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PLASMODIUM OVALE  
IN FRENCH-SPEAKING COUNTRIES OF AFRICA

by

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Forty years after its discovery, Plasmodium ovale Stephens, 1922 is still a rare blood parasite. However, in recent years and as a result of very thorough and technically appropriate studies, it has been identified more frequently. In French-speaking territories of Africa, it was found for the first time in 1939 in Cameroun by Bock, and again in the same country in 1941 by Vaucel. Since then it has been detected in Haute-Volta, the Ivory Coast, the Central African Republic, Chad and the Congo (Brazzaville), and we observed it in a certain number of smears in 1961-62 in the Republic of Senegal.

In Cameroun, after the identifications of Bock and Vaucel, Languillon et al. (1955) identified it 25 times (including 19 times in a forest zone) in 3483 specimens collected of which 1761 were positive, and 6 times in a mountainous region in the west in 1400 specimens of which 483 were positive.

In Haute-Volta, Masseguin & Palinacci (1955), found it 8 times in 69 307 specimens of which 64 847 were positive. All these specimens come from savannah regions. In 1958 we examined a slide showing P. ovale from the Bobo-Dioulasso area. In 1961, the Malaria Section of the Muraz Centre detected the parasite in 13 specimens from the region on the north-west frontier of Dahomey, in a savannah woodland area.

In the Ivory Coast, the same Malaria Section of the Muraz Centre found P. ovale 14 times near the frontier of Liberia and 10 times in the west-centre of the Ivory Coast near the frontier with Guinea. These regions were also savannah woodland.

During 1961 in Senegal, the Antimalaria Service which covers the Thiés region identified P. ovale 10 times in specimens collected outside the pilot zone which had been subjected to DDT spraying, chemoprophylaxis or a combination of both methods. In all cases the specimens were taken in savannah areas, sometimes in villages on the sea coast.

In the former French Equatorial Africa, we identified the parasite 25 times among 6000 positive specimens - 18 from savannah woodland areas in the Congo (Brazzaville), 3 from the Central African Republic and 4 from the Republic of Chad, in semi-desert savannah regions.

Of the 105 cases of P. ovale identified in these French-speaking countries, we find that practically all the specimens in question were taken in savannah areas (19 only were from the forest region of Cameroun).

In most cases, P. ovale was found to be associated with other malaria parasites: it was only found alone in 28 of the 105 specimens. It is generally associated with P. falciparum or with P. malariae and fairly often with both species. The percentages of the associations in the 105 cases in question are as follows:

- 27% alone;
- 39% associated with P. falciparum;
- 3% associated with P. malariae;
- 31% associated with P. falciparum and P. malariae.

All the positive specimens were from children and nearly always from children under 8 years of age. The maximum findings in fact appeared to be in the 2-4 years age-group; there was only one child in the 15-19 years age-group (Haute-Volta, Masseguin et al. 1955). All the cases identified in Senegal were in children under 8 years of age. While it is true that the malaria surveys cover mainly children, there is no doubt that this particular blood parasite appears to attack more often children in the lower age-groups; its disappearance after adolescence may be explained by the fact that P. ovale, unlike P. falciparum, has only a single strain so that immunity to it can be rapidly established whereas immunity to P. falciparum, which has a number of different strains, develops slowly with a sometimes considerable degree of parasitaemia persisting over a long period.

It should be noted that the distribution of P. ovale seems to be fairly localized. In fact, it is found in relatively large numbers in certain villages where there may be up to 5% positive specimens (Ivory Coast - Fobédougou). In the Congo (Brazzaville) we found P. ovale 8 times in a single village where 28 of the 43 children examined were positive, that is, more than 28%. In Senegal we found the same thing: in a village we identified P. ovale 3 times among 70 positive specimens (more than 4%).

The relative rarity of P. ovale depends however on three other factors:

- (1) its elusiveness;
- (2) the very high proportion of P. falciparum as compared with P. ovale. P. falciparum is still the most frequent blood parasite in all African territories south of the Sahara;
- (3) the difficulty of detecting it.

In fact, it may be said that P. ovale is found incidentally only. It may be identified in a carrier but it will be impossible to detect it in specimens taken in the following days when the same person is carrying P. falciparum or P. malariae. It is therefore a particularly elusive parasite and this quality makes the study of its clinical manifestations even more difficult.

In addition, in mass campaigns where examination of the slides is entrusted to subordinate staff, the presence of P. ovale in the specimens may escape notice because it may be concealed by P. falciparum owing to the very high proportion of the latter. The microscopist must, in fact, examine a great many slides and very often the investigations are confined to the thick film which brings to light an abundance of P. falciparum. Since there is no time to examine thin films, and as it is very difficult to identify P. ovale in thick film, an association of P. falciparum, P. malariae and P. ovale may very easily pass unnoticed.

In order to identify P. ovale beyond doubt, it is necessary to have a well-made thin film, stained within the normal time-limit with a good, freshly-prepared staining solution - and these conditions can rarely be fulfilled with respect to specimens taken in mass campaign surveys.

As it is particularly difficult to identify P. ovale in thick film, the thin film must therefore be examined. Unfortunately, however, this is often badly made: the blood slide collected in the field is not protected from impurities and dust, and sometimes stained several days, or even weeks, after the taking of the specimen; the stains used are sometimes defective owing to their being too old or having been inadequately protected against light or prepared with unsuitably buffered water. Finally, the staining technique may also be defective.

In order to identify P. ovale beyond doubt it is therefore necessary to have:

- (1) a thin film and not a thick film;
- (2) a thin film stained shortly after the taking of the specimen with freshly-made stains prepared with suitably buffered water.

If smears are already old and badly stained and there is a doubt about identification (particularly possible confusion with P. malariae) we recommend re-staining for several hours and then rapid passage through a 1% boric acid solution. This often brings into evidence Schüffner's granules which do not appear with standard staining. By this method we have succeeded in identifying as P. ovale parasites which were on first examination taken to be atypical P. malariae.

We would emphasize again that identification must be effected with a smear and not a thick film since in the diagnosis of this parasite the red blood cells of the host, and their modifications, are absolutely characteristic.

With the thick film, on the other hand, there may be confusion concerning the parasites noted: we have too often seen the "tenue" form of P. falciparum confused with P. vivax, and P. ovale taken for P. malariae or vice versa.

With the smear, there is less likelihood of error. In the trophozoite stage, the red blood cells are already definitely "Schüffnerized" in the case of P. ovale, whereas with P. vivax this phenomenon is often completely absent or only very slight; in the case of P. malariae there is no change in the red blood cells; the Maurer spots which may appear in the host red blood cells as a result of the presence of P. falciparum are not easily confused with Schüffner's granules. Furthermore, the

nucleus of P. ovale is fairly large, much larger than the nuclei of the other blood parasites, and at this stage multiple infection is fairly frequent. This "pluriparasitism", which exists at this stage only in P. falciparum cannot lead to confusion between the latter and P. ovale on account of the "Schüffnerization" of the red blood cells in P. ovale infection and of the morphology of the latter being thicker and having a larger nucleus.

At the schizont stage, the very highly "Schüffnerized" host blood cells (usually oval with crenated edges), the thick, compact and regular ectoplasm of the parasite with large granules of pigment are of value in identification. At this stage, if Schüffner's granules are clearly visible the only confusion can be with P. vivax, but the ameboid cytoplasm of this latter, the considerably larger, polygonal and not oval red blood cells of the host, identify the parasite.

However, if the "Schüffnerization" of the host red blood cells is not evident, it may be thought that the parasite is a large P. malariae - and this has happened to us. We believe therefore that it is necessary, whenever there is a parasite resembling an abnormally large P. malariae, to over-stain for the purpose of bringing to light any Schüffner's granules which may identify the parasite as P. ovale.

In the schizogonic stage, the compact protoplasm surrounding a small number of merozoites with thick nuclei makes it possible to differentiate from P. vivax - which has more numerous merozoites - and also from P. malariae, particularly since in this latter case the host red blood cells are not "Schüffnerized".

At the gamete stage, identification is more difficult but this form is seldom found alone in a specimen and the characteristics of the parasite in other stages will point to P. ovale.

#### CONCLUSIONS

P. ovale at present exists everywhere in West Africa. It has been identified in all of the English-speaking and most of the French-speaking countries.

Its special morphology facilitates identification on condition that well-prepared and correctly stained films are available for examination.

Finding of this parasite is difficult because of its uneven distribution and its elusiveness.

Formerly, the presence of P. vivax in large quantities was noted in the territories of West Africa south of the Sahara whereas at the present time this parasite is rarely found - and when it is, it has usually been imported. May we not formulate the hypothesis that there has sometimes been confusion between P. vivax and P. ovale and that as the result of easier P. ovale immunization this species is becoming increasingly uncommon?

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