

developed, and there is plenty of time in which the nymphæ or larvæ can be caught. The larvæ and nymphæ are very active, and when the water is touched they rush to the bottom of the pool, but with a sieve made from a piece of muslin spread on a wooden framework, it is after a little practice easy to catch them.

I have ventured to differ in one or two points from the authors of the Liverpool Report, from Christy, and from Celli. I may of course be describing a different variety of mosquito, but let me add that what strikes me forcibly is the marvellous accuracy and completeness of the numerous observations recorded in these three works, and although I have noted one or two points in which their observations do not tally with what we have seen here, still there are hundreds of their observations which have been verified here; but there is a limit to an Editor's patience, and the repetition of facts which have been so well and carefully recorded in these works would be trespassing too far on that patience. I would advise those who have not a copy of the works referred to to get them without delay.

Several anopheles which were fed on the blood of a man suffering from ague have been allowed to bite healthy individuals. The results will be communicated later. Up to date only one of those bitten has been attacked by fever.

CAPTAIN ROGERS' RECENT INVESTIGATIONS IN MALARIA.

BY G. M. GILES, F.R.C.S.

LIEUT.-COL., I.M.S.

I HAVE read with interest the discussion in the *Indian Medical Gazette* on the above subject and, in connection therewith, desire to draw the attention of your readers in general, and of Captain Rogers in particular, to a table published at p. 30 of the current report of the Sanitary Commissioner, North-Western Provinces and Oudh, showing the death-rates in certain places before and after the introduction of modern water-supplies and drainage.

This table has been published annually for several years, and they are necessarily readily accessible to all officers of the Sanitary Department in all provinces, so that it is the more difficult to understand how Captain Rogers could be led to base so wide a generalization on his observations without being at the pains to ascertain what alterations of mortality had elsewhere followed the introduction of a piped and filtered water-supply, for it is impossible to imagine that any diminution in malarial fevers and splenic enlargement could fail to show itself in a diminution of the general death-rate.

For the benefit of those to whom the above reports may not be readily accessible, the figures bearing on the question are extracted below:—

Town.	Average annual death-rate since introduction of a filtered water-supply.	Average annual death-rate for the five years' period preceding its introduction.	Remarks.
Cawnpore ...	47.83	41.15	I extract here only the data as to towns provided with a filtered supply; places supplied with unfiltered water have been excluded, as also have cantonments and hill stations.
Allahabad ...	28.70	25.77	
Lucknow ...	43.79	44.68	
Benares ...	48.81	39.99	
Meerut ...	35.06	32.13	
Agra ...	35.46	32.23	

The addition of this table to the Sanitary Reports was probably initiated with the view of illustrating the benefits conferred by modern sanitation; but, if this be the case, the compilers must have been most disagreeably surprised, for with hardly an exception a rise, and not a fall, of mortality has followed. There are, of course, absolutely no statistics extant of any value whatever as to the absolute number of deaths referable to malaria in any Indian town, but Captain Rogers will not, I presume, be disposed to dispute that the disease is everywhere in India, accountable for a considerable proportion of the total mortality, or that any perceptible improvement in the prevalence of malaria, could fail to make itself evident in the total death-rate.

It is inconceivable that the introduction of a pure water-supply should raise the death-rate from cholera and bowel-complaints and, as a matter of fact, the figures of such of the towns as I have looked up, show improvement in this respect.

Nor can the enhancement of the death-rate be fairly ascribed to improved registration, as during the entire period this has been admittedly fairly accurate as to total mortality, however worthless it may be as to detailed causes, nor is there any evidence to show that there has been any general improvement in this respect. Moreover it must be remembered that the dates of introduction of a regular water-supply differ widely in different places, and that the increased mortality has followed immediately in by far the majority of cases. Further, the increase though immediate is not progressive, as may be seen by running through the series of tables published up to the present date.

It is therefore undeniable that, in these provinces at least, municipal malaria has in-

creased and not diminished coincidentally with the introduction of filtered water-supplies.

For those who believe in the agency of the mosquito in the propagation of malaria, the explanation of this unexpected and undesired result of modern sanitary enterprise is not difficult.

In by far the majority of cases no attempt at improved surface drainage has accompanied the spread of the waterpipe.

Financial tightness has necessitated that the essentials of sanitary reform should be taken in hand one by one; and the effort to introduce a pure water-supply has so exhausted the resources of each municipality in which it has been carried out, that the proportion of cases in which the engineers have been able to so place their hydrants as to secure a ready flowing away of waste water has been perforce a very small one, and the result has been that, in by far the majority of cases, each hydrant is the source of a string of puddles of constantly renewed, fresh cool water, and not unfrequently so placed, as to be for the greater part of the day in the shadow of tall buildings. In pools so fed and situated, anopheles larvæ may be found at times of the year when, but for the hydrants, they would be as rare as the dodo; for these larvæ do not appear to be able to develop in water as hot as that of the ordinary stagnant pool or tank in the hot dry weather. At any rate it is only in such exceptionally conditioned water that *anopheles* larvæ can be found in these provinces in March and April, for the ordinary garden tanks which in the rains will harbour large numbers are then full of culex larvæ only. In this way, a piped water-supply extends the period of possible infections over several months which ordinarily can yield but few fresh cases.

As even when confined to its normal times and seasons, malaria is responsible for a larger share of the total mortality than any other disease; the above explanation appears to me to adequately explain the apparent failure of pure water-supplies to improve the general health.

It is obvious however that the increased sickliness and therefore presumably malariousness of these places are an indirect result only of the introduction of a water-supply, as to the direct connection of which with malaria there exists no tittle of proof.

In employing the proportion of persons found to have enlarged spleens as a measure of the malariousness of places, Captain Rogers probably assumed that the causal connection between malaria and chronic enlargement of the spleen was undoubted and undeniable; and it may be freely admitted that the geographical distributions of the two diseases, as a rule, coincide; but this coincidence is, I am convinced, less close than is generally supposed, and, in any case, is, taken alone, insufficient to

prove that the one is a sequel of the other. Apart from this it will, I think, puzzle Captain Rogers to advance any anatomical evidence to shew that the *chronic* enlargements of the spleen is the work of the malarial parasite. Personally I rather incline to the belief that there is some direct or indirect causal connection, but it certainly cannot be considered as proved, and therefore the employment of an enlarged spleen ratio as a measure of malariousness is quite inadmissible; but apart from this, it is so impossible to ensure that the individuals observed are really representative of the population that the compilation of such statistics is mere waste of labour, which at the best can only confuse the issues under consideration, and I trust I shall not be considered "fatherly" in pointing out that the establishment of a single anatomical or biological fact would be more valuable than an indefinite amount of enumeration whether of spleens or of blood corpuscles.

P. S.—It may be well to note that I have no desire to discredit Captain Rogers' observations as to the prevalence of anopheles larvæ near Calcutta in the hot weather. The climatic conditions differ entirely from those of these provinces. It is to be regretted however that he has given us no information as to the prevalence of the perfect insects, as the presence of larvæ by no means necessarily indicates the coincident presence of the imaginæ, for the reason that when climatic conditions are unfavourable to pupiation the larvæ are certainly capable of living for months unchanged.

THE ROMANOWSKY STAIN FOR DEMONSTRATING THE TERTIAN MALARIAL PARASITE.

By J. CHAYTOR-WHITE, M.D.,
CAPTAIN, I.M.S.

(From the Netley Pathological Laboratory.)

By the Romanowsky method of staining, which has only lately been introduced, the demonstration of the common tertian malarial parasite becomes a simple matter. The method demonstrates primarily the *corpuscle* in which the plasmodium is situated, and secondly makes the parasite itself more apparent.

Schüffner lately described in an article how a peculiar dotting occurs in the host cell (blood corpuscle) inhabited by the tertian malarial hæmamaeba, when the blood film is stained in a certain manner, and this dotting is so remarkable a phenomenon, that it reduces the discovery of the plasmodium in a film from a laborious examination to the simplest of procedures.

Maurer has lately shown (*Centralblatt für Bact.*, August, 1900) that not only was the Romanowsky stain made unnecessarily difficult, but that the limitations of the stain were not