diluent is added to the milk, cream and sugar to make the required amount. If lime-water is to be used, 5 or 10 per cent., as desired, is added before adding the diluent.

If barley water or other cereal water is used, as recommended by many to assist in breaking up the curd, it, too, may be added in the quantity desired before adding the water. Since barley water contains of fat 0.05 per cent., carbohydrates 1.63 per cent. and proteins 0.09 per cent., (Holt), when it alone is used as the diluent, a reduction should be made in the carbohydrate per cent. of the formula; e. g., if a 3-6-1 mixture is desired the ingredients of a 3-5-1 mixture should be used, the percentage of the carbohydrates being subsequently raised

sugar necessary to make up the mixtures were actually given in the table, the decimal point would be two spaces to the right of what it now is.

As the table is, the amounts of milk, cream and milk sugar in a certain amount of any mixture are found by multiplying that amount by the figures opposite the mixture in the table, for example, suppose we desire 36 ounces of a 3-6-1 mixture. We find that the three numbers in the table opposite 3.00-6.00-1.00 are 0.148, 0.150 and 0.047. By multiplying 36 by 0.148 we have the amount of milk, multiplying by 0.15 we have the amount of cream and by 0.047 the amount of milk sugar in ounces. Or suppose we desire 850 gm. of a 3-6-1 mixture. By multiplying 850 by 0.148 we have the amount

SCHEDULE FOR AN AVERAGE HEALTHY INFANT, SHOWING PERCENTAGES OF FAT, SUGAR AND PROTEIDS, AND THE QUANTITIES

Age.	Percentages of—			Quantity for one feeding.		No. feedings in 24 hours.	Interval by day.
	Fat.	Sugar.	Protids.	Ounces.	Grams.		
Premature Infants	1.00	4.00	0.25	$\frac{1}{4}$ - $\frac{3}{4}$	7-22	12-18	1-1½ hours
First to fourth day	1.00	5.00	0.30	1 - 1½	30-45	6-10	2-4 "
Fifth to seventh day	1.50	5.00	0.50	1 - 2	30-60	10	2 "
Second week	2.00	6.00	0.60	2 - 2½	60-75	10	2 "
Third week	2.50	6.00	0.80	2 - 3½	60-110	10	2 "
Fourth to eighth week	3.00	6.00	1.00	2½ - 4	75-125	9	2¼ "
Third month	3.00	6.00	1.25	3 - 5	90-155	8	2½ "
Fourth month	3.50	7.00	1.50	3½ - 5½	110-170	7	3 "
Fifth month	3.50	7.00	1.75	4 - 6	125-185	7	3 "
Sixth to tenth month	4.00	7.00	2.00	5 - 8	155-250	6	3 "
Eleventh month	4.00	5.00	2.50	6 - 9	185-280	5	4 "
Twelfth month	4.00	5.00	3.00	7 - 9	220-280	5	4 "
Thirteenth month	4.00	4.50	3.50	7 - 10	220-310	5	4 "

by the addition of the barley water. The same point must be observed when adding the various dextrinizing powders to the milk mixtures. The dextrinizing process raises the sugar content about 2 per cent., so if a 3-6-1 mixture were desired, the ingredients of a 3-4-1 mixture are dextrinized.

In the modification of cow's milk by any formula it is essential to know the composition of the milk and cream used and while it is true that average herd milk is usually 4 per cent. and gravity cream is usually 16 per cent. it is advisable to make the simple fat estimations with the Babcock centrifuge from time to time, for if the fat percentage is correct, the amounts of the other ingredients will also be correct.

Holt¹ recommends the accompanying schedule for an average healthy infant, showing percentages of fat, sugar, and proteins, and the quantities.

It will be seen by this schedule how important it is to have great accuracy in respect to the proteins.

A few of the mixtures from the table calculated by the formula which I have described appear below.² If the per cent. or parts per hundred of milk, cream and milk

of milk, by 0.15 the amount of cream and by 0.047 the amount of milk-sugar in grams.

One-half the quantity of cane-sugar may, of course, be used in the place of milk-sugar.

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THE RADICAL CURE OF MALARIA; ITS IMPORTANCE AND HOW IT IS ATTAINED *

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Science has almost solved the problem of malaria in all its phases; but, despite our almost complete knowledge of the life-history of the malarial parasite both in man and in the mosquito, despite our familiarity with all the manifestations of the disease, and despite the fact that every physician knows that it is easily prevented and ordinarily yields to treatment, malaria, though decreasing in severity and frequency, continues as one of the most prevalent diseases in many localities of the United States, in some places its mortality rate amounting to 25 per cent. of the total number of deaths.¹

According to the statistics obtained from the last census, the number of deaths from malaria in the United States in the year 1900 was 14,909. The following states showed the greatest mortality: Arkansas leading with 1,730; then Texas, with 1,331; Alabama, 1,055; Louisiana, 1,030; Georgia, 1,011; Tennessee, 987; Missouri, 965; Mississippi, 938; South Carolina, 749; North Carolina, 527; Illinois, 497; Virginia, 409; Indiana, 340; and New York, 308.² These statistics are of question-

2. The following list of mixtures has been selected from a very elaborate table including over 400 mixtures, which I have calculated by the formula described above, and is given here to convey some idea of the character of the complete table which will be published with the reprint of this article:

Mixture.	Fat.	Carbohydrate.	Protein.	Milk.	Cream.	Sugar.
0.50	4.00	0.25	.055	.017	.036	
0.75	4.00	0.25	.037	.037	.036	
1.00	4.00	0.25	.018	.057	.036	
1.00	5.00	0.30	.037	.053	.046	
1.50	5.00	0.50	.074	.075	.043	
2.00	6.00	0.60	.074	.107	.052	
2.50	6.00	0.80	.111	.129	.049	
3.00	6.00	1.00	.148	.150	.047	
3.00	6.00	1.25	.240	.127	.044	
3.25	6.00	1.25	.203	.167	.044	
3.50	6.00	1.25	.222	.147	.044	
3.50	7.00	1.50	.290	.144	.051	
3.50	7.00	1.75	.388	.126	.047	
4.00	7.00	2.00	.444	.139	.044	
4.00	5.00	2.50	.630	.092	.018	
4.00	5.00	3.00	.815	.046	.011	
4.00	4.50	3.50	1.000	.000	.000	
5.00	7.00	3.50	.920	.080	.025	

* Read in the Section on Practice of Medicine of the American Medical Association, at the Sixty-first Annual Session, held at St. Louis, June, 1910.

1. Sutherland, H. L.: Gulf States Jour. Med. and Surg. and Jour. Southern Med. Assn., February, 1910.

2. Twelfth Census of the United States, Vital Statistics, 1900, I and II.

able value, since they are largely derived from information obtained by the census enumerators in the rural districts, and no doubt many deaths reported from malaria were due to typhoid fever and other diseases. It should be remembered, however, that malaria as a complication of pregnancy and of a number of diseases, and as a cause of arteriosclerosis and nephritis, is responsible for many deaths which are ascribed to other causes. It would therefore seem that these statistics do not overestimate the number of lives sacrificed to this easily preventable and curable disease.

The simple statement of the number of deaths from malaria does not half tell the story of its ravages. Its expense to the people of the United States is appalling. It is estimated that malaria costs our nation from \$50,000,000 to \$100,000,000 annually.³ Dr. Albert Woldert, of Tyler, Texas, after a careful study of the mortality and morbidity rates of Texas, estimates that malaria costs that state more than \$5,000,000 per year.⁴ Assuming that the United States census mortality rates are as correct for Missouri as for Texas, and that the morbidity rates are in the same ratio, malaria taxes the state of Missouri more than \$3,000,000 annually.

MALARIA UNNECESSARY

The unnecessary burden of malaria can be relieved simply by radically curing those suffering from the disease, but, strange to relate, this most important point has been most neglected. Malaria can be entirely eradicated, in one year, in any community, without regard to the number of anophelines present, if every person having the disease will take quinin long enough to be completely cured.⁵ It is man, and not the mosquito, that carries malaria through the winter, thus perpetuating the disease. Therefore, the most important measure in the crusade against malaria is its radical cure, and it is this phase of the subject that I shall discuss.

The average physician does not regard malaria as a serious disease. He relieves the acute symptoms in a few days and when a patient dies of malaria he feels that the patient has neglected himself. It is in the most malarial regions that the disease is most lightly regarded. We should emphasize the seriousness of the disease and the importance of its radical cure.

The complications of malaria which result from our failure to cure our patients are responsible for more deaths than the acute and pernicious forms. The manifestations of malaria, like those of syphilis, are protean, and no organ in the body is exempt from its ravages. Its most marked effect is seen on the renal organs⁶ and the vascular system.⁷ As a consequence, in malarial regions, the general death-rate is high and the mortality from nephritis and the various forms of paralysis is inordinately increased.

While there is certainly no relationship between malaria and syphilis, and the etiology, histology and pathology of the two diseases are widely and essentially different, yet many of the clinical manifestations are analogous. I realize that it is an "odious comparison," but it is made to emphasize the importance of the prolonged treatment of malaria.

Malaria and syphilis are general or systemic diseases, the organisms and their toxins circulating in the blood; both are inoculable; they have a definite period of incubation; in the secondary stage of syphilis there may be a fever of a remittent type (I saw a case of syphilis in the secondary stage, with daily rise of fever to 103 to 105 F., in which a clinical diagnosis of typhoid or malaria was made, but the laboratory proved it to be syphilis); there may be skin manifestations in malaria;⁸ the tendency to chronicity is marked in both, as well as the proneness to involvement of many different organs; there may be prolonged periods of latency in malaria as in syphilis; no two diseases produce more nearly similar or more serious effects on the vascular system and renal organs; malaria is sometimes a cause of ulcerative keratitis,⁹ optic neuritis, the acute psychoses,¹⁰ sclerosis of the cord,¹¹ and even progressive paralysis;¹² in both diseases we have drugs which are almost specific in their action, but in order to get the best results treatment in both diseases must be begun early and continued for a long period.

Relapses, which result directly from our failure to cure our patients, may occur as recrudescences of the fever soon after acute symptoms, as exacerbations during the chronic course of the disease, or as distinct attacks during latency. Reinfections are usually relapses or recurrences.

Celli¹³ regards a relapse in malaria as the recurrence of symptoms at any time within one year from July 1. Reinfections occur after one year. Undoubtedly relapses have been observed several years after infection, and reinfections may occur in less than a year, but Celli's rule is a safe one to follow. If we adopt this rule and keep records of our cases we shall find how few of our malarial patients we radically cure.

The world owes a debt of gratitude to Manson for his self-sacrificing work in studying malaria, and he is rightly regarded as one of our greatest authorities on the disease; yet even he did not cure the disease in himself when first infected. He allowed himself to be inoculated by infected anophelines on Sept. 10, 1900, and had a relapse on May 30, 1901.¹⁴ Authentic cases of relapse after three years of latency have been reported.¹⁵

There would be but little chronic malaria if the acute cases were cured, but there are to-day probably two or three million persons in the United States who are harboring malarial parasites. Headaches, neuralgias, neuritis,¹⁶ gastric disturbances and acute diarrhea are among the most frequent symptoms of the chronic or "masked" forms. Indeed, malaria may simulate almost any disease. Craig¹⁶ reported fourteen cases of malaria which had been diagnosed as pulmonary tuberculosis.

TREATMENT

All authorities agree that quinin is almost a specific in malaria, when treatment is begun early and continued long enough to eradicate the parasite from the system completely, though there are differences of opinion as to the time of administration, the dosage, and duration of treatment.

3. Harris, Seale: Prevention of Malaria, *THE JOURNAL A. M. A.*, Oct. 9, 1909, p. 1162.

4. Woldert, A.: Malarial Fever, Its Expense to the People of Texas, *Tr. Med. Assn. Texas*, 1904, p. 37.

5. Koch: *Ztschr. f. Hyg.*, May 22, 1903.

6. Moore, J. F.: Nephritis in Malaria, *Am. Med.*, Dec. 28, 1901.

7. Marchiafava and Bignami: *Twentieth Century Practice of Medicine*, William Wood & Company, New York, 1900.

8. Reissman: *Am. Med.*, March 22, 1902.

9. Ellett, E. C.: *Ophth. Rec.*, March, 1899.

10. Bondurant, E. D.: Unreported Cases, Mobile, Ala.

11. Spiller: *Am. Jour. Med. Sc.*, December, 1900.

12. Marandon de Montel: *Rev. de méd.*, Nov. 10, 1900.

13. Celli: *La malaria secondo le nuove ricerche*, Rome.

14. Manson: *Brit. Med. Jour.*, July 13, 1901.

15. Ziemann: *Mense's Handbuch der Tropen-Krankheiten*, Leipzig, 1906.

16. Craig: *Med. Rec.*, New York, Feb. 15, 1902.

Given a patient in a hospital where his symptoms can be watched, and with competent microscopists who can make repeated daily examinations of the blood, the rule "no parasites, no quinin" is best; but, practically speaking, nine-tenths of the physicians, in the rural districts where malaria abounds, have not microscopes, or the time to make blood examinations; therefore the diagnosis must be made from the symptoms and quinin administered at once. In malarial districts it is a good rule, when in doubt, to give quinin and watch for symptoms of other diseases. Quinin does but little harm in any disease, and it may do a great deal of good in eliminating malaria, which may complicate and make more serious any other disease.

The microscope is not always a criterion as to chronic malaria, because undoubtedly the disease does exist without the presence of parasites in the peripheral circulation. Now, however, that we have, in most states, laboratories connected with our state boards of health, where examination of blood is made free, and many private laboratories, where specimens may be examined for a small fee, the physician who is not equipped with a microscope should carry a few slides at all times and get a specimen of blood from cases of suspected malaria immediately before beginning the administration of quinin. He can get a report in two or three days, by telegram in twenty-four hours, if the symptoms are urgent. The few doses of quinin given before the report is received cannot injure the patient, and if the parasites are present the drug should be continued until a cure is effected.

There are differences of opinion as to the most favorable time of the day to administer the quinin. Torti's, also called the Roman, method of giving one large dose, 15 or 20 grains, several hours before the expected paroxysm, based on the theory that the best effect of the quinin is obtained during sporulation, when the youngest forms are free in the blood-stream, has many followers in the South. Some of the older physicians still follow Sydenham's method of giving one or more large doses during the remission or intermission of the fever, when the drug is less apt to produce nausea or other discomfort. In my opinion the best method, that employed by Gorgas, Deaderick,¹⁷ Craig,¹⁸ Rogers¹⁹ and other authorities, and the method which I have employed for fifteen years, is to keep the patient continuously under the influence of quinin, by giving him small doses every four hours, both day and night, with perhaps an extra dose about four hours before the expected paroxysm.

In the tertian and quartan forms 3 or 4 grains every four hours is sufficient, but in the more resistant estivo-autumnal variety 5 grains every four hours will be required. This dosage should be kept up for three or four days after the fever has subsided; then half the quantity should be given for two weeks. I do not believe that there is ever any occasion for giving more than 30 grains of quinin a day, and the very large doses are regarded by some authorities as positively dangerous.

In the acute and severe estivo-autumnal fevers the quinin may have to be kept up in maximum doses (30 grains daily) for several weeks, because the crescents, or gametes, are very resistant to quinin. In 1904 I

reported a case of a negro girl, aged 14, who had crescents in her blood after the administration of 4 grains of quinin, in solution, every four hours for twelve days.²⁰ Darling, of the Canal Zone, in the Section on Practice of Medicine last year reported a number of cases in which gametes remained in the blood from two weeks to twenty-five days in spite of the daily administration of 30 grains of quinin.²¹ Craig has also made extensive studies of the gametes in the peripheral circulation for varying periods of time after the use of quinin.²²

In the acute cases of all types of malaria it is important for the patient to remain in bed for several days, because undoubtedly the best effect is obtained from quinin while the patient is at rest.

How long should the quinin be continued to attain a radical cure? Deaderick¹⁷ says: "A few days' treatment with quinin no more cures malaria than does a few weeks' rubbing with mercury cure syphilis." He continues the quinin in 15-grain doses on two successive days of each week for two or three months. Craig, Rogers and other well-known authors also advise a modification of Koch's method.

In Italy small daily doses (6 grains) are given for three months after the acute symptoms have subsided, just as it is given to entire communities for the prophylaxis of the disease.²³ No doubt the prophylactic doses effect cures in many chronic cases, since in some localities the disease has been almost entirely eradicated and in five years the Italian death-rate from malaria has been reduced three-fifths (Thayer).

Ross²⁴ says: "To extirpate the parasite in a patient demands four months' assiduous cinchonization," and I believe that this is the safest rule to follow.

Thayer advises the small daily dose (6 grains) rather than the large intermittent doses. My experience has been that the small daily doses (3 grains night and morning) are efficient and are better borne than the large doses repeated at intervals of several days. I have also found that the memory test of giving quinin on certain days of the week or month is too severe for malarial patients, and they frequently give it up in disgust, while by taking it two or three times a day they form the quinin habit and will keep up the drug for even longer periods than is desired.

PROPHYLAXIS

It is not my intention to suggest any less vigilance in destroying anopheles mosquitoes and their breeding-places, and I would urge that those measures be employed to the fullest extent possible. I do maintain, however, that the most important and the most practical measure, at this time, in the crusade against malaria, is the radical cure of those harboring the parasites, because every patient cured means one less focus of infection. We should remember that there are malaria carriers as well as typhoid carriers, and that one is as dangerous to the community as the other. We should not forget that the patient with the parasites of malaria in his blood may infect mosquitoes and transmit the disease to others, just as in yellow fever, and that malaria may be as serious a disease as yellow fever.

20. Harris, *Seale: Therap. Gaz.*, Jan. 15, 1904.

21. Darling: *Tr. Section on Pract. Med. A. M. A.*, 1909.

22. Craig, Charles F.: *The Sexual Forms of the Malarial Plasmodia Occurring in the Blood of Man*, *Arch. Int. Med.*, April 15, 1910, p. 325.

23. Thayer: *The Prophylaxis of Malaria*, *Jour. Southern Med. Assn.*, November, 1909.

24. Ross: *Allbutt's System of Medicine*, p. 285.

17. Deaderick: *A Practical Study of Malaria*, W. B. Saunders Co., 1909, p. 366.

18. Craig: *The Malarial Fevers*, William Wood & Company, 1909, p. 377.

19. Leonard, Rogers: *Fevers in the Tropics*, Oxford University Press, 1909, p. 234.

I believe that we should at once institute a campaign against malaria. It offers the most brilliant results of any of the public health problems now confronting us.²⁵ A campaign of education should be begun with the medical profession, because physicians as a class, and particularly those residing in malarial regions, do not appreciate the seriousness of malaria, or the ease with which it may be eradicated. The public should be educated by means of popular addresses and literature on the subject should be placed in the hands of every one residing in malarial districts. Malaria, being both infectious and contagious, should be classed as among the reportable diseases, and the state and county boards of health should lead in the fight. Municipalities, counties and states should be called on to furnish money to purchase quinin to cure the indigent sufferers from malaria and to destroy the anophelines and their breeding-places. Philanthropists should be urged to aid in this fight against one of the greatest enemies to mankind. Money spent in eradicating malaria will yield greater returns than any other philanthropy.

It is no idle dream to hope that the blot of malaria may be erased from the fair name of our Southland and from the Mississippi and Missouri valleys, where the disease is most prevalent. Our government has given us an example of what may be accomplished even in the tropics. Gorgas,²⁶ with the resources of our great country to aid him, when he applied the knowledge of the mosquito transmission of disease and eradicated yellow fever and malaria from Havana and the Canal Zone, made conquests which should be regarded as among the greatest in the history of the world, victories that mean more for the welfare of nations than have ever been achieved in war.

ABSTRACT OF DISCUSSION

DR. CHARLES MACLELLAN, Chicago: In my opinion the theory of the anopheles being the only carrier of malaria is wrong; malaria is sometimes found in northern latitudes where there are no anopheles. I remember, while in the Orkney Islands, being called to see a sick man, suffering from a severe attack of malaria, and in that region mosquitoes are unknown. Of course the gnat, of the same genus, exists in the British Isles. A second case in a man who had never been off the island came to my knowledge. Of course, we know that the anopheles is the great carrier of malaria, but there must be a first cause in the mosquito region.

With regard to the method of treatment, the administration of quinin in capsule or powder, is not an efficient manner of getting at the disease for its eradication. I believe the best method of administering this agent is in a solution of sulphuric acid. I have in mind one patient who gave a history of malaria, having been ill over a week and who had taken from 6 to 10 grains of quinin in capsule 3 times a day, without result; on giving him 2 grains of quinin 3 times a day, of the solution just mentioned, he escaped the chill on the second day and it did not return.

DR. ARNOLD TRAUBITZ, Neelysville, Mo.: I live in a district where every patient who goes to a physician's office is supposed to have malaria, and, having treated many of them with success, I cannot agree entirely with the method of treatment just outlined. Giving quinin 3 times a day for 3, 4 or 5 months is wrong; the patients cannot stand this treatment because of the resulting gastric disturbances. My method of treatment of the malaria that shows itself every other day, or every third day, consists in giving 4 or 5 hours before

the expected attack, in one dose, from 25 to 30 grains of quinin; I give this about 4 or 5 hours before the chill is expected. Even with such a dosage, often I do not get the results I expected. I have given as much as 60 grains at one time. I find then that the patient always misses the next chill. It should be remembered, however, that the chill cannot be broken on the same day that the quinin is administered. Some patients cannot stand quinin every 4 hours. The main thing in the treatment of this disease is elimination; the stomach must be in proper condition to eliminate and cause a proper action of the gall-bladder; otherwise patients must be kept on quinin indefinitely, a procedure, which they cannot stand. The long-continued use of quinin is unnecessary. In treating malaria, the digestive system should at first be placed in a receptive condition for the specific; after the administration of the quinin the annihilated bacteria should be excreted from the system.

DR. W. E. CHAPMAN, Sheboygan, Mich.: In 1902, I served as contract surgeon in the Philippines, and was called to treat many cases of malaria. In one very stubborn case, running over a period of several weeks, I kept increasing the dose in capsules until 70 grains were taken daily, vacillating in my diagnosis between malaria and typhoid fever, as the quinin did not influence the fever, and at last being assured of my diagnosis, I dissolved 150 grains of sulphate of quinin in a weak solution of hydrochloric acid, and gave it to the patient in 4½ hours. The next morning the man was free from fever; he had a beautiful eruption and was very deaf, but for the following 3 months, while he was under my care, he had no more chills or fever.

DR. I. J. WOLF, Kansas City, Mo.: One thing to remember, and one that Dr. Harris laid stress on, was that malaria may assume the picture of almost any organic disease we know or can name. I remember one case of intermittent pneumonia which was due to the malarial parasite. I have in mind also another case in which the malarial parasite was responsible for an acute attack of enterocolitis in a baby during the summer months. The question at first arose: Was the trouble due to a faulty diet? I had just read an article on malaria in children and I suspected that something of this nature was the trouble. An examination of the blood showed that it was swarming with malarial parasites. The proper administration of quinin brought an end to this attack of enterocolitis. I do not believe that the treatment of malaria differs in any way from the treatment of any other disease. One should never have a stereotyped method of treatment of this, or any other, disease. One physician spoke of giving enormous doses of quinin, while another referred to the giving of small doses. Whether the dose of quinin should be large or small depends on the patient who is to receive the remedy. It is very important that the question of the total eradication of the disease should be borne in mind, as well as the immediate cure. One should not be satisfied with the production of the latent stage—but should be satisfied only with cure. Thousands of dollars have been spent on the eradication of the mosquito; if a fractional part of this money had been spent on the cure of the patient much good could have been attained. Without a malarial patient, the mosquito could not be a conveyer of this disease.

DR. VERNON BLYTHE, Paducah, Ky.: One thing that has not been sufficiently discussed is the difficulty of diagnosis of malaria from certain other fevers, especially typhoid. I am of the opinion that the giving of quinin in typhoid, which is done so much, does harm. I think that when a definite quantity of quinin has been given to a patient suspected of having malaria, and in those cases in which there is a question in diagnosis between malaria and typhoid, and when the quinin has had little if any effect on the temperature, the amount should be cut down to the minimum. The use of quinin in typhoid I believe to be distinctly harmful, especially to the circulatory and nervous systems. This drug has little effect on the temperature of typhoid, and I wish to enter a protest against its use in treatment of this disease.

DR. S. P. CHILD, Kansas City: As Dr. Harris has stated, there is great confusion at times and great difficulty in making a positive diagnosis between malaria and typhoid because

25. Harris, Seale: Some Problems in Medicine which Affect the Prosperity of the South. Jour. Southern Med. Assn., April, 1909.

26. Gorgas, W. C.: Malaria in the Tropics. THE JOURNAL A. M. A., May 12, 1906, p. 1416; Ann. Rep. Dept. of Sanitation, Isthmian Canal Commission, 1908, Government Printing Office, Washington.

of the absence of findings in the peripheral circulation. Physicians in Kansas City get many cases of malaria from Missouri towns and elsewhere; these places have many mosquitoes; a large number of cases appear in children and these have proved to be mainly of the estivo-autumnal type. Some cases, in which the frequent examination of the blood has shown the malarial parasites, have previously been diagnosed as pernicious anemia. In a period of six months at the Mercy Hospital in Kansas City, a hospital for children, we have had 7 cases of malaria, diagnosed by the blood findings, with one death. There was one case of typhoid fever during this period. Among these 7 cases there were 3 of the estivo-autumnal type, and the blood findings were suggestive of pernicious anemia. It was found that small and repeated doses of quinin by mouth would not cause a destruction of the organisms; therefore, we resorted to hypodermic medication of a combination of urea and quinin hydrochlorate; in every instance, as was shown by the result, we were justified in resorting to regular and systematic hypodermic medication. Only in 2 instances were large doses required and then we gave up to 12 grains every 2 hours hypodermically, in the gluteal muscles. In no case did we produce true cinchonism. These patients should be watched for several months before it is announced that a positive cure has been obtained.

DR. C. C. BASS, New Orleans: In my section of the country we see malaria every month and every year; the disease there appears in two varieties. I believe that there is an impression among almost all the physicians practicing in that section of the country, that of all the specifics in medicine, one that is as nearly a specific as any is quinin in treatment of malaria. A second impression that prevails is that in every patient who has malaria to such an extent as to give symptoms the plasmodium can be demonstrated in the blood by the use of the microscope.

DR. JOSEPH H. PRATT, Boston: Many of the conditions accompanying malarial infection should not be confused with the infection itself. Various diseases of the nervous system are frequently attributed to malaria on insufficient evidence. I recently saw a typical case of migraine in a patient from Illinois who had been treated for years for chronic malaria. A physician whom she consulted in Boston concurred in the diagnosis and on examination of her blood reported that it was "swarming with parasites." This patient, now 30 years of age, has not had chills or fever since childhood. When I examined her she was not anemic and the spleen could not be felt. There were no malarial parasites in the blood. Certainly a medical man must be thoroughly imbued with the false idea that all sorts of nervous disturbances may be the manifestations of malarial infection to regard for a period of ten years a case of migraine as one of malaria in a patient who did not present a single symptom that was characteristic of the latter disease. It is a common error for the inexperienced man to mistake malarial parasites for blood platelets in stained specimens. There is no doubt, that even at present, many physicians in all parts of the country mistake typhoid, tuberculosis, and septic conditions for malaria. Many base their diagnosis of malaria solely on the presence of chills and fever. I remember a striking case in which the error was not discovered until revealed by autopsy. The chart was typical of malarial fever. The paroxysms, consisting of chills, fever, and sweating recurred regularly. Large doses of quinin had been given and although the fever did not yield, the physician in charge held to his diagnosis of malaria. Autopsy showed a purulent thrombus which filled the portal vein. Such experiences as these teach two lessons. 1. We should awake to the truth, so clearly stated by Osler, Craig and others, that a fever which does not yield to small, repeated doses of quinin properly administered with the patient confined to his bed, is not malaria. 2. Blood examinations are of no value unless made by a competent person.

DR. G. C. SMITH, Boston: The idea of a man from Boston speaking on the subject of malaria seems strange, especially as there is so little of the disease in Massachusetts. I know how prevalent the disease is in the middle west and south, but we in the New England states do encounter an occasional case. We have some cases imported from the west and

south, and some patients have appeared here who reported that they were cured of malaria. It has been my fortune to see many such cases in consultation. I can corroborate the remarks of Dr. Pratt. During the past year I distinctly remember 3 cases of pyelitis of chronic form which had been diagnosed as malaria, and 2 patients with suppurative disease of the gall-bladder which had been treated with quinin, under which the chills and fever had subsided. The patients were supposed to be cured of the malaria. The attacks came and went. There was a repetition of the administration of quinin and always with the same results—temporary disappearance of the chills and fever. Of course the patients did not improve because of the quinin they took. I believe that there are so many suppurative affections which are liable to be misinterpreted as malaria, that this point should be emphasized.

DR. J. A. WITHERSPOON, Nashville, Tenn.: I rise to insist on a never-ceasing effort on the part of the physician to teach people how to rid themselves of this fell destroyer. Notwithstanding the fact that our brothers in Boston may find cases in which errors in diagnosis have been made, such as pyelitis and infected gall-bladders, if they would only visit the delta of the Mississippi River they would have more respect for the old-fashioned malaria of which Dr. Harris has spoken. I will even go farther and say that we realize the mistakes that are made, and that blood counts are necessary, but from my own personal observation I believe that there is no better class of men who can handle malaria in general than those men who practice medicine in the south where this disease is so prevalent. It is a mistake to say that down there the diagnosis is made largely on hearsay and without proper examination. There was a time when, all over the country, the physician looked at the patient's tongue and felt of the pulse and made a diagnosis; that is not true today in my section of the country. In spite of the statements made by Osler, Pratt and others that if a fever does not yield after administration of a few doses of quinin it is not malarial, I wish to state that no more false statement was ever made in the Mississippi Valley than that; it certainly is not true. I agree with Dr. Harris that the early disappearance of the malarial plasmodium from the peripheral circulation in the latent cases of the disease does not mean that they are gone entirely from the circulation; one may repeatedly examine the blood and not find them; but they are still to be found in the deep-seated organs, lying there dormant, especially in the spleen and other organs. It requires several months of continuous treatment to eradicate the disease in such cases. It seems to be almost impossible to eradicate malaria of latent form if such patients are allowed to be up and around. We are up against a problem that costs not millions of dollars only, but hundreds of lives throughout the country because the disease is not properly treated in the latent stages.

DR. C. SHATTINGER, St. Louis: The question in mistaken diagnosis from Boston is interesting, but I should like to bring up a reverse condition, and relate a case which occurred in Kentucky where malaria is so prevalent, and where physicians might be supposed to be familiar with the disease. This patient, a woman, suffered for a long period of time and it was believed that she had some ovarian or uterine disease, and hysterectomy was decided on. By accident she happened to fall into my hands. Examination of the blood revealed swarms of the plasmodia. In this case 35 grains of quinin were given every 24 hours and it was necessary to keep this up for a period of 10 days before the paroxysms ceased. This corroborates Dr. Witherspoon's announcement that we cannot control the disease always by the administration of 1, 2 or 3 large doses of quinin.

DR. R. ALEXANDER BATE, Louisville, Ky.: A point brought out by Dr. Harris that impressed me very much was the quiescence of malaria for a period of 3 years. I do not wish to question this statement, but I wish that Dr. Harris would tell us why such a statement should be sustained. It is believed that the malarial protozoan segments in the light; therefore, this accounts for the immunity sustained by some of the negro race. I can readily understand why the protozoa might remain in a quiescent state for a reasonable period of time. But how can Dr. Harris explain that reinfection did

not take place and that there was not a relapse? How can he explain or exclude the possibility of reinfection? It was suggested by one speaker that the malarial protozoa are in the deeper structures, not so much in the peripheral circulation, and away from the light; but how can this be demonstrated?

It is of course beyond question that the mosquito is the active agent in the cause of malaria; but I think, with certain Italian observers, that the mosquito is not the only source of infection. In recent papers the statement has been made that we must eradicate the swamps before malaria can be eliminated from a district infected with this disease.

With regard to the periodicity of malaria, it should be remembered that there are many diseases of metabolism which show periodicity. Certain materials accumulate in the system until a period of toxicity is reached.

DR. ARTHUR G. BELL, Dallas, Texas: A case in a blacksmith, weighing 250 pounds, in my district was diagnosed as hip-joint disease. He had been a confirmed invalid for several years, and simply directed the work at his shop. He told me that some physicians had diagnosed his case as rheumatism and that others had pronounced it hip-joint disease. One surgeon stated that the Y-ligament had been bound down by adhesions, and that nothing would give relief except an operation. I examined the man carefully. I decided that his facial expression indicated chronic malarial cachexia. He ridiculed the idea, giving no history of malarial complications. Nevertheless, I directed him to take 4 grains of quinin, 3 times daily, till an ounce had been taken. After this simple treatment had been continued for some time the trouble disappeared like magic. The ligaments soon assumed their normal actions. Frequently I have seen physicians who lived in the same state or county disputing vehemently whether it was right to give quinin in malarial hematuria or not. One says that if you give quinin in malarial hematuria the patient will die. The other says that if you don't give quinin the patient will die. Some communities would not tolerate a doctor if he gave quinin in such cases, and others would discredit a physician if he did not. The text-books agree no better than the practitioners. One says quinin. The other says no quinin. It is said, however, that in cases of malarial hematuria, in which there are red corpuscles in the urine, quinin is indicated whereas when there is hematin, or hemoglobin in the urine no quinin is safe. When I formerly took steps to stop the hemorrhage from the kidneys I usually signed an extra death certificate. I have not attempted to stop the hemorrhage from the kidneys in my late cases. I wish to call attention to the fact that in the disease called malarial hematuria there seem to lurk two distinct diseases—one demanding quinin and the other no quinin. Will some one make the differentiation?

DR. ISAAC IVAN LEMANN, New Orleans: One cannot be sure of one's diagnosis of malaria without an examination of the blood for the plasmodium. This is a point that cannot be put too strongly. Dr. Harris is probably correct in looking on the incompletely treated patients as a reservoir for the further propagation of the disease. The plasmodia may be deep-seated in the internal organs, and not found in the peripheral circulation, but one can only determine that by aspirating, for instance, the spleen. Splenic puncture is relatively a rare procedure, and one which is not often justified. The real point I wish to make, however, is that in many of the cases of intermittent chills and fever the disease is not malaria at all; these might be the symptoms of a lot of other diseases.

DR. B. W. FONTAINE, Memphis, Tenn.: After an experience of ten years in a very malarial district it has become my rule to doubt the diagnosis of this disease, malaria, unless the parasite is demonstrated in the blood. After repeated search for the plasmodia in the blood, if I fail to find any, then I doubt the diagnosis of malaria.

DR. J. A. CHILTON, Van Buren, Mo.: My first experience with malaria was personal; I had it myself, and with ten years' experience in wrestling with this disease as a physician, I have come to have certain fixed ideas regarding it, founded on this experience. I believe that the disease becomes dormant, so to speak, and remains deep-seated in

the system for months, and that it requires in many cases months to free the system from it, and to effect a certain cure. I have treated a great many patients who would obtain medicine enough to keep the chill off, and notwithstanding my advice to return for further treatment, would neglect the matter until another chill, or perhaps two, would send them back to me, usually some time for the fourteenth to the twenty-first day from the date of their first visit. I have had careless patients repeat this thing many times, thus demonstrating the necessity of continuous treatment. I wish to relate one case of interest. A young man, about 22 years old came to me for medicine to relieve his fever and headache temporarily. On inquiry and investigation I found him suffering from malarial chills, and he said that he had had them for about all his life, and almost constantly for the past two years and that he had "tried the doctors" till he was discouraged, and did not wish any treatment save to get temporary relief. This man's history, together with the clinical symptoms, were all that was necessary to establish a diagnosis. I succeeded in getting him sufficiently interested in his condition to agree to stay with the treatment for four months if necessary, which he did. After beginning treatment with quinin and other tonics as iron, etc., combined with sufficient elimination through the bowels, the man did not have another chill, and in two months the color came back to his cheeks, he regained his strength and was redeemed from the ravages of malaria; he returned to his work, that of a common laborer. This man was under constant treatment for three months. I relate this case to illustrate the necessity of constant treatment, continued for a period of months, in order to cure malaria, and my belief that the plasmodium will "hibernate," so to speak, in the spleen for a winter, and come forth in the spring hungry and "seeking whom he may devour," resulting in another attack of chills, unless the patient be given proper and continuous treatment.

DR. T. J. RAGSDALE, Lee's Summit, Mo.: I should like to relate the history of four cases of malaria seen by me 2 years ago. These patients were four young men who had been away from town but returned to it with malaria. They were treated about three weeks and the malaria disappeared. These young men were apparently well from September or October until the following April. When all four developed chills and fever again within a week or ten days of each other. After three months of appropriate treatment they were cured. In citing these cases I wish to call attention to the regularity with which they suffered relapses.

DR. D. C. WATT, Little Rock, Ark.: I dislike to think that the feeling against the mosquito is waning; the eradication of the mosquito is possible. Those of us who live and practice in the malarial countries know perfectly well that people who are protected from the mosquito by screens, suffer less from malaria than those who are exposed to the mosquito. In the treatment of malaria I think the individual himself is very much neglected; we should treat the patient more than the disease; because if we understand the normal condition and abnormal relations, we will find that the plasmodia will not be in evidence when the condition is practically restored to the normal. In the south most of the people carry with them the plasmodia; but what I wish particularly to emphasize is that we must pay more attention to the treatment of the individual. In giving quinin, a certain amount of discretion must be used. When I am treating patients from August to October I use very little quinin excepting as a prophylactic. But in the earlier months I give full doses to effect. I am sure that quinin has been the cause of immediate death of some of my patients suffering from subacute malaria. We have to consider the matter of waste and repair. I believe that it is the patient more than the disease that should be considered.

DR. A. H. VANDIVERT, St. Joseph, Mo.: The statements in regard to the diagnosis of malaria by an examination of the blood, and the finding of the plasmodia, are correct, for this is the scientific way; but in the larger percentage of the cases of malaria, the diagnosis will be made by other means than a blood examination. Frequently the diagnosis will be made on the symptomatology alone. We should be careful

to differentiate between malaria, septic fevers and other forms of disease which cause periodical chills and fever. There is no doubt that the administration of quinin in proper doses, if properly assimilated, will eradicate the malarial poison. When giving quinin to the extent of $\frac{1}{2}$ dram we are giving a sufficient amount to stop, temporarily at least, the malaria, or the malarial infection we come in contact with. If more than $\frac{1}{2}$ dram of quinin is required it means that the quinin is not properly prepared, or that it is not the right preparation, and that the drug is not given in sufficient quantities. The question always is: Why is not the drug properly assimilated? If quinin is not taken up by the stomach, then it should be administered in some other way.

This whole question of malaria resolves itself, I believe, into the correct diagnosis by scientific means if possible, or otherwise by the clinical symptoms. Success in the treatment means the continuation of the treatment over a period of months, and looking to the proper assimilation of the agent which brings about the eradication of the malarial element from the system. This is the experience of most men who live in malarial districts and who are called on to treat this disease frequently. In my section of the country there is less malaria now than there was a few years ago; the draining of the swamps has caused a decrease in the number of cases. Malaria was very prevalent before the days of the investigation of the blood for the plasmodium. We certainly have advanced very far in our knowledge of this disease.

DR. A. COMINGS GRIFFITH, Kansas City, Mo.: I want to call attention to one point brought out in the paper, the similarity of malaria and syphilis. Recently a patient was brought to me with a history of infection, with chills and fever. Examination of the blood revealed the presence of the malarial parasite. This patient, a man, was placed on quinin in small doses and the chills and fever disappeared. However, the enlargement of the spleen and liver did not disappear. The patient got along nicely, was up and about, and 6 months later had shown no recurrence of the trouble. He went south because of some specific trouble and there the specific lesion was found. The blood again was examined but no plasmodia were found. The patient had a well-marked systolic murmur and his condition pointed to chronic endocarditis. He died. At autopsy there was found that the diagnosis was a correct one, chronic infectious endocarditis. There still existed an enlargement of the spleen and the malarial parasite in the blood.

DR. SEALE HARRIS, Mobile, Ala.: Regarding the administration of quinin in malaria, the ordinary soft gelatin capsule is usually easily dissolved in the stomach, but to be certain of solution, it may be followed with dilute hydrochloric acid. Most patients object to taking quinin in solution. Gastric disturbances following the administration of quinin do not often occur when the doses are small, but frequently follow the large doses, i. e. fifteen grains. Dr. Chapman spoke of giving a patient 150 grains of quinin in one day. His patient did not die but I think it dangerous to give such large doses. Large doses will not cure malaria any quicker, or more certainly than will 30 grains a day in divided doses. The experiments of Rogers in the tropics proved this. He gave as high as from 60 to 100 grains a day, but these large doses did not shorten the course of the disease any more than the 30 grains a day, and he found that the large doses were distinctly depressing.

Dr. Wolf mentioned a case of pneumonia supposed to result from malarial infection. Malaria may have been a complication but I do not think that the plasmodium can cause a true pneumonia. The presence of the parasite in the blood does not necessarily mean that the patient is not also suffering from other disease. Always look for something else. Dr. Bass's remarks regarding the frequent absence of the plasmodium in the peripheral circulation in chronic malaria I believe to be correct. Sometimes, however, we find the plasmodium in the blood of patients who give no history of having had chills, fever, or other acute manifestation of malaria. Dr. Pratt doubts that the malarial parasite causes neuralgia, neuritis, general paralysis and nephritis. One of my colleagues, Dr. E. D. Bondurant, who is professor of neurology in the University of Alabama, has made frequent

examinations of blood of patients suffering from these diseases and other nervous disorders. He states that in the majority of such patients coming from malarial districts, malaria is the causative factor and the symptoms yield to quinin. Dr. Bondurant also states that he has seen cases of the acute psychoses due to malaria. Manson has also called attention to neuralgias and neuritis of malarial origin.

With regard to the effect of malaria on the kidneys, I merely cite the articles by Marchiafava and Celli in the "Twentieth Century Practice of Medicine," edition of 1900. Many others have also called attention to the fact that malaria may cause nephritis. It is unquestionable that arteriosclerosis is much more common in malarial districts than elsewhere. I must take issue with Dr. Pratt's statement about the cases of fever that do not yield to quinin in 3 days not being malaria. Most of them are not, but some cases of malaria are very resistant to quinin. I must also differ with him in what he quoted Dr. Craig as saying. In the April *Archives of Internal Medicine*, Dr. Craig states that he found the parasite of malaria in the blood of a number of patients who had been taking quinin for varying periods of time, some of them longer than a week.

In 1903, in the *Therapeutic Gazette* I reported the case of a patient who had had quinin in solution in large doses for more than a week, yet the fever continued and crescents were found in the blood. Last year in this Section Dr. Darling reported several cases in which the patients had been given 30 grains of quinin a day for from 2 to 3 weeks yet the crescent forms were not destroyed. We all must agree with Dr. Witherspoon in what he says regarding the crusade against malaria. This is certainly very important and should hold the attention of all.

In regard to my authority for the long periods of quiescence or latency in malaria, I refer to Deaderick's book on malaria. Dr. Bate also spoke of the immunity, or infrequency, of malaria in the negro race. I do not believe there is any greater fallacy with regard to the negroes than is contained in such a statement. The statistics for 1900 show that in proportion to population three times as many negroes as whites died from malaria. The negroes certainly have malaria as much as do the whites but possibly not in so severe a form. I do not believe that there is any such thing as immunity to malaria. I agree with Dr. Lemann that a blood examination, whenever possible, should be made in every case of suspected malaria; but there are thousands of physicians all over this country who do not possess a microscope and yet who in nine-tenths of the cases are able to make a correct diagnosis of malaria. This is especially true in malarial districts. However, one should bear in mind that if a patient residing in a malarial district has a chill, it is not necessarily due to malaria; it may be due to a number of other causes.

The real and important point which I desire to emphasize is this: If you do not question your diagnosis of malaria, give the patient quinin at once and keep on giving him quinin until he is radically cured. It has been proved that malaria can be absolutely eradicated from malarial localities by the use of quinin alone. Koch advanced this theory ten years ago, and his plan was carried out on some islands off the coast of Africa. In less than two years, by administering quinin, the disease was practically eradicated from them. In Italy and in southern Austria the same results were obtained. The most important point to remember in prophylaxis, is to cure malarial patients. Cure them. It takes several months to do this. But if you do not cure them they will be carriers of the infection from one year to another.

Differential Diagnosis Between Lichen Planus and Syphilis.—The glans, penis and vulva may be affected with lichen planus, but as this is usually associated with lichen planus in other or more typical situations, such as the forearms and legs, it seldom leads to any error in diagnosis. It must be borne in mind that syphilis may occur in a patient already suffering from psoriasis or lichen planus, and when this happens the character of the non-specific eruption is modified.—C. F. Marshall, in the *Practitioner*.