

LEAGUE OF NATIONS.

C.H./Malaria/253.

Geneva, December 17th, 1937.

HEALTH ORGANISATION.

MALARIA COMMISSION.

During its meeting in Geneva (October 27-30th, 1937) the Reporting Committee of the Malaria Commission had included in its Agenda the Question of the

STANDARDISATION OF THE TERMINOLOGY EMPLOYED IN MALARIOLOGY.

The Committee considered a communication from Dr. EJERCITO, the member of the Malaria Commission representing the Philippines, asking whether the Malaria Commission could usefully endeavour to standardise the terminology most commonly employed (a) in the epidemiology of malaria and (b) in questions relating to the species, sub-species, varieties, and races of anopheles.

(a) The Committee examined a memorandum drawn up on this subject by the Secretary of the Commission, and decided to entrust the further work for the standardisation of the nomenclature employed in malariology to a sub-committee consisting of Sir Rickard CHRISTOPHERS (Chairman), Dr. HACKETT, Professor SERGENT, Professor SCHUEFFNER, and the Secretary of the Commission. The memorandum will be sent to all members of the Commission, who will be asked to append their observations. These will be embodied in a general report, which will be examined by the Sub-Committee with a view to its making suggestions conducive to the desired objects. The report and suggestions will be circulated to all members of the Malaria Commission, and will be finally discussed at the next meeting of the Reporting Committee and, if possible, at the full meeting of the Commission which it is proposed to hold in connection with the Third International Malaria Congress.

(b) With regard to the second question raised in the Ejercito proposal - that of standardising entomological terminology - the Committee considers that this is a matter of zoological systematics, and is therefore not within its province.

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The Health Committee, at its 26th session (November 1937) approved the constitution of this sub-committee for the preparation of a draft report on the subject.

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Herewith the memorandum.

Memorandum on the nomenclature employed in  
malariology.

An attempt has been made in the following note to bring together definitions of the terms most currently used in malaria studies. The note does not claim to be exhaustive, but has been prepared in order to illustrate the varying uses made of such terms.

Should the Malaria Commission succeed in framing recommendations designed to render the use of these terms uniform, a brief report might be published pointing out the desirability of malariologists' taking due account, in their publications, of the definitions proposed by the Malaria Commission, if they are prepared to adopt them.

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On completing its tour of investigation in Europe in 1924 (document C.H.273, page 31), the Malaria Commission found that methods for measuring the incidence of malaria appeared to have been generally ranged as follows:

Spleen examination of all schoolchildren and, if possible, of pre-school infants;

Spring and autumn blood examinations of schoolchildren as well as diagnosis of infected children as they fall sick.

Examination of groups of workers, etc.

SPLEEN MEASUREMENT.

In its Second General Report, 1927 (document C.H./Malaria 73), the Commission defined the "spleen index" as the percentage of children below 12 years of age in whom the spleen can be felt by palpation, while the "spleen rate" (in French: "taux splénique") is merely "the percentage of enlarged spleens among any given population".

Index or rate? In making a choice between these two terms, it is well to refer to ROSS' suggestion that the word "rate" (in French: "taux") should be used exclusively for a value expressing an absolute truth, e.g., the birth-rate or death-rate, while the word "index" ("indice") should be used wherever the value indicated refers only to a group or sample of the population, or where it is obtained by a method which does not claim to give absolutely accurate results.

Accordingly, ROSS considers it proper to speak of a "spleen rate" in connection with the spleen examination of a whole population not only by palpation - which method does not detect spleens only very slightly enlarged - but also by percussion. On the other hand, it would not, with the means at present available, be in any way possible to obtain a parasite "rate".

HACKETT has rightly observed that the expression "rate" ("taux") applies to quantities measured in relation to a time-unit, whereas the expression "ratio" ("rapport") is more appropriate to the relation between two quantities, such as the one we are concerned with. Nevertheless, usage must be accorded its rights.

As to the degree of enlargement of the spleen, the Commission considered that it would have been useful if SCHUFFNER's method, which it had itself used during its tours of investigation, had been adopted throughout. With this method, the subjects are examined standing up, and enlarged spleens are divided into five classes, the fifth including those extending beyond the umbilicus towards the right, and the fourth including spleens which reach the umbilicus on the line joining the latter with the anterior superior iliac spine on one side and the costal margin on the other.

In India, the Malaria Survey of India uses the expression "spleen rate" ("taux splénique"), without qualification, to denote the percentage of enlarged spleens in children aged from 2 to 10. Whenever an enquiry covers subjects whose ages fall outside those limits, an appropriate qualification of the spleen rate must be made, e.g., "adolescent spleen rate", "adult spleen rate", etc. It is always desirable, as urged in "How to do a Malaria Survey", to specify, in the case of an unqualified spleen rate, whether all the subjects examined were schoolchildren. Palpation of the spleen is carried out normally and rapidly with the subject standing up, at any rate in the case of children and adolescents.\*

In Europe, on the contrary, the expression in current use is "spleen index", which HACKETT defines as "the percentage of subjects, in a given population-group, having enlarged spleens which can be detected by palpation". MISSIROLI confines this index to children between the ages of 2 and 12, whom he divides into two groups, from 2 to 5 and from 6 to 12.

For estimating the extent of enlargement of the spleen, the method which appears to be most currently used in Europe to-day is one adapted from SCHUFFNER's old method. It has been in use for several years among the Italian workers, and it divides enlarged spleens, starting from the costal margin and ending at the pubic symphysis, into four classes (1, 2, 3 and 4), spleens just palpable when the subject takes a normal breath ("P") being of course considered as enlarged, but those which are only palpable when the subject breathes deeply ("O") not being so considered.

HACKETT formerly used six classes (0, P, 1, 2, 3, I, II, III), but has now abandoned this system in favour of the one described above.

The French workers, on the other hand, including SERGENT, measure enlarged spleens by the finger-breadth method. There are other differences between French and Italian practice:

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\* The advantages of excluding children under 2 are particularly marked in the case of populations highly infected with syphilis.

thus MISSIROLI examines the spleen in children aged from 2 to 12, and with the subject lying down, whereas SERGENT keeps the subject standing and calculates the spleen index up to the age of 15.

BOYD classifies enlarged spleens into: P.D.I. for spleens palpable when the patient breathes deeply; Class 1 for those palpable at the costal margin when a normal breath is taken; Classes 2 and 3 for spleens extending as far as the umbilicus; and Class 4 for those that go beyond it. This system was adopted by DE BUEN in Spain.

ROSS classifies enlarged spleens into: (a) normal, (b) slight, (c) average, and (d) considerable hypertrophy, and allots the quantitative coefficients, 1, 3, 6, and 9 to those classes respectively.

This system has also been adopted by a number of workers in the U.S.S.R.

CHRISTOPHERS (Ind. Journ. Med. Res., 1914) used to classify spleens, measured in finger-breadths, into seven groups. Later, he propounded his system of anthropometrical spleen measurement, which met with great success in India and has also been used in Africa.

#### Average spleen - (Rate moyenne).

This is defined by ROSS as the total volume of spleens in the whole population (children, adolescents, and adults) divided by the total number of persons examined. The "average enlarged spleen" ("rate agrandie moyenne") is the total volume of the spleens divided by the total number of persons having enlarged spleens. "ROSS's Index" is a term frequently used by Russian workers to indicate the "average spleen": it is calculated according to Ross's method, with his coefficients of 1, 3, 6, 9. MOSHKOWSKI, however, derives from this a further index: the "spleen surplus index" ("indice d'excès splénique").

SERGENT's "splenometric index" is defined as follows: "Each enlarged spleen is measured in finger-breadths. The average size of the malaria-enlarged spleen is calculated, and the result is multiplied by the spleen index."

#### RESULTS OF BLOOD EXAMINATIONS.

Parasite rate. In its Second General Report, the Commission describes as "parasite rate" or "endemic index" (pages 54 and 59) the percentage of children below 12 whose bloods are found to be positive by a short microscopic examination of a stained thick blood-film.

The expressions "endemic index" and "blood index" do not appear very suitable; the first, suggested by STEPHENS and CHRISTOPHERS, is liable to be confused with ROSS's endemic index.

In India, the term parasite rate used without qualification refers exclusively to children; it is always qualified if other age-groups are included. As it is customary in India to deal only with children between 2 and 10 years of age, it is to be supposed that to-day the term 'parasite-rate' refers

to that particular age-group only. STEPHENS and CHRISTOPHERS urge that it should always be ascertained, at least in a group of 25 children aged 2 to 10.

In view of what has been said above concerning the use of the terms 'index' and 'rate', it would seem advisable not to use the expression 'parasite rate', but rather the expression 'parasite index'.\* HACKETT does not specify any age-limit, while MISSIROLI uses the term as applying to children between 2 and 12, excluding those who attend schools in which quinine is administered regularly.

Endemic index. According to ROSS, who first used this expression, it indicates the total percentage of children found showing symptoms of malaria infection, detected either by blood examination, or by means of the spleen index, or by both methods. This is, in fact, a combined parasite and spleen index. Its use to indicate the number of children below 14 years of age subject to malaria attacks, multiplied by 100, must, it would seem, be abandoned (it was used by RASMERITZA in Roumania).

Malaria index ("Indice malarique"). This index is used to show the total number of cases who have been subject to malaria attacks, or show enlarged spleens, or have parasites in the blood. As HACKETT has pointed out, it is both illogical and useless.

A further matter in relation to which comparison between the findings of different workers is extremely difficult is the duration of the examination of blood samples. Some workers, chief among them ROSS, MISSIROLI, and BOYD, urge that the smear should be examined for 15 minutes before it is classed as negative; as for thick films, MISSIROLI and BOYD examine them for 5 minutes, which corresponds to 75 fields. Other workers, such as SCHUFFNER and SWELLENGREBEL, only examine thick films for 3 minutes. It will be remembered that the members of the Commission responsible for the programme of coordinated experiments in the field (C.H./Malaria 227) agreed that 3 thick films should be examined for a total period of 10 minutes. That method was followed in a series of experiments carried out on a large scale and over a considerable period.

As regards the counting of parasites, the Malaria Survey of India suggests that in order to obtain a rough approximation 100 fields should be examined in smears and 20 in thick films.

If use is made of SINTON's method with red corpuscles from chickens, the Malaria Survey counsels the examination of a number of fields corresponding to 500 nucleated corpuscles, equivalent to 1/20th of a cubic millimetre of human blood.

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\* The expression 'parasite rate' should, however, be used in relation to malaria in birds, when the blood examination covers the whole population and is carried out by means of isodiagnosis.

In any event, it would appear desirable to relate the number of parasites in every case to cubic millimetre of human blood.

The term "infestation index" is used to describe the number of parasites per cubic millimetre found in all the subjects examined, divided by the number of positive subjects.

#### RULES APPLICABLE TO SPLEEN AND PARASITE INDICES.

Age-groups in which indices are taken.- We have seen that, in the detection of both enlarged spleens and parasites, results are classified by the various workers into groups corresponding to age. These age-groups are generally 2-10, 2-12, and 0-15.

The suggestion made in the programme for the co-ordinated experiments (C.H.Malaria 227) might be repeated, namely, that the indices should be obtained for the following age-groups: 0-2, 3-5, 6-10, 11-15\*, and 15 and over. The 11-15 age-group should, however, be divided so as to obtain a sub-group for 11-12. It would then become an easy matter to compare the work of the different authors by obtaining figures for groups 3-10 and 3-12, and also for the comprehensive group 0-15. The expression "crude-index" ("indice brut") might also be adopted when the index refers to a population-group of varied ages. This has been done by BOYD and several others. In this connection, it would be useful to state that subjects of all ages should, of course, be examined when a first enquiry is being carried out.

As regards infants, particular attention should be given to the first year of life:

Infant malaria index ("indice des nouveaux-nés"). This indicates the percentage of children below 12 months who show parasites at the end of the epidemic season. This index can be identified with the Transmission index, which is defined as the "parasite index of infants one year old or less" (BARBER, RICE, and MANDEKOS, 1936).

Average new-born infection period ("moyenne du délai d'infection chez les nouveaux-nés"). This index was suggested by DANIELS to show the average lapse of time before infection becomes manifest in children born during the year.

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Period of year best suited for taking indices. In any region where seasonal variations in malaria occur, it would be desirable to urge that spleen and parasite indices should be taken before the epidemic season, including under that description not only the transmission period but the period of relapses of benign tertian fever which often precedes it. Indices should be taken a second time at the end of the epidemic season.

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\* This group would be better designated as 11-14, since the next group includes subjects who have completed their fifteenth year.

Number of population-groups for which indices should be taken. It is obvious that in most cases the spleens on the blood samples of part of the population only are examined. The question arises which group is likely to constitute an adequate and representative sample of the community to be examined. In general, the examination of one-tenth of the population - provided it offers the same variety of racial and social types and the same age-distribution as the whole population - will be sufficient. Nevertheless, the probable error will be very considerable if the indices are in the neighbourhood of 50 per cent, and in such cases the groups should be enlarged in order to reduce the margin of error. The POISSON-PEARSON formula\* should always be used, as ROSS advised.

#### ENDEMICITY.

Degree of endemicity. In India, endemicity is considered to be moderate when the spleen index, in children from 2 to 10, falls between 10 and 25 per cent, high when it falls between 25 and 50 per cent; areas of hyperendemicity are called the areas where the index is constantly permanently 50 per cent or over.

In Italy, MISSIROLI considers malaria to be moderately endemic up to a spleen index of 30 per cent, highly endemic up to 80 per cent, and hyperendemic above 80 per cent (children aged 2-12).

HACKETT defines hyperendemic malaria as an expression "arbitrarily applied to situations in which at least half the children of the community or group give evidence of chronic enlargement of the spleen throughout the year".

Epidemic figure ("chiffre épidémique"). This is the figure obtained by dividing the total number of deaths recorded during the month in which a given epidemic reaches its peak by the number of deaths usually recorded in the corresponding month in years without epidemics.

Amount and intensity of malaria. According to HACKETT, the amount is the percentage of infected subjects in the population, while the intensity or transmission rate is the average number of infections in the population (cf. "Transmission index" above).

#### MOSQUITOES.

Anopheline infection index. A certain confusion can sometimes be observed in the use of expressions referring to mosquito infection. Some workers speak of a sporozoite index, and include among positive cases anopheles showing oocysts but no sporozoites in the salivary glands. It would therefore seem logical to speak of a natural (or experimental) infection index, which would cover the percentage of mosquitoes infected by a given species; such an infection index might even be subdivided into a sporozoite index and an oocyst index (zygote rate). HACKETT lays stress on the need for ascertaining the sporozoite index in anopheles (female, of course)

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\*  $e\% = \frac{200}{n} \sqrt{\frac{2p(r-p)}{n}} \quad 1 - \sqrt{\frac{n-1}{N-1}}$

captured in their natural state. If we merely dissect anopheles captured in houses, the fact must be clearly stated in quoting the index.

In India, the terms sporozoite rate or natural (or experimental) infection index are used without reference to where the female anopheles were captured.

Anopheles density. This is the average number of adult anopheles per house, according to the Malaria Survey of India. According to BARBER, RICE, and MANDEKOS, (1936) the density index represents the average per collection of adults in village houses and stables.

REFERENCES

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