

The Journal of the American Medical Association

VOL. XXVII.

CHICAGO, ILL., DECEMBER 26, 1896.

No. 26.

ORIGINAL ARTICLES.

THE AUTUMNAL FEVERS OF THE SOUTHERN ATLANTIC STATES AND THEIR TREATMENT.

Read before the Pan-American Medical Congress, Mexico, 1896.

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Fever of a malarial origin is an annual visitant, from August to the middle of October, of all that vast section comprised within the Southern Atlantic and Gulf States, and also of a large portion of the interior, comprising the Middle, Western and Southern States. The large number of cases occurring within the vast area comprised within these borders, the distress of mind and body, the loss of time by sickness, the additional expense incurred, the impairment of health and the greatest of earthly evils, the mortality resulting, combine to render this one of the most important and interesting subjects in our profession, and how successfully to prevent malarial infection and to correct it after it enters the human system, become questions of paramount importance.

While this subject has for years received the closest attention from scientific and practical minds, it never loses interest or grows trite and in all probability it never will.

As already stated autumnal fever is an annual visitant in the eastern section of the United States and in certain cases passed under the name of malarial fever and in certain other cases under that of typhoid fever. I find that this fever makes its appearance in our section about August 10 or 15 and continues to prevail until killing frost or freezing temperature begins and then it as suddenly disappears as it appears. I find also among the profession and among the people that this fever in its simple, uncomplicated state goes under the name of malarial fever, while in its complicated state and in its advanced stages it is denominated typhoid fever. Hence, in all cases of malarial fever, characterized by symptoms of malignancy, as a dry tongue, delirium, jactitation, insomnia, tympanites, frequent pulse and general prostration are always miscalled typhoid, and by some typho-malarial fever. These misnomers and misunderstandings of the proper character of autumnal fever are very misleading in relation to our proper conception of the treatment and management of the disease.

In this fever which annually visits our section I do not believe that there is one case in twenty which is genuine typhoid or enteric fever, for these autumnal fevers, however they may in certain cases simulate true typhoid, disappear from our country at the first heavy frost, to return again at the next autumn.

This is not the course, or a part of the history of true typhoid fever. Typhoid fever does not come in hot seasons and go in the cold, when frost and ice begin to make their appearance. Typhoid fever does not come when the temperature goes up to 80 or 90 degrees and disappear when it goes down to 32 degrees. But rather typhoid is a disease prevalent in low temperatures, in the late months of winter and early months of spring. On the contrary, malaria thrives, flourishes and grows in high temperatures and moist seasons, in flat, low localities. Typhoid fever has its favorite homes in high, cool localities in northern and mountainous sections.

Etiology of autumnal fevers.—The question of the origin of malaria, which is the true cause of our autumnal fevers, and of its peculiar nature, is now so well settled by scientific investigation it is unnecessary to discuss. The plasmodium malarie of Laveran, so clearly described by that careful investigator, its parasitic nature, its vegetable origin, its entrance into the circulation, its fastening itself on the red blood corpuscles as any other parasite, its growth and development in those corpuscles, its nourishment and sustenance on the material of the corpuscles, and finally its destruction of the red corpuscles, as any other parasite would do when fastened on an animal or vegetable body. This destruction of the red corpuscles of the blood explains many, if not all, of the pathologic changes resulting from malaria, as organic changes in the liver, spleen, blood and venous tissues. It explains the chills, the fevers, the congestions and irregularities of circulation of malarial fever. The circulation can not pursue its regular course through the round of the vascular system with disorganized, broken down blood corpuscles. They lodge somewhere in the capillaries and cause local congestion in the lungs, liver, spleen or brain. This is the true secret of those terrible congestive or pernicious fevers found in malarial regions. The corpuscles of the blood have been either partially or wholly disorganized and are unfit for circulation through the capillaries. The fever that follows the chill is a bold and determined effort of nature to assert itself and relieve a congested circulation. The chill is a partial cessation or suspension of circulation from partially disorganized blood structure. The fever that follows is necessary to correct that suspension and restore the equilibrium. If there was no fever to follow the chill of malarial fever, the circulation in its integrity and equality could never be restored and in every case there would remain local congestions of the great central organs as the brain, liver, lungs, spleen, that would inevitably produce disorganization of that organ and certain death. The pernicious fever is an example in point. Here there is no reaction, or only a partial reaction, and the result is almost certain death. After the seven days' battle around Richmond, in 1862, I saw cases of this

fever, contracted in the Chicahominy swamps, die within fifteen hours after the first chill.

The plasmodium malarie of Laveran is probably the most certain diagnostic of malaria when found in the blood.

Another very interesting question in this connection is the channel through which the malarial plasmodium is carried and conveyed into the system, whether through the atmosphere, or water, or both. Formerly it was the professional opinion that the air was the channel through which it was conveyed. At present the trend of professional opinion tends to the view that water is the principal channel. Experiments instituted by many observers in many localities go to show that water certainly is a common carrier of the malarial parasite. These experiments show that in malarial regions persons using surface water, as that of spring or wells or streams, are exceedingly subject to malarial poisoning, while the same persons when made to use water from the deep reservoirs of the earth, as for instance from artesian wells, are entirely free of all malarial infection. In other words, that it is the water from the earth's surface saturated with the debris of vegetable decomposition that contains and carries the malarial parasite.

The importance of these facts elicited by scientific investigation can not be overestimated in a sanitary point of view. But I must think that there is certainly some truth also in the idea that was entertained for so long a time, that the air is a carrier of malaria.

I believe that there is some ground for the opinion that there are different forms of the plasmodium malarie to account for the different types of malarial fever and that these different types of disease are not simply due to a difference in quantity of the dose.

Forms of malarial fever.—The time honored division of malarial fever into three distinct forms of the disease, the intermittent, remittent and pernicious or congestive, still holds good. But there is a subdivision of the remittent form into two distinct types, the acute, sudden and violent, and the slow, progressive and insidious type.

This division of the remittent form into two distinct types I consider of so much importance that I shall, when I come to consider that form, dwell upon it at some length.

Intermittent fever or fever and ague.—Fever and ague usually runs a distinct course, and is rarely disposed to run into the remittent. At certain seasons it becomes unusually prevalent in the section of the Southern Atlantic States. Then again it may disappear and scarcely be seen for several years.

It is rarely seen in the thickly settled or central portions of towns and cities or thickly populated, well watered, and well drained countries. Its favorite localities are the suburbs of towns, low, swampy regions, supplied with bad drinking water from shallow wells, springs and streams containing vegetable matter. Persons using boiled water, cistern water, artesian water, or well filtered water rarely suffer, if at all, from fever and ague.

The plasmodium of fever and ague appear to have a positive tendency to infect the liver and spleen. And it is after a time very certain to fasten itself on the red corpuscles of the blood. The habitual subject of fever and ague ever presents an appearance highly characteristic of the disease. The complexion at once combines the jaundiced appearance of hepatic disease, and the extreme pallor of profound anemia,

showing the poisonous action of malaria on the structure of the liver and at the same time the disorganizing action of the plasmodium on the blood corpuscles. Thus we have in these cases a combination of jaundice and anemia.

There is a peculiarity about fever and ague that has never been accounted for, which differs entirely from the remittent and that is a constant tendency to recur, even long after the subject has ceased to reside in a malarial region. The question is, does he get a new dose of the poison, or does the malarial germs possess the power of generation and multiplication within the system, similar to other ferments and spores? I myself take the latter view of the case. Otherwise I do not see how this peculiarity can be accounted for.

The acute type of remittent malarial fever.—The acute form of malarial fever begins suddenly while the patient is in his usual health. It has no premonitory symptoms. The victim may be in a perfect state of health and be stricken down within a few minutes. It is almost invariably ushered in by a distinct chill or chilliness. The temperature after reaction begins, rises rapidly, advancing to 103 or 104 degrees, even to 105 degrees, within a few hours. Then in the course of ten or twelve hours remission commences. There is a diurnal rhythmic movement of fever. In all of these malarial fevers, there will be observed a rhythmic element except the pernicious, in which it is absent.

In pernicious fevers there is no well defined or regular rhythmic movement in febrile action whatever. Rhythm in fever is a conservative action and an effort of safety and is designed on the part of nature as a protective measure to the patient. It is an alternation of rise and fall of corporeal temperature, solely brought about by the conservative forces of nature. Deprived of this rhythmic tendency in fever we would either have a continual high temperature or low temperature. In our treatment of fever we attempt to imitate the rhythmic action of nature by medical agencies. Chill in fever is a partial suspension of nerve force by the action of certain poisons on the blood and tissue, whether from malaria, sepsis or other causes, in which the circulation is partially and in fatal cases wholly suspended, and for the time the blood-making and heat-generating powers are also in partial suspense. Chill, whether slight or grave, means blood poisoning. The fever that follows, which we term *reaction*, is an effort of nature to restore nervous and circulatory action and throw off the offending cause and is therefore a conservative movement. The chill, the fever and remission, constitute the rhythmic movement of malarial fever, and when we see in our cases of malarial fever this rhythmic action carried out in perfection, we prognosticate a favorable result. But when on the contrary we observe an absence of regular rhythmic action in our cases we argue unfavorable result, provided we can not restore the rhythm of fever by artificial means. Rhythmic movement of temperature is peculiarly characteristic of malarial fevers and is generally known under the term periodicity. But it is not confined to those forms of fevers. We see it in typhoid to a certain extent, but much less defined. We see it clearly defined in hectic and pyemic fever. Here it is again evidence of a poison acting on the blood, depressing the nervous system to an extreme degree, lowering the temperature and reducing the circulation, which we

term a chill. Then follows febrile reaction, which is a vain effort of nature to reassert itself and throw off the effects of blood poisoning, and failing in this then comes the copious perspiration in the further vain effort to get rid of the poison, and finally comes after all this the blessed calm of remission, when the rhythm of fever for a time has been accomplished, with its delightful sensations of relief from the torture and suffering of fever.

Prolonged malarial fever.—This is a distinct type from the acute form of malarial fever. It differs in having a well marked, well defined premonitory stage, which the other has not. This premonitory stage may be developing for a week or more and consists in general sensations of malaise. There is impairment of appetite, some daily headache, some painful sensations in the back and limbs. These symptoms are particularly apt to return toward evening. The victim always feels more or less relief in the morning. Toward night if the pulse and temperature are tested it will be found that they are slightly above, the pulse may rise to 85 and the temperature to 99.5 degrees. Nevertheless the patient continues to be up and about, though he feels there is a loss of physical strength and mental activity, and that he is incapable of much exertion. Toward evening the patient has sensations of chilliness. There is rarely diarrhea present.

These prodromic symptoms resemble very decidedly those of typhoid fever, except that of diarrhea, which is almost invariably present in the latter. But if closely observed it will be found that the prodromic symptoms of prolonged malarial fever increase in severity daily until the full development of the case. There is a daily but very slight increase of temperature and pulse rate, while the patient grows weaker and more indisposed to exertion of any kind.

Finally, there is entire loss of appetite; then there is an evening chilliness and fever, and toward morning a remission, when the patient feels better and stronger during the morning, but as certain as evening approaches there is a return of chilliness, feverishness and decline of strength. It will be observed that at this early stage the rhythm of fever is present and this is characteristic of this fever until it reaches the adynamic stage, when the type of fever assumes a more continuous form and loses the rhythmic character. I regard a proper conception and knowledge of the prolonged form of malarial fever as of exceeding importance, as it is often confounded with genuine typhoid fever. A mistake of this kind is exceedingly unfortunate, as the treatment of the two diseases is entirely distinct.

At the meeting of the Pan-American Medical Congress held in the City of Washington, some years ago, a most instructive and interesting paper was read by Dr. Lobos of Carraccas in Venezuela, on the subject of "Prolonged Malarial Fever" as observed by him in the Tropics, where typhoid is rarely found.

He states that this type of malarial fever, which he regarded as a distinct form, prevailed annually in his section of Central America. The development and progress of the disease are so graphically described by him were eminently slow. It is a fever, while characterized by frequent changes, subject to extreme exacerbation and extreme increase and decline of temperature, often continues for three or four months.

The prolonged malarial remittent fever of our Southern Atlantic States, as witnessed by me for

many years past, has three distinct stages, the premonitory preceding the development of fever, the simple febrile stage and finally the true adynamic stage. This is the form of fever we so commonly meet with from July to October in our Southern States, which prevails annually during that period and suddenly disappears when the temperature falls to 32 degrees.

The curves of temperature in the acute and prolonged forms differs widely. In the acute they are sudden, sharp, abrupt and extreme. In the prolonged forms they are slight, gentle, moderate and never sudden, sharp or abrupt. The rise of temperature is gradual and slow and never reaches suddenly a high point. In neglected or improperly treated cases there is a gradual increase daily in temperature until the case reaches the true adynamic stage, when it may attain 105 or 106 degrees. But these high degrees are never attained in the early stages of prolonged fever, but only in the advanced or adynamic.

The premonitory stage.—The premonitory stage is characterized by a decline in physical strength and mental activity. The victim suffers from languor of mind and body. There is a decline correspondingly in appetite. There are neuralgic pains in the limbs, back and head, due to the action of malarial poison on the great nervous centers, the brain and spinal cord.

The premonitory stage of prolonged malarial fever is always characterized by neuralgic manifestations, and these neuralgic symptoms bear out the rhythmic habits of malarial disease. They have their exacerbations and remissions with much regularity. These neuralgias of the premonitory stage of malarial fever are not infrequently mistaken for muscular rheumatism, the effects of cold or simple neuralgic pains. In this stage neuralgic symptoms are often of so marked a character as to obscure all other morbid indications. They may appear in the head, neck, back and limbs. From an early period the poison of malaria makes a marked impression on the sensitive centers of the spinal cord. Its effects on these centers is to produce a state of hyperesthesia or increased sensibility running into neuralgic forms. Whereas the poison of typhoid exerts a contrary effect by producing rather a state of anesthesia of the nervous centers. Nervous sensibility in typhoid is always impaired, blunted and below par. Hence the poison of typhoid exerts a marked sedative on the brain and spinal cord. The premonitory stage of prolonged remittent fever usually continues from five to ten days before the development of the febrile stage.

Secondary or febrile stage.—The appearance of chilliness and fever decides the import of the premonitory symptoms. It decides that they are the prevailing symptoms that usher in an attack of fever. Fever of this type is rarely ushered in by a decided or marked chill, but rather by chilliness at evening. Following this chilliness there is a slight rise of temperature, at first usually 100 or 101 degrees. Toward morning this declines to 99 or 99.5 degrees. For a week or ten days there is an evening chilliness, then a slight rise of temperature, continuing during the night, which declines toward morning. This is the true rhythm of fever constituting exacerbations and remissions. The curves of temperature at this stage are never abrupt, sharp or extreme, but gentle, gradual and slight. The rise will rarely exceed 102 degrees or the fall decline to 99.5 degrees.

The simple febrile stage, if unrestrained, about the third week usually begins to assume a decidedly aggravated form. Then during the febrile exacerbations the temperature rises, the pulse becomes more frequent, the tongue dryer, the appetite is lost, the sleep is disturbed and less refreshing, the mental powers are less clear. These symptoms all denote the approach of the adynamic stage. This is the stage of mortality in prolonged malarial fever. I have never known a case to terminate fatally in the simple, uncomplicated febrile stage. This is the stage in which question of the life or death of the patient are to be determined. The case must reach and pass into the adynamic stage before a fatal termination. Hence the infinite importance of averting this stage. So long as we can avert the adynamic stage our patient is safe. Insomnia, restlessness and delirium constitute early indications of adynamia, that should enlist our attention. In adynamia the blood and nervous system are profoundly affected, there are degenerative actions at work in both, calculated to destroy life. I am persuaded the great system of sympathetic and vasomotor nerves participate in this degenerative action, which explains many of the morbid phenomena of circulatory irregularities of fever.

In the adynamic stage the rhythmic movements grow less and less daily and are less defined. The febrile type gradually loses the remittent form and assumes the continued. Delirium becomes a constant feature. The rest of the patient is seriously impaired and marked insomnia sets in. The tongue becomes dry, crusty, red or dark brown. In place of tympanites there is often retraction of the abdominal walls and in very protracted cases the spinal column may be detected through the abdomen. The pulse increases in frequency and the temperature from 104 to 105 degrees. By the end of the fourth week the temperature will range at about 105 degrees, and the pulse rate at 125 or 130. Hence the extent and gravity of adynamia in this form indicate the degree of degenerative action in the blood and tissues. After the adynamic stage sets in then recovery can only take place after such changes or their effects have been repaired by nature. It is this stage of adynamia which all cases of prolonged malarial fever when neglected or ill treated pass through, that induces the belief in many that it is true typhoid fever, while others regard it as a combination of typhoid and malarial fever or what is termed by many typho-malarial fever, which is evidently a misnomer, as there is no such disease.

It is simply a case of prolonged malarial fever that has passed into the adynamic stage.

The habit of prolonged malarial fever.—As we advance from the more temperate climates toward the warm and tropical regions this form of disease becomes more prevalent, until we reach a point where it is the endemic of the country, and this is in the region of the Central American States. Dr. Lobos tell us in his very interesting paper that it is endemic in Venezuela, and as witnessed by him it assumes a very protracted form, often continuing three or four months. The idea which I desire to inculcate here is that as we advance toward the tropics, the tendency to the prolonged form increases until we reach a point where the protracted form is the prevailing type of malarial disease.

In the Southern Atlantic States the disease usually runs a course of from three to six weeks. In the tropics from three to four months, according to Dr. Lobos.

Pernicious or congestive fever.—This form of fever is not infrequently seen in the lower Atlantic and Gulf States during the autumn months. It is noted for the suddenness of its onset, the rapidity of its course and termination. Its chief characteristics are sudden chill protracted over many hours, either without reaction or followed by very imperfect reaction. In this imperfect reaction the head and body may be intensely hot while the extremities have the coolness of death. I have seen cases of this fever in which the extremities and surface were icy cold, while the thermometer in the rectum denoted 106.5 degrees.

Malarial coma is a frequent feature of these cases. The pupils are widely dilated; the tongue is cold and very pallid. In some cases there is intense nausea and vomiting. At times the pulse is slow, at others rapid and very feeble. The cardiac sounds are very indistinct and scarcely audible. Hematuria is not an infrequent symptom, and albumin is often found in the urine.

The degree of malignancy of pernicious fever must be regarded as the measure of the extent to which the corpuscles of the blood have been disorganized or destroyed by the plasmodium malariae. It is difficult to say what proportion of these corpuscles may be disorganized without producing fatal results, whether a fourth or a third or a half. But in pernicious fever a very large proportion of blood corpuscles must speedily be rendered unfit for circulation and purposes of life. It is altogether probable that the peculiar phenomena of this fever are due to this pathologic fact. The prolonged chill, the extreme reduction of temperature, the imperfect reaction, and finally the intense and extensive congestion of the internal organs, are all due to the fact that the blood corpuscles to a large extent have been disorganized by the malarial parasite or have lost their amebic characteristics and find fixed lodgment in the capillaries of the internal organs, as the lungs, liver and spleen, and in these organs cause irremediable congestion. In those cases where reaction and restoration took place, what becomes of the debris of those broken down corpuscles is an interesting question. They exist in the congested organs as effete material that must be gotten rid of before there can be a restoration to health. To convert this effete matter into new forms, fitting it for elimination from the system, becomes the work of that potent agent, oxygen. By the action of this wonderful agent, the debris of broken down corpuscles is converted into urea, uric acid, creatin and creatinin, forms perfectly adapted for elimination by the renal organs.

True congestive fever, like cholera, is a disease rapid in its incipency, rapid in its onset, rapid in its course and sudden in its termination when fatal, and treatment, to avail anything, must be prompt, as every minute counts for much in arresting its progress. A marked feature in pernicious congestive fever is malarial coma. This symptom usually sets in when the algid stage is at its climax. It is often impossible to arouse the patient. The pupil refuses to respond to light. The powers of sensation are often lost. You may handle many of these patients rudely and roughly, you may prick them with a sharp instrument, and the nervous system fails to respond. The nervous centers are profoundly intoxicated with the malarial poison. Yet the coma of malaria resembles neither the coma of apoplexy or of uremia. It is wanting in the stertorous breathing and hemiplegic symptoms of the

former and the convulsive features of the latter. The patient is in an apparent profound, quiet sleep. The breathing is slow and labored.

The prognosis of pernicious congestive fever is always bad. A certain proportion of these cases die and never react, after the first chill. Another proportion die during the second and third chill. But as a rule, these latter cases never fairly and fully react. If the patient only partially reacts after the first chill and suffers a second chill, he generally succumbs in the second. In many of these cases such is the extent of disorganization of blood corpuscles from the first onset, the case is fatal from the beginning and is beyond the reach of remedies.

The rate of mortality is always very high. It ranges from 30 to 60 per cent.

Differentiation between the symptoms of typhoid and prolonged malarial fever.—In differentiating between the symptoms of the two diseases, the curves in the temperature of the two forms are really almost if not in perfect resemblance. The prodromic symptoms, while alike in some particulars, are dissimilar in others.

During the prodromic stage of prolonged malarial fever there are always present decided neuralgic features common to malarial poisoning. These are almost invariably absent in typhoid fever.

In typhoid, diarrhea is invariably present. In malarial fever the opposite is usually the case. In typhoid fever there can usually be detected on pressure in the right iliac region, distinct gurgling. The rose-colored eruption over the abdomen is usually present in typhoid, and absent in malarial fever. Tympanites is invariably present in the second stage of typhoid and absent in malarial fever. In the latter a state of retraction of the abdominal walls usually exists throughout its progress. Hemorrhage is a not infrequent occurrence in typhoid fever, and is never present in malarial fever.

But the most characteristic difference is found in the presence of the malarial parasite. The presence of this body at once is sufficient to determine the nature of the case.

It will not do in these cases to depend upon the curves of temperature as a means of differentiation. I see cases of prolonged malarial fever every season in which these curves resemble perfectly those of typhoid. They possess all their gentleness, their slightness, their evenness, slowness, similar to typhoid fever. They have none of the sharpness, suddenness, abruptness or extreme character of acute malarial fever. The rise and fall of temperature is moderate, never sudden, abrupt or extreme throughout. In this way the curves of temperature in the prolonged variety are often deceptive and misleading.

A large majority of medical men of my acquaintance, as a matter of differentiation between prolonged malarial fever and typhoid depend largely on the character of the curves of temperature.

Another feature very much depended on for diagnosis is the continued form of fever assumed by malarial fever in the adynamic stage. These are all deceptive and fallacious tests. I regard the proper differentiation between the prolonged form of malarial fever and typhoid as a matter of infinite importance, as the treatment of the two diseases is entirely distinct, and as a question that can only be settled by the microscope.

TREATMENT OF AUTUMNAL FEVERS.

I know of no subject in the practice of medicine, with the exception of typhoid fever or tubercular phthisis, of more importance and that merits our careful and scientific consideration more closely than that of the treatment of the autumnal fevers of our country. These forms are not only an annual visitant of the Atlantic States of the South, but their visitation always brings distress, trouble, suffering and too often death, and may ever be regarded in the light of a calamity.

Prophylaxis.—It is conceded by all authorities that malaria enters the human system either by means of the air we breathe or the water we drink, or through both of the channels. For many years it was the accepted opinion that the air was the only common carrier of malaria. More recently carefully conducted experiments go to prove that water is the true carrier of malaria. If this be true it is obvious that we have at hand a far greater command of the situation in instituting measures for the protection of the human system against malarial poisoning. Frost and malaria are deadly enemies. When water sinks in its temperature to 32 degrees F. all malarial germination and life ceases, and after that water in the most malarial districts may be imbibed with impunity. Our water supply, according to the latest and most reliable scientific experiments, is to be the field of future hygienic investigation and operation in regard to the question of malaria and its entrance into the human system. Formerly drainage, the clearing up of swamp lands, tillage and improvement of the soil were the only hope of those residing in malarial districts. Since the discovery that water, if not the chief, is a common carrier of malaria, another and a renewed hope has arisen for those who are yearly subject to malarial influences and that hope lies in a supply of purified water. If this be true, and all the evidences point in that direction, those who reside in the most deadly malarial districts may not despair, for by a little expense and not much labor, they can command the situation. It is very well established that malarial infected water is confined to that on or near the surface of the earth. The deep reservoirs of the earth, which can only be penetrated by artesian wells, are free from malaria. But the expense of this resource renders it impracticable in many sections. But a resource available for the poorest and humblest in malarial regions is that of *sterilized water*, which has been subjected to the boiling point. But sterilized water, while its malarial parasites have been killed by the action of heat, nevertheless contains a certain amount of dead organic matter. From this objectionable element sterilized water can be made free by filtration.

Certain products of cinchona undoubtedly possess prophylactic power in addition to their curative properties. Quinin, its most important product, must be regarded, in addition to its multiplicity of medicinal properties, as an antidote to the malarial poison. And it has a claim to be ranked among the chemic antidotes. It arrests fungoid generation and growth by arresting all fermentative action in the blood. If the article quinin possesses the chemic property of accomplishing these objects it is entitled to be ranked among the antidotes for fungoid growth and fermentative action in the blood.

Its well-known antipyretic powers in fevers are no doubt due to its remarkable antifermentative action.

But regardless of all theory on the subject, well-

attested experiments in its use as a prophylactic in all malarial regions, as the Southern Atlantic and Gulf States, East and West Indies, have established beyond a doubt its prophylactic powers. Ten grains of the bisulphate taken in a glass of sherry wine before breakfast and previous to all exposure, when combined with the systematic use of sterilized water will ensure protection.

I think in filtered sterilized water we have the ideal non-malarial drinking water for common use by residents of malarial districts when other resources, as artesian wells, are impracticable. However much water may be impregnated with the malarial parasite, in sterilization and filtration we have a certain means of purifying it and rendering it fit for human use. By the process of sterilization the vitality of the parasite is destroyed. But that does not remove the dead organic remains from the water. That can only be accomplished by a thorough process of filtration. Hence safety lies in a combination of sterilization and filtration.

The rate of mortality in the prolonged form of malarial fever or the so-called typho-malarial fever, is about equal to that of true typhoid fever. The rate of mortality of pernicious congestive fever is very high. It not infrequently reaches 50 or 60 per cent.

In the treatment of these diseases the important question arises, can we by any known means modify the types of these fevers, by rendering them milder, and at the same time reduce their rate of mortality?

These are questions of paramount importance. I believe that by proper treatment these objects can be accomplished.

Quinin is the only certain and acknowledged antidote to the parasite of malaria.

But its efficiency as such depends absolutely upon the manner of its administration. Given according to rules it is a remedy of great precision. Given according to other methods it is entirely insufficient. There is much in the manner of giving remedies, and even the most valuable and potent may fail if given without proper method or system.

Forty years ago it was the custom to give quinin in malarial fever in doses of one grain every hour, or two grains every two hours, or three grains every three hours. Well do I remember the utter inefficiency of the remedy in modifying the type or reducing the rate of mortality. By this method the system failed to get sufficient of the antidote to destroy the parasite. In giving this antidote it becomes somewhat a question of mathematical calculation. We must gauge the quantity of our antidote to the amount of parasite in the system and the gravity of the case. Not only this, but the remedy should be given in large doses at longer intervals, rather than in small doses at shorter intervals. Thirty grains given in ten-grain doses three times a day is far more efficient in the remittent forms of fever than the same quantity given in two-grain doses every two hours. Twelve-grain doses morning and evening act more decidedly than twenty-four grains divided into broken doses every two hours. In decided forms of fever quinin should never be given in small doses, however often repeated. I have repeatedly seen cases in which one or two grains were given every one or two hours, without the least effect, when the same quantity per diem given in three equal parts three times a day changed the entire aspect of the case promptly.

For many years I have taken every opportunity to experiment with quinin in malarial fevers with a view of ascertaining in each form and stage of fever the quantity of quinin that was necessary to act as a destructive antidote to the malarial parasite.

I found by experiment that in the treatment of intermittent fever fifty grains (gm. 3) of quinin given within thirty-six hours preceding the chill, was the maximum quantity required to arrest the disease. Thirty grains (gm. 1.80) given within twenty-four hours preceding the chill in a majority of cases would arrest it, but not invariably. I found that five grains (gm. .30) of acetanilid given just before the chill invariably modified the chill and resulting fever. In regard to chronic chill and fever, I found 10 grains (gm. .60) of quinin given in sherry wine before breakfast and Warburg's tincture in full doses after dinner and supper, almost invariably acted as preventives.

Quinin should never be given in pill form as they are slow to dissolve and frequently do not dissolve in the stomach at all. It is preferable to give it in solution or powder as the bisulphate, or lastly in fresh capsules. I am satisfied that a certain proportion of cases are lost because of the insolubility of pills. I have repeatedly seen in my practice cases grow worse daily under the use of the quinin pill, that improved rapidly when the solution or powder was substituted. Then again in cases of great emergency where we desire prompt action, in my experience, the bisulphate is the most certain form in which it can be given.

In the application of this remedy as an antidote to the malarial plasmodium, we must be governed by fixed laws and practical rules, or failure will be the result.

It is certainly true that we have all grades and types of malarial disease from the mildest to the most malignant, and we must adapt our measures to these different grades or we can not have success. I found in my experience in the past thirty years, in about one hundred and seventy-five cases of malarial fever beginning suddenly, with a decided chill and followed by a temperature running up rapidly to 105 or 106 degrees, with intense neuralgic pains, 60 grains (gm. 3.60) of quinin per day of twenty-four hours given in divided doses of 10 grains (.60) every four hours would invariably arrest the attack in seventy-two hours and frequently less time. Thirty grains per day would prolong the attack to five or six days, especially if given in three grain doses every two hours. Twenty grains (gm. 1.20) per day would prolong the attack between one and two weeks, and 15 (.90) per day would prolong it from three to four weeks.

These facts teach us the important lesson, that to obtain the full antidotal effects of quinin, we must saturate the system with the remedial agent promptly in quantities sufficient to kill every malarial germ in the system. Otherwise if a single germ is left in a living state it becomes the nucleus for rapid germination and multiplication, and our work must be done over again.

The question arises whether in these violent types of high temperature, we have any means at hand to facilitate or promote the action of quinin. I can answer this question emphatically in the affirmative. I find that during the febrile exacerbation when the temperature is high, the skin is very dry, the pulse frequent, 5 grs. (.30) of phenacetin, and 3 (.18) of acetanilid given every two hours act charmingly in lowering temperature, composing excitement, and inducing perspiration and in this way aiding the action of qui-

nin. Then there is the additional means of sponging the surface with cold water and alcohol. But in those cases of hyperpyrexia with a temperature of 106 or 107 degrees threatening a speedy termination of life the cold poultice enveloping the chest, abdomen and spine, and changed every two or three hours has done me most excellent service. Then we have in this class of cases numerous and valuable resources in aiding and facilitating the action of quinin in doing its work.

Next in order to be considered is the treatment of the prolonged variety of malarial fever.

The prolonged form of malarial fever, if neglected or improperly treated, is certain about the third or fourth week to pass into the adynamic stage.

The questions arising in treating this form of fever are, whether its type can be modified, its progress curtailed, and the adynamic stage be averted.

I can with the utmost certainty answer this question in the affirmative. But in our treatment we have persistent disease to contend with, and our treatment must be systematic, constant and active, and as sure as we lapse into an expectant method, or relax our efforts, the progress of the case gains on us every hour and it will pass into the adynamic stage, there will be increase of temperature, of pulse rate, and the rhythm of fever will disappear and it will assume a continued form, and then the stage of delirium appears, with all other toxic symptoms. If we expect success in our treatment the antidotal treatment must be commenced from the earliest stage, and never relaxed to the end. Twenty grains (1.20) of quinin divided in three equal parts given three times a day will maintain the case in its simple type, keep the temperature down to 101 degrees in the morning and 102 degrees at evening, prevent typhoid symptoms, or other complications and finish up the case about the third or fourth week, but 30 grains (1.80) per day will do much better.

A very interesting fact will be noticed in the therapeutic action of quinin here in its power to preserve the case in its simple rhythmic forms of fever and uncomplicated state, with moderate temperature, with clear mental faculties throughout. Ten grains of bisulphate of quinin three times a day in a case of this kind will usually carry it through a course of two weeks and finish it up in that time.

I am convinced of the importance of the patient having every night for restful sleep. It will be observed that in all of these cases the medicine and nourishment are administered during the day. If signs of insomnia appear the patient invariably has at night a hypodermic of morphia and atropia.

The percentage of mortality in the cases treated by this method did not exceed 2 per cent. In regard to the treatment of the pernicious form of congestive fever, I will briefly cite the history of a case for the purpose of illustration.

Case 1.—Adult aged 30, robust constitution, had a chill which lasted twelve hours before signs of reaction. He was in a profound state of coma. The pulse was exceedingly feeble and very rapid, the temperature under the arm was 90 degrees, in the rectum 106 degrees. The extremities and surface were deathly cold, pupils dilated. Sixty grains (gm. 3.60) of quinin in a half pint of milk punch were injected in the rectum; the fiftieth of a grain (.0012) each of strychnia and glonoin were injected under the skin. Dry heat was abundantly applied to the surface. These remedies were repeated by hypodermic every two hours. In twelve hours signs of reaction began. Consciousness

was gradually regained, reactive fever set in, followed by perspiration. The patient had two drams more of quinin, which prevented effectually a return of chill.

I desire here more particularly to mention the action of glonoin in connection with quinin in these cases. Those who have observed the course of pernicious congestive fever have noticed that the blood almost entirely recedes from the surface and extremities to the internal organs. Probably three-fourths of the circulating blood has accumulated in the brain, lungs, liver, spleen and intestines, while the arterioles of the surface are in a state of contraction.

The action of the glonoin is to promptly dilate these vessels to invite the circulation back to the surface and extremities and to produce reaction.

The prolonged chill of pernicious fever, and the difficulty of reaction mean the destruction or disorganization of a large proportion of blood corpuscles, and the intense internal congestions mean that these dead or disorganized corpuscles have lodged in the capillaries of the internal organs and are in a state of stasis. Unless nature can again throw these dead and disorganized corpuscles back into the general circulation; which we term reaction, where they may be disintegrated and converted into urea, uric acid, creatin and creatinin, and in this form eliminated from the system the result must be fatal.

Hence all of our endeavors in these cases are to produce speedy reaction, and to destroy the life of the parasite of malaria, and finally to eliminate them from the system.

Tolerance of quinin.—It is surprising how the system comes to tolerate these full doses of quinin when long continued and which are followed by no evil results. I have given continuously for a month 10 grains (.60) three times a day, and after the first few days all unpleasant effects on the nervous system would cease, when there would be a complete state of tolerance, and the remedy would act as a pleasant sedative tonic and antipyretic.

THE RELATION OF THE MEDICAL PROFESSION TO THE PUBLIC.

Annual Address delivered before the Chester County (Pa.) Medical Society, January, 1896.

BY U. GRANT GIFFORD, M.D.

AVONDALE, PA.

The stream rises no higher than its source, the fabric partakes of the color and character of its component fibers; and the medical profession is no exception to this rule.

Certainly it is not to be denied that medicine stands sponsor for much that is intimately associated with human progress, happiness and well-being. We look with satisfaction at the record of medical science and point proudly to her achievements in the relief of human suffering and in the prolongation of human life. Vaccination, anesthesia and antiseptics compare well with any of the discoveries that grace the annals of human progress in any field. Pathology and bacteriology have thrown beneficent light on many of the hidden problems and have placed some of the older tenets of medical faith on a scientific basis. In the virgin but fertile field of preventive medicine a few furrows have been turned, some seed scattered, and the fruit already gathered gives token of an abundant harvest when the field shall have been well tilled. Sanitary measures have been studied and applied,