

What, now, are the disadvantages of faulty diagnosis?

1. We uselessly cinchonize, and thereby often depress, surgical cases and consumptives.

2. The art of medicine suffers by "slipshod" methods, as the laity learns to cinchonize all fevers and then, if quinine fails, to call physician, who should have been given opportunity to diagnose at first.

3. But most important. Efforts at prophylaxis and eradication are greatly hampered; for, if we are sure of the diagnosis, it is our duty not only to relieve the attack, but, also, to use every effort to free the patient's blood of the infection and thereby prevent him from carrying malaria from one season to the next.

I shall now draw conclusions, which I expect to be criticised severely in the discussions which follow.

1. The most valuable means of diagnosing malaria is by the blood examination, which, if positive, is conclusive.

2. Inasmuch as the facilities are not always at hand for taking smears and inasmuch as a negative report means nothing, we are justified, in some instances, in making a diagnosis clinically.

3. When in doubt and when the patient's general condition is good, especially in those cases where he has already been partly cinchonized, the therapeutic test may be tried, but never over 72 hours.

4. We should always carefully examine, clinically and hematologically, those cases of vague, low grade fevers diagnosed as malaria.

5. The vital necessity of care in diagnosis is not so much for the individual case, but for prophylaxis of the community.

TREATMENT OF MALARIA RELATIVE TO ITS ERADICATION.*

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In the preparation of this paper I have endeavored to maintain the viewpoint of the average practitioner, and yet, with proper perspective interest, the more tech-

nical man. An apology is not offered for the elementary features of this paper.

That we have malarial carriers throughout malarious districts, and often in other districts, is no longer a question; that these carriers play an important role in the dissemination of the disease is just as true. To do very effective work against malaria we must attack both the mosquito and the carrier.

For convenience all carriers may be divided into two groups. One group never comes under the observation of the physician; the other group has been under the treatment of a physician during an acute attack or some recurrence, and has not had the blood properly sterilized so far as concerns the plasmodia of malaria. This group of carriers is not a very considerable number when compared to the great number of carriers scattered over the country, yet it is a very important group, in that the physician can here render such valuable service; this group may in time be eliminated.

This naturally brings us to the consideration of the question: What method or plan can be used by the physician by means of which the blood of the malarial patient may be more often and more thoroughly sterilized of malaria while he is yet under the control of the physician? This loss of control before the treatment is completed is doubtless responsible for many carriers.

The usual method of treatment among the rank and file of general practitioners permits at least a tentative loss of control when the patient is given instructions as to subsequent medication. That a very small per cent of malarial patients carry out instructions for subsequent treatment is too well known to discuss here. The average patient has a physician just to "break the fever" or "break the chills."

An unusual method of treatment and yet one that deserves some consideration at our hands, I have tried out as faithfully as possible. I refer to the intravenous use of quinine in malaria.

Unusual opportunities have been offered at the St. Francis Sanitarium, in North Louisiana, for the study of malaria. This institution is utilized by the Missouri Pacific-Iron Mountain Railroad System as a hospital for its men. Because of its location this hospital receives quite the

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largest part of the malarial cases on the entire system. During the years of 1912, 1913 and 1914, according to the records, there were treated at this place 747 cases of malaria among the railroad men. During this year, beginning January 1st and ending November 1st, there have been treated here 249 cases.

During the past season, and with considerable interest, the hospital department of this railroad has considered the question of an intensive type of treatment; a treatment that will give a constant, prompt and thorough result. The thoroughness of the treatment has been considered largely along economic lines; a saving of two or three days in the hospital, without any recurrence of an attack, is greatly desired, and is a matter of considerable importance when applied to several hundred men within a year.

Again referring to the hospital records, it is found that in 1913 the average days in the hospital per patient of the malarial patients for the full year was 6.5 days; in 1914 it was 6 days, and of the 1914 list 30 cases were selected and treated intravenously. In 1915 up to November 1st, during which time more patients have been treated for malaria than either of the two preceding years, the average number of days in the hospital per patient was reduced to 4.1 days. Of the 1915 number, 91% had the intravenous treatment.

This economic feature of intensive treatment and prompt results, when applied to the whole malarial district in the South, is a matter of much greater importance and should receive serious consideration on the part of medical men.

Last November, at Richmond, I reported to this Association in a paper, "Thirty Cases of Malaria, Estivo-Autumnal, Treated with Quinine Intravenously." This series was taken from the 1914 number I have mentioned above. Through the different foremen and through other channels I have been able to make a check upon these thirty cases as to a recurrence. Of course a distinction must be drawn, when possible, between a recurrence and a new infection. Of the thirty cases reported in last year's series I have a check on twenty-two; of this number six had a second attack; of the six, four were evidently re-infected. Of the 249 cases of railroad patients treated this year, 228 were treated

with quinine intravenously; of this number only 195 were confined in the hospital; the others were out patients. As far as possible we are checking up this list as to recurrences; as yet the check on these cases is incomplete, because some of the more recent ones have not yet had time for a recurrence. However, it appears at this time that the percentage of second attacks in the cases treated this year will be very small. A more detailed report on the check of this second series of cases will be published when complete. Private cases, while mentioned, are not included in this series because of the difficulty in keeping complete records.

I have treated both tertian and estivo-autumnal by this method with uniform results, the estivo-autumnal constituting approximately 70% of the cases.

The observations made upon the original thirty cases reported have been continued during this season, though not so extensively as last year; with few exceptions our findings have been the same. Some new observations I will mention here as of considerable importance.

The ebolic action of quinine, in 10 grain doses, when given intravenously, is unquestionably pronounced. Of eighteen cases of malaria in women treated with quinine intravenously uterine cramp developed immediately in five. Fortunately, the method was not used during pregnancy before this particular effect was noticed. Even with this small number treated I believe that, without a doubt, pregnancy contraindicates quinine administered intravenously.

Three cases of idiosyncrasy, one a vomiting idiosyncrasy, the other two urticarial in type, were treated. The first mentioned had a more or less active estivo-autumnal infection extending over twelve weeks, which responded promptly and no vomiting ensued. The urticarial cases had the same treatment as to dosage and frequency of dosage as other patients and no rash was noticed. One of the last mentioned cases had previously been confined in this hospital for an operation, and during his convalescence was given the usual ward tonic which contained, among other things, two and one-half grains of quinine. After the second dose the urticaria appeared. As above mentioned, no urticaria appeared when treated intravenously.

I mention below a few points of general interest relative to this method of treatment. The quinine is given now in a 20cc all-glass syringe. The size of the needle, as well as its length, is of some importance; I am now using a twenty gauge, 1¼ inch needle, which is most satisfactory. The dose is uniform and is ten grains. Rather frequently it has been noted that if the dose is administered only once in twenty-four hours the impression made upon the disease is inadequate and the general result is not prompt. We are now giving at least two doses during the twenty-four hours, with from eight to ten-hour intervals. Not infrequently, in the severest cases, the treatment has been given in eight-hour intervals for four or five doses.

Relative to the rate of administration: Aside from saying that this should be reasonably slow, I do not attach any importance to this point. Every molecule of our quinine solution must come in contact with living red blood cells whether given rapidly or slowly. It is a dangerous excuse for giving a concentrated solution when we can say we are giving it slowly. I do not wish here to criticize Bacelli, who introduced this method. His direction for a slow administration was evidently an excuse for his concentrated solution. The claim that the blood will dilute our solution is in error; the dilution should be with reference to the blood.

Four cases of malarial hemoglobinuria were treated by this method, with recovery, which was rather prompt and uneventful. A full discussion of these four cases, while tempting, is impossible here.

The importance of using fresh distilled water in making up the solution, I wish again to repeat. I am inclined to believe, however, that a stock solution properly prepared, with the quinine added immediately, may be kept in the office and used for a reasonable length of time. Solutions made up and bottled in my laboratory and kept at varying periods of time of from one week to five weeks have been administered, and in only one of these test solutions was a reaction noted. Much of the difficult detail work incident to an intravenous treatment of quinine would be eliminated if a stock solution would keep. It is possible to have this stock solution put on the market by some of

the large drug houses. I am inclined to believe, disregarding the few tests I have made, that quinine will inhibit the growth of the objectionable elements in old distilled water and saline when added to a fresh solution with the exception of an occasional mould. The most helpful aid to the physician in this plan of treatment will be the ampoule with the quinine in proper dilution, 5 grains in 10cc, or 10 grains in 20cc. Until an ampoule is on the market in proper dilution, I am inclined to recommend the stock solution purely as a matter of convenience, especially for institutional work.

The general technique is too simple to outline here. In my service in this hospital I have taught during this season eight of the nurses to give this treatment; and by the close of the season, nearly all of the visiting staff merely write their directions on the chart for an intravenous quinine treatment, as he would for an ordinary hypodermic treatment. It must not be construed from this that we attach such little importance to a treatment of this kind to risk it in the hands of incompetent assistants; however, such great importance has been attached heretofore to intravenous therapy, relative to its dangers, I mention this above for this special purpose.

Records of temperature and pulse have been made at the time of the treatment, and every hour thereafter until the temperature is normal. From this we have been able to approximate the time when a given case will reach normal temperature; and so constant have been the results, that the nurses on duty in the railroad service soon were able to approximate the time to within two or three hours when a given patient would reach normal temperature. The temperature of an estivo-autumnal case declined almost as rapidly as that of a tertian following a chill.

CONCLUSIONS.

1. Intensive treatment of malarial patients must be employed if we decrease the number of carriers.

2. The intravenous use of quinine, administered with proper care, in doses of ten grains, in proper dilution, repeated in from eight to ten hours once or oftener according to the case, is a type of intensive treatment that more nearly sterilizes

the blood of malaria than any other method heretofore employed.

3. Fewer cases of recurrence will follow the intravenous use of quinine.

4. The discomfort to the patient is slight, of short duration, not lasting over five or six minutes; no unfavorable effect has been noted upon kidneys, circulation, nervous system, eyes or gastro-intestinal tract; no vomiting is noted except in high temperature.

5. The ebolic effect is sufficiently pronounced for pregnancy to be a contraindication.

6. Urticarial and vomiting idiosyncrasies do not appear to be evidenced in this method. No case of hemoglobinuria has followed its use.

7. The technique is so simple that nurses in training may be taught to administer quinine by this method with reasonable certainty.

8. An ampoule of proper dilution is indicated. There are none at present on the market of sufficient dilution to be safe for intravenous use. These will appear during the next season. In the absence of a proper ampoule I recommend a stock solution, especially for institutional work, as a matter of convenience.

9. The results in thirty cases treated last season, 228 treated this season, have been uniformly prompt, constant, and entirely satisfactory.

10. In the railroad service at the St. Francis Sanitarium, in Monroe, La., the men leave the hospital and return to their work two days earlier, according to the hospital records, than by the former method of quinine by mouth. The hospital records further show fewer returns this season than ever before.

11. While the technique is simple, I would not urge any physician who is not reasonably careful as to sepsis to use this method of treatment. Reasonable care, at least, is imperative.

"A Concentration Method for the Diagnosis of Malaria," by Drs. William Krauss and J. S. Fleming, read in this Symposium, was printed in our February issue (1916), pp. 141-144.

DISCUSSION SYMPOSIUM ON MALARIA

Papers of Drs. Herold, Wright and Krauss.

Dr. R. H. von Ezdorf, U. S. P. H. S., New Orleans, La.—The subject as presented in the papers could be widely discussed. I will only touch

upon several points that have been brought out in these papers. Dr. Herold uses the term pseudo malaria, which I believe is unfortunate. I notice that he specifies the low grade fevers as belonging to pseudo malaria. The term masked malaria has been used to embrace such diseases as that spoken of and has come to be used to embrace nearly every disease unrelated in any way to malaria. This term pseudo malaria should not be used any more than pseudo-any-other-disease when malaria is meant.

The points in the paper are well covered and there is nothing that I could add to it. In fact, all of the papers that have been read on the treatment of malaria are excellent. I want to congratulate the doctors on the excellent results obtained.

With reference to the paper of Dr. Wright, I can not report on as many cases as have been presented by this method of treatment. From what I know and from what I have learned in talking to physicians regarding the results of intravenous injections of quinine, the results have not been uniformly as good as those that have been reported.

I believe that we should limit the intravenous use of quinine to the treatment of complicated or the more pernicious forms of malaria. I use and advise a less concentrated solution of quinine than the one cited by Dr. Wright. I think that 5 grains of quinine for each 50cc of normal salt solution to be a safer dilution. I have used 15 grains of quinine in 150cc of salt solution for intravenous use and repeated it every 18 to 24 hours until four doses have been given.

Dr. Wright makes a point that by the method used by him cases of malarial fever remain in the hospital much shorter time. I believe that similar results can usually be obtained by the use of quinine in solution given by mouth, as the acute symptoms are easily controlled. If a case of fever is not controlled after five days of treatment with quinine, given properly, then it is likely not to be a case of malaria. I usually treat my cases by the use of quinine given in acid solution administering 10 grains three times a day or 10 grains every six hours until the acute symptoms are relieved; as I have stated, in a case of malaria good results are obtained within three to five days.

With reference to the concentration method described by Dr. Krauss, this is a new one, and, knowing how accurate he is in his work, we can accept it as unquestionably reliable and accurate. I think that the method has its limitations and is to be used only by men that are versed in laboratory technique, and that it might be done in hospitals. The concentration method employed by me is what is generally known as the "thick blood smear method." This has given us excellent results. I believe the method should be more generally used by the practitioner. It is convenient and requires no additional apparatus in the technique of making it or of staining it. However, in using the thick blood smear method one should be thoroughly familiar with the parasites in the thin blood smear before undertaking the thick blood smears and he should also make trial specimens with known cases in order to familiarize himself with the appearance of the

parasite in the thick blood smear. I believe that the method is the only one practical in the examination of blood of a large number of persons where we desire to establish a parasite rate. The thick blood film method is advocated by many men who have undertaken to do work of this kind. The most recent that I might mention is that of Barber and those associated with him in their work on the subject of malaria in the Philippine Islands, which has been described in the *Philippine Journal of Science*, May, 1915.

The Public Health Service has thus far completed an examination of 13,526 persons, of which number 1,797, or 13.28%, were found to contain parasites. In a special study made by Technical Assistant H. A. Taylor, connected with the malarial investigations being conducted by the United States Public Health Service, he examined 526 thin smear preparation corresponding to the 526 thick smear preparation, the thick all positives, in which parasites were found. In the thin preparation he could only confirm the findings in 125, or 23.7%. You can see from this that the thick blood smear has a greater advantage over the thin. Even in thick blood smear work the element of time devoted to an examination is a factor. In our malaria index work we make it a rule to examine thick blood smear not longer than five minutes, but Barber in the Philippines, and others, and even in our own experience we may sometimes find parasites in the thick blood film where they are extremely scanty, if the examination extends over a longer time—that is, ten or possibly fifteen minutes.

The method of Dr. Krauss, in which a much larger quantity of blood is used, would undoubtedly give still better results where the parasites are very few in number. One point of interest I failed to mention in the examination of blood smears for establishing malarial index is the finding of the gametocyte in but 24% of those in whom parasites were found. This means that about one out of every thirty persons of the 13,526 examined was a carrier, a potential factor for the transmission of malaria. In other words, a malaria-bearing mosquito biting such carrier might become infected, as the sexual forms necessary are present in the blood. From my experience, I believe the thick blood smear method to be sufficient in the examination of persons suspected to have malaria.

Dr. Louis Leroy, Memphis, Tenn.—The subject is one which has been extremely interesting to me recently, because I have been able to apply it largely to the development of the method of Dr. Krauss; and because a great deal of the work has been done with some of my patients in the city hospital service in Memphis, and I can merely say that it frequently has happened that with a reasonably good laboratory force we have repeatedly had negative reports for both thick and thin smears when examinations by the concentration method have shown positive and subsequent history bore it out.

In one case of hemoglobinuria repeatedly careful findings failed to show any parasites, but they were found upon subsequent investigations by the concentration method of Dr. Krauss. In another case gametes were found, in a case of

hemoglobinuria. So that it is a considerable advantage in the ordinary case.

There is one thing that the concentrated method does. It does not destroy your parasites. It gets them in shape you can observe them just as they are. I regard that, from the interne's standpoint, a very valuable thing.

As to the point about the intravenous use of quinine, I have used it a great deal this year and have had very good results. I have used it in a good deal larger doses; used it up to 25-grain doses with satisfactory results. The amount of dilution that the doctor insisted upon is not always necessary.

Dr. Nathan Barlow, Honduras: I was very glad to hear Dr. Leroy's discussion. I have treated about 100 cases of malaria with intravenous mercury, 50 of them with mercury alone and 50 of them with mercury and quinine together. The results were such as to confirm most of Dr. Leroy's remarks and also the results obtained by Dr. Lyons as reported in the *American Journal of Tropical Diseases and Preventive Medicines*.

As sufficient time has not yet elapsed to be sure of any relapse in these cases, I would prefer not to enter into the discussion of this point further than to state that I believe that mercury will be found to be of value as an adjuvant to quinine, especially in aestival-autumnal cases.

In Dr. Herold's paper I thought that he omitted one disease which is often mistaken for malaria. Many cases of hook worm present a daily fever, weakness, emaciation and enlargement of the spleen and are almost indistinguishable, clinically, from chronic malaria. Inasmuch as the antipyretic and tonic effects of quinine may cause temporary improvement in such cases, they may often be mistaken for malaria for long periods of time.

With regards to Dr. Wright's report, I have myself used quinine intravenously very extensively in my work in Honduras, often giving as many as from four to six intravenous injections of 15 to 25 grains. In nearly all of these cases subsequent oral administration was required to remove the parasites from the peripheral blood; and I can not believe that a few intravenous injections can be relied upon to cure cases of malaria.

As Dr. Wright states that there have been many more cases in his section this year than in previous years, it seems probable that the greater number of cases treated by him were of very recent date, and we know that such cases are often cured by comparatively brief administration of quinine.

I think that all of us, in reporting results of treatment of malaria, should pay particular attention to classifying the cases according to the length of time that the disease has been present before treatment was begun.

Dr. C. P. Gray, Monroe, La.—There is one point which was brought out by Dr. Herold which I wish to commend. This is the mistaken idea so many physicians have had in regard to treating every low grade fever or every chill and fever as malaria. The mistake has been that a physician sees a case as above mentioned and makes a snap clinical diagnosis as malaria and so treats it for from one to three weeks with no improve-

ment, when it finally dawns upon him that the case in question is one of tuberculosis or some other similar condition which is associated with a low grade fever or with both fever and chills. I could mention several just such cases and am sure that you older physicians could recall even more.

As a whole Dr. Herold's paper was very practical and well chosen to come under this Section, and contains much timely advice in the diagnosis and handling of malaria cases.

With reference to Dr. Wright's paper on the intravenous use of quinine, I must say I am very glad to have heard the doctor read this paper. I have nothing to say but to commend and endorse what the doctor has said. I have been more or less familiar with Dr. Wright's work in handling his malarial cases for the past two or three years, as we are both on the visiting staff at the same hospital. For a period of about nine years I did a large general practice in a so-called malarial district, even much worse than we have around Monroe. It was then that I tried quinine in every form and in almost every known mode of administration. I finally adopted the intramuscular method, and while in the majority of the cases I got good results, it was only a question of time before I began to have sloughs and large indurations with an area of anesthesia which persisted for an indefinite length of time. This, no doubt, you are all familiar with, and must admit that it is a very serious drawback to this method. Upon the advice of Dr. Martin, of Hot Springs, I began the use of the dihydrochloride put up in ampoules in seven and one-half grain doses. This form proved satisfactory in many cases, but still there was that severe form of malaria which demanded radical and severe treatment if we were to be of service to the patient. It was in this class of cases that I first began the intravenous method as you have heard described by Dr. Wright. I have used the method in something like forty-five cases and have no cause to regret its use in a single case. I would not, however, advise its use as a routine measure in every case of malaria, but in those severe cases and in the case where it is doubtful that the patient will follow the treatment outlined or in the case where time is a factor, I would not hesitate to use it nor recommend its use. The exact size of dosage or some of the minor details may yet have to be worked out, but the method has clearly demonstrated that it has a place in the treatment of the severe types of malaria. To make my position clear, I wish to report my experience with the method in just one case. A patient was sent to me with an acute appendix. During the routine blood examination, it was found that he was also heavily infected with malaria. I had to operate on the case at once and remove a big, red, rosy appendix. As early as possible I began the administration of quinine by mouth with the hopes of eradicating the malaria. The patient was apparently relieved of the malaria and his recovery was otherwise uneventful. Two weeks later this same patient was sent back to me with a very severe case of malaria. I then administered to him three intravenous injections of seven and one-half grains of bisulphate of quinine in

20cc of freshly distilled water on successive days. The patient remained in the hospital four days and has since been in good health.

Dr. A. A. Herold Closes.—I merely wish to ask Dr. Wright to bring out, if he knows, the application of the intravenous method as to whether it actually cures any more than by mouth or otherwise.

The general object of my paper was to call attention to the matter that has been brought out so much before us, viz: the necessity of curing the disease and not just stopping the attack. If we did that in all cases and prohibited the importation of the malarial carrier in every way, we would soon rid the South of the scourge.

Dr. T. E. Wright Closes.—I am particularly pleased with the favorable comment upon my paper, but more pleased by the questions that have been asked.

Referring to the matter of dilution, I do not agree with Dr. von Emdorf relative to the dilution mentioned in his discussion. Last season I gave all intravenous treatments of quinine in the same dilution mentioned by him—that is, 15 grains in approximately 200cc of saline. This season I have brought down the dilution to 10 grains in 20cc of saline. The reason for this is obvious—the convenience of the 20cc syringe, together with the fact that it is just as safe and effective, is enough to justify the change. Again let me repeat that there is a danger point in the dilution of quinine used intravenously. This is best demonstrated by a simple test that has been made by different workers in malaria. I mention this test at this time for obvious reasons. Washed red blood cells are put in small test tubes as if for a Wassermann; different dilutions of quinine in saline are added to each, beginning with a 1 to 1 dilution; it is found that solutions of quinine up to approximately one to twelve or thirteen dilution will produce hemolysis; above this no hemolytic effect is noted. Now, 10 grains in 20cc saline is a 1 to 30 dilution, and this quantity can be administered about as easily as 5 or 10cc, and certainly is much safer. Not long ago I saw in consultation a case of severe embolism in both arms, due to a concentrated solution. This concentrated solution was nothing more than the ampoules of quinine now on the market. I must admit that Baccelli gave his quinine in a 1 to 10 dilution, and yet Baccelli, according to our best records, gave it only in his pernicious cases; and it is possible that Baccelli did not record some accidents he must have had. While I am not inclined to go back to the high dilution as used last season, I am at the present time unquestionably opposed to using a stronger dilution than I have just recommended. Certainly, with the large number of cases treated this season with this dilution, if it is unsafe, some ill effects would have been noted on some.

Regarding the question asked as to whether or not we know a patient is well when he leaves the hospital in such a short time. This is purely a matter of keeping a check on the patient. Our system of records and checks against these cases leads us to believe that if they do not return and do not have a recurrence, except in a few cases, we naturally class them as cured. While some of these cases are not heard from again after

they leave, a very large percentage is checked against from time to time with information coming through the different foremen and others belonging to the same group of men. It must not be understood that when a patient is in our hospital for four or five days, and all symptoms have been relieved, that we would be so particularly optimistic about the permanency of the cure if in following up this patient through some good checking system we did not have the evidence that he remained well.

In the matter of the acute and chronic cases. These were separated in the original series of thirty cases reported a year ago, but in this series they have all been classed together. Of this second series a rather substantial percentage had evidences of chronic malaria. Relative to the treatment in the acute and chronic, three intravenous treatments, as I have outlined, are enough for an acute case, one the first day, two the second, or two the first day and one the second, depending upon the time of the first treatment. A fourth or even the fifth may be given in very severe cases, with eight or ten hour intervals. No subsequent treatment is needed in acute cases. I am inclined to believe that in the chronic malaria some sort of subsequent treatment is advisable; the small number of relapses or recurrences we have had are in this type. At the present time I would recommend one or two treatments one day in each week for two or three weeks after the patient has been discharged, for the chronic type.

I wish to refer again to the constancy and promptness of our results, and in doing so I will give a case in illustration. One case came to the hospital at 10 a. m. with rectal temperature 106, pulse about in proportion. He was quiet, mental condition normal; skin hot and dry; spleen very much enlarged; blood examination showed three to seven estivo-autumnal plasmodia to a field. At 11 a. m. he was given the usual intravenous treatment. The nurses at once began approximating the time when he would reach normal temperature. He had not taken any quinine for this attack. Eight hours later he was given a second treatment. At 2:30 a. m. the following morning the temperature was normal. It is interesting to state here that the nurses who approximated the time had been on this service for some time and none of them were further than four hours from the exact time when the patient reached the normal temperature. I mention here a rather severe estivo-autumnal case because those of you who are acquainted with the usual method of giving quinine by mouth have an idea about how much it would require to make a substantial impression upon the general condition of the patient as well as upon his temperature.

Referring to the stock solution. In the absence of a proper dilution on the market of an ampoule I recommend a stock solution, especially for institutional work; certainly it shortens the labor incident to an intravenous treatment. When we have on the market a proper dilution in ampoules, 5 grains in 10cc or 10 grains in 20cc, it will be a wonderful aid to the general practitioner and I recommend its use.

A number of elementary features in the tech-

nique I have outlined in my paper for the special benefit of the average practitioner who might be a beginner in this line of work. Along this line I have done my best to maintain the viewpoint of the average doctor, in whom I have considerable faith, and for whom I have a very high regard. His duties are arduous and his methods of diagnosis, while reasonably accurate, are often subjected to question; and any assistance that can be given to him in the matter of prompt and effective measures in the treatment of this, our common enemy—malaria—should be given.

Dr. William Krauss Closes.—In regard to the intravenous administration of quinine, it is known that Bacelli recommended its use more than twenty-five years ago. I have used it in my service for as long as fifteen years. We learned very early that it was not safe to inject concentrated solutions. Bacelli recognized the danger because he counsels very slow injection. He even goes so far as to direct the physician administering the quinine by vein to assume a comfortable attitude so that it can be delivered drop by drop. In view of the tendency of the plasmodium falciparum to cause the containing blood corpuscles to clump, resulting in the obstruction of certain vascular areas, I am in favor of giving it diluted with 200cc or even more of salt solution in order that these congested areas be flushed out if possible.

Our object in treating malaria is to convert the blood into a chemical solution which is toxic for the malarial parasite. It is logical, therefore, to introduce the chemical agent directly where it is wanted to get the quickest and most pronounced effects. The blood should be a 1 to 10 thousand or even a 1 to 5 thousand solution of quinine in order to effectually destroy the parasites. Approximately this equals a maximum daily dose of one-quarter of a grain per pound of body weight.

With reference to my technique for concentrating the parasites, I want to say again that any one may devise a method different from this which might be equally as good, or perhaps better. The idea of a concentration method was suggested to me by Dr. Haskell, who said one ought to get parasites in a sediment of a centrifuge tube similar to tubercle bacilli in the anti-fermin method. The work was undertaken by my assistant, Dr. Fleming, and he, assisted by Dr. Rucks, with occasional corrections and criticisms by me, reduced it to a technique. Many plans were tried but rejected, because while satisfactory in our hands, they would not answer to put in the hands of those unequipped with every facility. Modifications were attempted and they were rejected until about seven hundred experiments had been made. It was my purpose to furnish a technique free from ambiguities and difficulties, sufficiently flexible so that it could be applied under a variety of conditions.

The objection might be raised that a general practitioner will not adopt a technique requiring vein puncture. I am sure he will do better at filling a bottle containing a previously prepared solution with blood, even if he has to make an incision in the finger to get it, than he would trying to make films fit for examination.

In our laboratory, as I stated in discussing Dr.

Stingily's paper, we receive blood upon paste board, window glass, stuck between slides or slide and cover glass, and in all sorts of ways except the right way, and I really think that more usable specimens will arrive at the laboratory when sent in in citrated salt solution. By studying the tables just once, one can become familiar with the time factors which are suitable in a given case. If the specimen is to arrive at the laboratory twelve hours or longer after removal, formaldehyde can be added at the source so that the blood will arrive in a condition of fixation. A reference to the tables will also eliminate the necessity of going over much ground, which will lead to failure. By adopting the time and dilution factor, which will give you a plus in the second and third tables you may rest assured that the parasites will be found, even though all other methods have failed.

Dr. Louis Leroy, Memphis, Tenn.—I wish to say another word of commendation of the method of concentration for finding malarial plasmodium, which Dr. Krauss has presented, as much of this work has been done on patients under my charge at the city hospital at Memphis. It has frequently occurred that where a very competent laboratory force has failed both with the thin and thick smear method to find parasites, they have discovered them by the concentration method and the history of the case subsequently bore out the findings.

Attention may also be called to the fact that with this method we are not liable to make mistakes of so-called artefacts, because each parasite remains in perfect form, the corpuscle having been dissolved we have it, and it is not masked by other material lying over and around it, and the parasite is not distorted by having been mashed in the process of spreading.

Again in the thick smear method unless a man has become more than average expert he is apt to find many things in the thick smear which will confuse him and which he may misinterpret for a possible parasite. This method, of course, is rather tedious and is not to be applied to the ordinary cases in which the old method is amply sufficient to give satisfactory results. In connection with the eradication of malaria I wish to make a preliminary statement to the effect that I have a method which I have been instituting in my service in the city hospital at Memphis this summer. The first suggestion was made from an article by Barlow in the *Journal of Tropical Medicine* a few months ago, in which two cases are reported which gave some evidence of benefit by intravenous administration of bichloride of mercury. In trying to determine what it was that gave the benefit they made a number of experiments and observed that the intra-corpuscular type of parasite gave no evidence of being affected by it, but that gametes disappeared from the blood soon after the administration. Further investigation has shown that gametes may be eradicated by the salvarsan and neosalvarsan intravenous injection, but that these substances have no effect whatever upon the occurrence of chills and fever in the initial attack, because these are due to the intra-corpuscular parasite. On the other hand, we frequently find patients giving us no symptoms whatever and be

carrying large numbers of gametes in their circulation. Quinine has practically no effect upon the gametes and in order to eradicate the disease completely it is necessary to administer quinine for months, so that if at any time a gamete reverts to the vegetating type, sufficient quinine will be present in the circulation to cause its death. In this connection I will state again that I have examined thirty-odd cases of estivo-autumnal malaria, all of which were gamete carriers, and these have yielded to the intravenous administration of bichloride of mercury, in addition to the routine quinine, showing no gametes in repeated blood examinations within from 24 to 48 hours. The treatment by quinine has been continued until the immediate symptoms disappeared and the patients have been discharged with apparently no return of symptoms and nowhere showing gametes in the circulation.

The technique of the process is very simple, merely consisting of the intravenous administration of one-fourth of a grain of bichloride in 20cc of normal saline, given very slowly, so that it will have ample opportunity to mix with the blood and avoid local irritation. Usually a single injection is all that is required, but I have given two or three to a single patient.

A preliminary examination of the urine is always made to be sure no renal disease is present which might be aggravated by rather large doses of mercury. This is, of course, merely a preliminary report, based upon thirty cases, which have been so uniform as in my estimation to warrant the report.

A TWO YEARS PUBLIC HEALTH CAMPAIGN IN A RURAL COUNTY*

BY CARL A. GROTE, M.D.,
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Most of us agree that public health is to a very large degree a purchasable commodity. We are aware, too, that this partial awakening of the possibilities along the lines of disease prevention has been brought about during the past few decades, and that ere long, not only the medical profession, but the masses will better appreciate its importance and will demand better public health service as economy. The United States, however, as a whole, has not kept pace with the rapid strides of progress in preventive medicine that have been taken by many of the European countries. During the past few decades our National Government has rendered a most excellent service through its Public Health Department. Some of our State Boards of Health have done work which has been

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