors

*Anopheles gambiae* and *A. funestus* were the only *Anopheles* found with infected glands in those localities where *P. ovale* was detected always with other human Plasmodiums. Both species were almost always found together in the same place. It may be assumed that the *P. ovale* infection is transmitted by either one or both species.

3. DISCUSSION

Until recently, one would have supposed that *P. ovale* in Uganda was extremely rare. Admittedly, the Medical Annual Reports of the Uganda Ministry of Health have reported every year since 1903 a relevant number of cases of "benign tertian" which might have included cases of *P. ovale*. Yet, it is likely that they were referring exclusively to *P. vivax* infections.

From the activities recently carried out by the PEP teams it would appear that *P. ovale* is not only present in the Eastern, Western and Northern Regions of Uganda but is even more prevalent than *P. vivax*. It was found more frequently in the West and North than in the East. Choumara (1963) in Cameroon found *P. ovale* more often in the forest zone than the savannah regions of the north of the country. In Uganda the ecological conditions of the Western, Northern and Eastern Regions are quite similar. In general the main type of vegetation is the wooded savannah. The climate is almost identical in the three regions with small changes of temperature during the year and rainfall averaging 50" - 60" (1270-1524 mm) occurring in 100-150 days annually. The rains follow a definite pattern in the annual distribution: there is a yearly alternation of two periods of rain (March-June and September-November) with two periods of comparatively dry weather (July-August and December-February). Eventually, the dry seasons are a little more protracted in the north. The only exception to these environmental conditions is the Karamoja district (Onori, 1967) which is a very dry and barren area, quite different ecologically and geophysically
from the rest of the country. There are reasons to believe that the vectors of
P. ovale are the same in all the districts where the infection was found. One
possible explanation for the few cases found in the Eastern Region might be that,
this region being the first one to be investigated, P. ovale might have been missed
by the microscopists not yet sufficiently familiar with this Plasmodium.

Comparing the distribution of P. ovale in East and West Africa (Clyde, 1962;
Clyde & Mngi, 1963; Clyde & Mzo, 1964; Bruce-Chwatt, 1963; Lacan, 1965) it would
appear that P. ovale is more frequently found in the western part of the continent.
Nevertheless, it is thought that more investigations should be carried out in East
Africa for the study of P. ovale prevalence and distribution. In Uganda, where
P. ovale had been almost ignored in the past decades, it seems that the infection not
only exists, but is even more prevalent than P. vivax. It might be
worth-while repeating here what has been already pointed out in the past: P. ovale
can be easily missed if the examination is not carried out on the thin film, if
this is not properly stained and the microscopist not sufficiently experienced (James
et al., 1933; Lacan, 1963). According to the author's experience this
plasmodium can also be missed if the microscopist is not specifically asked to look
for it. P. ovale is in fact more commonly found in association with other malaria
parasites (Lacan, 1963) and the level of parasitaemia being as a rule low, the
presence of a mixed infection makes identification of P. ovale more difficult
(Iysenko & Beljaev, 1966). On very few occasions we have found only two or three
pre-segmenters in a whole thin film; the differential diagnosis with P. vivax in
these circumstances might be extremely difficult.

From the results of the present study it would appear that in Uganda P. ovale
is found among all different age-groups but certainly more frequently among infants
and adolescents than in older age-groups. Epidemiologically, therefore, P. ovale
maintains in Uganda the same characteristics already shown in West Africa and other
parts of the world.

SUMMARY

Country-wide malarriometric surveys in the Eastern, Western and Northern Regions
of Uganda, longitudinal surveys in Busoga and Karamoja districts, control operations
in the Kigezi district have been carried out by the malaria pre-eradication programme
during the last two years. The material collected by all these different activities has offered an opportunity for the assessment of *P. ovale* distribution in the areas where the investigations were carried out. From these observations it would appear that *P. ovale* has a country-wide, although scanty, distribution and it is to be more frequently found in the north-western (Busia, West Nile, Madi districts) and northern (Lango and Acholi districts) parts of the country. These areas do not noticeably differ, ecologically and climatically, from the Eastern Region where the infection was quite rare, unless perhaps, for a lightly protracted and less humid dry season. *A. gambiae* and *A. funestus* seem to be the only Anophelines which can be incriminated as potential vectors of the disease.

*P. ovale* is more frequently found among infants and very young children than in older groups of the population.

ACKNOWLEDGEMENT

Grateful acknowledgement is expressed to Dr. N. Baingana, national malariologist, who took part in some malarialometric surveys; to Mr. F. Bentheim, WHO laboratory technician, who was in charge of the entomological section of the project and to Mr. J. Kaharuza, national laboratory assistant who was in charge of the haematological laboratory.

Thanks are also due to the entomological staff and to the microscopists without whose co-operation this work would have not been possible.
RESUME

Au cours des deux dernières années, le programme de pré-éradication du paludisme a comporté l'exécution d'enquêtes paludométriques nationales dans les Régions orientale, occidentale et septentrionale de l'Ouganda, des enquêtes longitudinales dans les districts de Busoga et de Karamoja et des opérations de lutte dans le district de Kigezi. Les renseignements ainsi rassemblés ont permis de déterminer la distribution de Plasmodium ovale dans toutes les zones étudiées. D’après ces observations, il apparaît que ce parasite existe dans l’ensemble du pays, mais qu’il n’est pas fréquent et qu’on le trouve plus souvent dans le Nord-Est (districts de Bunyoro, du West-Nile et de Madi) et dans le Nord (districts de Lango et d’Acholi). Ces régions ne diffèrent sensiblement ni écologiquement ni climatiquement de la région orientale où l’infection est très rare, sauf peut-être par la durée et la rigueur de la saison sèche. Anopheles gambiae et A. funestus semblent être les seuls anophélins qui puissent être considérés comme des vecteurs potentiels de l’infection.

P. ovale est plus fréquent chez les nourrissons et les très jeunes enfants que dans le reste de la population.
REFERENCES

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Zulueta, J. de et al. (1961) E. Afr. med. J., 38, I

Zulueta, J. de et al. (1964) E. Afr. med. J., 41, 102
Fig. 1. *P. ovale* distribution in the Eastern, Western and Northern Regions of Uganda (January 1964 - December 1966)
<table>
<thead>
<tr>
<th>Region</th>
<th>District</th>
<th>Time of survey</th>
<th>Number examined</th>
<th>Parasite rate</th>
<th>P. falciparum</th>
<th>P. malariae</th>
<th>P. ovale</th>
<th>P. vivax</th>
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### TABLE 1. INFECTION RATE AND PREVALENCE RATE OF *T. CABLE* AMONG DIFFERENT AGE-GROUPS IN 14 DISTRICTS OF UGANDA

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<tr>
<th>District</th>
<th>0-13 months</th>
<th>12-23 months</th>
<th>24-44 years</th>
<th>45-69 years</th>
<th>10-14 years</th>
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</table>

* IR = Infection rate.
  PR = Prevalence rate.

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* Based on 2,000 blood examinations only.

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  PR = Prevalence rate.
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