

AN EPIDEMIC OF HEMORRHAGIC NEPHRITIS  
FOLLOWING SCARLET FEVER.\*C. F. WAHRER, M.D.  
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The word "epidemic" here employed is used in its most liberal sense, meaning thereby a certain rather prevalent and fairly general disease in a given district. The origin of most diseases has thus far been ascribed to well-known, partly known, or suspected vegetable or animal micro-organisms.

In spite of the admirable achievements of bacteriology and laboratory methods, there are many things not easily accounted for by our bacteriologic findings alone. For instance, one epidemic of measles is followed by such sequelæ as otitis, pneumonia, bronchitis, pleural effusions, mastoiditis, etc., while after other similar epidemics complications are much less frequent or may even be absent. It becomes a question, so far unanswered, why we have these different manifestations of the same disease.

## THE EPIDEMIC.

In Lee County, Iowa, in the southeastern corner of the state, with Fort Madison as a center, we had in the early months of 1906 a very ordinary epidemic of scarlet fever, attended by few of the usual complications and sequelæ. There was a very low mortality, especially low when we consider that hemorrhagic nephritis followed the scarlet fever in many of the cases.

There were, as well as I could gather from the number reported to the health office and a few of the unreported, about 195 or 200 cases of scarlet fever from December, 1905, till May, 1906, in the town of Fort Madison, and there was also a fair sprinkling of cases in the surrounding country within a radius of from five to fifteen miles.

The whole number of deaths did not exceed six, either directly from the disease or from its sequelæ, or a fraction over 3 per cent. in all. Out of this total of 195 patients about 35, or 18 per cent., had hemorrhagic nephritis. Out of the six that died only two died from nephritis, but whether death was caused by this alone I could not definitely ascertain, as the observers reporting them reported from memory only, having no case records from which to refresh their memories and to furnish in detail all the factors entering into all the causes of mortality. All my own patients recovered except one, who died from adenitis with deep phlegmonous streptococcal infection of the cervical and parotid regions.

Sequelæ of some sort are by no means rare in scarlet fever. We nearly always have some nephritis, some cervical infections, otitis, paralysis with temporary or sometimes permanent loss of function of members affected. But to have so large a percentage of cases of hemorrhagic nephritis and so very few other sequelæ is all the more remarkable, since no cause can be assigned except mere chance, and I for one am not a very strong adherent to the doctrine of chance as an etiologic factor in disease. I have witnessed in all twelve or more scarlet fever epidemics, some in which the mortality was quite high, both from the disease itself and from the sequelæ as well, but in none was there such a preponderance of nephritis as in this one, and certainly

none showed as high a percentage of the hemorrhagic form.

Before giving the pathology of this form of nephritis, I will give you the treatment employed for the scarlet fever itself, so that you may observe beforehand what relation, if any, it bears to the nephritis following, as we well know that certain drugs employed may produce a toxic nephritis in certain persons so predisposed.

## TREATMENT OF THE SCARLET FEVER.

No stereotyped treatment for scarlet fever thus far is known. Patients with mild cases see no physician, and do not even go to bed. Others require more or less attention, but the treatment is usually symptomatic. Most of my patients were ordered to take a tepid sponge daily, followed by inunction of lard with some mild antiseptic, as boric or salicylic acid. This usually keeps the temperature within limits and gives comfort to the child, allaying the itching. The bowels were kept open with small doses of calomel or Rochelle salts, and when there was vomiting bismuth was added. Ventilation was insisted on and the temperature of the room kept at from 68 to 72 F. Urine was always examined early in each case, as we generally find some albumin even when we have no marked nephritis. When the quantity of urine was diminished, milk diet was enjoined with small doses of digitalis and potassium citrate. When fever was high, 104 to 105 F., or more, bathing was ordered and in persistent cases the wet-sheet pack was employed at 70 or 80 F. These simple procedures were usually sufficient to treat the average case of scarlet fever. Thus it can be seen there was nothing in the treatment prejudicial to the best interests of the patient.

## PATHOLOGY OF DIFFUSE NEPHRITIS.

Now considering the pathology of diffuse nephritis, we usually find not only the parenchyma of the kidney involved but also the interstitial tissue. Hence we have a diffuse nephritis. We have here an enlarged and edematous kidney, distended vessels with accumulation of round cells in groups, especially around the afferent vessels of the glomeruli and from there around the capsules.

Various interpretations have been given for these round cells. Orth claims that they are derived from the connective tissue cells. Councilman says that they correspond to Unna's plasma cells and are found at the boundary zone of the pyramids in the cortex beneath the capsules and around the glomeruli. He found them also in the blood vessels of the boundary zone associated with lymphoid cells, but without interstitial infiltration.

The blood vessels themselves show no alterations, though some authors have described hyalin degenerations of the intima, or swelling of the muscular coat, and adventitia with deposits of cells and accumulation of fibrous masses and desquamation of the endothelia, in nephritis of scarlet fever and diphtheria.

Microscopically, a granular brownish-red, coagulated mass is found in Bowman's capsules and especially in the uriniferous tubules, the straight and convoluted; the latter especially contain hyalin casts and renal epithelium in process of cloudy swelling and various stages of disintegration.

The microscope in all my cases revealed the presence of blood corpuscles, hyalin and granular casts, renal epithelium in all stages of degeneration and, in some cases, bacteria. Chemically, albumin was found in quantities from 0.125 to 1.5 per cent. The specific

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gravity was frequently high, owing to the very small amount of urine passed, until the treatment modified the condition. Many specimens contained so much blood as to make the urine very dark red and opaque.

The dropsy, the second prominent phenomenon, has all the characteristics of renal dropsy. It usually develops early, and unless the patient is under constant observation by the physician it is often the first symptom reported by the parents. The amount of dropsy is not always in proportion to the amount of albumin or other urinary phenomena. These may be very pronounced when there is but little dropsy, and the converse may be true.

#### MODE OF RECOVERY.

Now a word or two as to the mode of recovery. The inflammatory process may undergo more or less involution by absorption of the interstitial exudate, the removal of the contents of the uriniferous tubules by the urine, and partly also by absorption and regeneration of the epithelium, by forming new elements from the cells which may remain. Thus a recovery, more or less complete, may result; if incomplete, we have a loss of secreting parenchyma, and scattered areas of contraction.

To ascribe the amount of toxicity to the height of the fever, as some do, is impossible in this particular epidemic, as the temperature did not run very high during the scarlet fever itself. Moreover, we often find a toxic nephritis where there has been but a low preceding temperature. So it is to be inferred that there is still present to account for the amount of toxicity some unknown factor for which there is no name, unless this unknown factor be called a mixed infection mainly due to streptococci, as has been suggested by Herrick of Chicago.

The scarlatinal nephritis seldom makes its appearance until after the febrile stage is nearly or entirely over, presumably because the infection was prior to this exhibited in the skin. When desquamation begins this infection becomes manifest in the kidneys, because absorbed by the lymphatics and carried to the kidneys, where it may set up, not only the usual nephritis but a glomerulonephritis, in addition to the interstitial and parenchymatous condition. This diffuse form of nephritis belongs to scarlet fever during the stage of desquamation. We may find it much more rarely in malaria, diphtheria or in the secondary stage of syphilis. When seen in scarlet fever it is usually of grave character and a variegated symptom-complex.

The most important phenomena are the urinary changes and the dropsy. In nearly all the cases which I observed in this particular epidemic a genuine hematuria, hence a hemorrhagic nephritis, was present. By microscopic examination I found blood corpuscles in large quantities, thus establishing the diagnosis after excluding all local sources of hemorrhage, as from the bladder or urethra. It is well to observe also that in a few cases there was only a hemoglobinuria in which there were no blood corpuscles or only a few. This was also further attested by the well-known Heller test for blood.

It may be suggested by some in discussion that certain drugs used in the treatment of the primary disease may have been responsible for a toxic nephritis. We are aware that chlorates, sulphuric and oxalic acids, sorrel, chloroform, ether, mercury, glycerin, turpentine, carbolic acid, tar, naphthol and other antiseptics may produce a nephritis when ingested or applied locally.

Further, certain foods and beverages, mustard, radishes, pepper and alcohol may, in susceptible people, also produce kidney inflammation. Exposure to cold is also an unquestionable factor in the etiology of the disease. As far as could be ascertained, none of these factors was responsible for the epidemic described.

There is also a widespread tradition among the laity, shared by many physicians, that taking cold during desquamation causes the disease to "strike in" and thus produce the mischief. While this does not sound very scientific, yet it is well to caution patients to keep comfortably warm during the scaling period and thus avoid the factor of cold. By the application of ointments or bacon rind the pores are kept relatively closed and little moisture is lost by perspiration; hence the fluid passes through the kidneys, thus flushing them.

#### TREATMENT OF THE KIDNEY LESION.

Now, as to the treatment of these cases I would call attention to the fact that the treatment given for the primary disease was in itself prophylactic. When the much-dreaded scarlatinal nephritis appeared the measures early begun were now most strictly carried out and supplemented as follows:

The patient was put to bed and kept comfortably covered. Milk diet was ordered; any kind of milk was allowed, sweet, skimmed, sour or buttermilk, or junket made with rennet, or whey. When this became distasteful, or amelioration set in, light broths, animal or vegetable, were permitted; crackers, toast and cocoa also were added. Carbonated mineral water and "soda-pop" were much used. All spices and condiments were absolutely forbidden. When dropsy was extreme, fluids were restricted as much as possible.

A weak infusion of digitalis with small doses of potassium citrate was given every three hours, or a substitute of an elixir of sourwood compound, containing to each dram two grains each of sourwood and Canadian elder and one-fourth grain of squill. When dropsy was a marked feature, especially with high temperature, my mainstay was the wet-sheet pack employed twice a day for two hours each time. When the patient improved the pack was used once a day. This never failed to relieve and prevent uremia, reduce the temperature and give general relief. In a few cases where the hematuria was intense and stubborn, ergot was administered three times a day, in some cases with benefit, in others with no apparent results. In many cases the dropsy, hematuria and consequent albuminuria responded in one or two weeks, but most of them persisted for five or six weeks with slight albuminuria for three months. Apparently all the patients made complete recoveries. None has since died from intercurrent affections as far as I have been able to ascertain.

I have asked most of my colleagues to give me data of their cases, but as none of them keeps case records they were unable to give me anything except cursory facts gathered from memory. This after a lapse of two years would not be very exact nor reliable. Some said they had had a number of patients, most of whom recovered, while some died from the nephritis. Other physicians had had but few patients, most of whom recovered; others, again, could not remember having had cases of hematuria. A few did not notice the urine at all, hence their experience would be of little value in this report. But I take it from a consensus of their conversation with me that their average experiences were similar to my own.

## SUMMARY.

1. This was an unusually mild epidemic of scarlatina.
  2. An unusual number of patients had albuminuria and nephritis as sequela.
  3. A large percentage of these had diffuse nephritis with hematuria and hemoglobinuria.
  4. Nearly all the patients recovered from what is usually considered a most serious complication.
  5. None of them has since shown symptoms of relapse or imperfect recovery. The future may show exceptions.
  6. We are still in the dark as to certain etiologic factors in disease phenomena.
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## ABSTRACT OF DISCUSSION.

ON PAPERS OF DRs. KERLEY AND WAHRER.

DR. HENRY EXOS TULEY, Louisville, Ky.: One of the factors in epidemic scarlet fever which has not been brought out is the milk supply. This was illustrated recently in Chicago. A severe epidemic of scarlet fever was caused by the milk from a large dairy, it being found on investigation that one of the milkers was in the stage of desquamation following scarlet fever. I have noticed in several epidemics in a large orphan asylum in Louisville that scarlet fever is much less contagious than the other exanthemata. I have noticed too that isolated cases of scarlet fever are often much more severe than those seen in epidemics. One such case I can recall in which there was marked hyperpyrexia, a severe double otitis media, a marked membranous angina, involving the larynx, and requiring intubation and finally tracheotomy, nephritis and pulmonary edema from which the child died. Because of the frequency with which streptococci are found in the throat I believe that we get good results from the use of the antistreptococcal serum, especially in the presence of hyperpyrexia.

DR. R. B. GILBERT, Louisville: It is a well-known fact that the germs of scarlet fever are carried by the exfoliations and that they retain their vitality for many months. As to Dr. Wahrer's remark relative to bacon-rind, I think that a better thing would be fresh hog's lard. Another thing that interested me was the statement as to the recurrence of scarlet fever. I took the stand in a paper on this subject that measles, scarlet fever, smallpox, etc.—any one of these diseases—will occur but once in an individual, ordinarily, yet every one may a second time occur, and I recall one patient, a girl, who had measles a third time. I believe that it is due to the fact of a difference in the route of entrance of an infection. If, for instance, it enters through the bronchial mucosa, these glands will forbid any further entrance through that route, but the lymphatics of any other route may not forbid an attack. I recall a case in which a child, sick with measles, was visited by a cousin who had had the disease, and later the second child developed the condition. I do not believe that any drug has any control over scarlet fever. I want to draw the line against a cold draught in scarlet fever, for it is a well-known fact that a draught of air in such cases increases the danger of nephritis. I believe that daily high irrigation of the colon with normal saline solution is most efficacious.

DR. H. M. McCLANAHAN, Omaha, Neb.: I agree that the contagiousness of the disease is not active during the first twenty-four hours. I doubt the wisdom of letting go broadcast the statement that at the end of the third week it is entirely safe to permit a child with scarlet fever to associate with other children. I recall a case of scarlet fever that was taken from a piece of flannel that had been kept ten months. In scarlet fever, when the temperature falls and the heart remains fairly rapid, is it not an indication of endocarditis? As to its occurrence in infants, von Pirquet of Vienna, of 1,056 cases, saw but one patient as young as 4 months, and but three under 1 year. I recently had an experience in a poor family in which a child under 9 months was repeatedly exposed yet failed to contract the disease. Dr. Kerley says that in probably

10 per cent. of the cases the Klebs-Loeffler bacillus was found. I would like to know in what number of those cases did they discover a laryngeal complication following. This would be pretty good proof whether the Klebs-Loeffler bacillus is the cause of the disease or not. My observation has been that nephritis is more likely to follow the mild cases than the severe cases, and I have thought that was because they were permitted to be up early. I have, therefore, made it a rule to require every one of these patients to remain in bed four weeks.

DR. F. S. CHURCHILL, Chicago: I want to speak of one point that is very important, and that is the statement that scarlet fever is not contagious after the third week. It is a generally accepted idea that scarlet fever is contagious as long as desquamation lasts. Mallory has made an investigation of the desquamation in which he found some organism which he thought might be the means of communicating the disease. I do not recall how long he persisted in the investigation, but until we know what is the specific organism in scarlet fever I think it would be a dangerous thing to let out of quarantine any child who is in the desquamating stage. I do not think that this section should allow the opinion to prevail that we do not believe that scarlet fever is contagious after the third week.

DR. J. W. VAN DERSICE, Chicago: As to the development of scarlet fever in infants, I had an experience this winter which has some bearing on the question. A boy 6 years of age contracted scarlet fever. Six days later an older brother came down with an attack and three days later a breast-fed infant developed the fever. The infant had a moderately severe fever; the temperature was never higher than 103, pulse never over 130. During the three weeks it developed hundreds of petechiae over the body. There was no other apparent complication. Dr. George Weaver made a microscopic examination of the blood, but nothing was found. The child died during the fourth week, apparently of exhaustion. In that case I had assured the mother that the child was practically safe from infection, but with all my assurances the mother was very careful of the child. We had a trained nurse; the child was never taken into the sick-room, and the mother never entered the room.

DR. H. B. WHITNEY, Denver: Whenever I ask students the treatment for any disease whatsoever I have noticed that they almost invariably reply: "Open the bowels with calomel, reduce the temperature, give plenty of fresh air and plenty of nourishing food." I have tried to get away from the routine method of procedure in scarlet fever and have paid considerable attention to the throat. I have been using with satisfaction the sozoidolate of sodium which is not attended by danger, and which has been shown to possess marked bactericidal properties. An insufflation of the pure powder is made at each visit, and sometimes in the intervals by the nurse. In infants 1 to 2 drams of a 2 per cent. solution is given every hour, or in older children used as a gargle. With this I have also used at times a 50 per cent. alcoholic solution of resorcin. I can only say of this method that it has been satisfactory to me and that I have felt I was doing something rather than merely following a routine. In regard to the source of infection, in Denver a patient of mine told me that five families in the same street having a case or more of the fever had been taking milk from the same dairyman as she, and she wondered if the disease had been contracted in that way. I at once reported the matter to the health commissioner, an investigation was made and it was found that one of the milkers was in the desquamating stage. Over sixty cases resulted from this source of infection.

DR. CHARLES DOUGLAS, Detroit: Dr. Kerley referred to the fact that very young children did not take scarlet fever and also stated that they were not subject to sore throats. I find by examination of the throat always that children of that age have as much sore throat as older children.

DR. JOHN LOVETT MORSE, Boston: I wish to say a word. I believe that we should regulate the diet in scarlet fever as we would in nephritis, that with the idea of protecting the kidneys. We know that the kidneys eliminate the products of carbohydrate and fat digestion and metabolism very easily, but have

difficulty in eliminating the products of proteid metabolism, extractives and certain salts. Consequently we should cut down the foods that may irritate the kidneys, keep the milk low, cut out broths, beef tea, etc., entirely, and feed the child on carbohydrates, especially starches, diluted cream, and later green vegetables and fruits.

DR. T. G. ALLEN, Chicago: I have seen two cases that I was absolutely sure were scarlet fever and in which I could find no desquamation. That there are often cases without desquamation is to be assumed, as we frequently get cases of nephritis with a history of sore throat but no history of desquamation. As to immunity in infants due to the fact that the mother is nursing the baby, Dr. Van Derslice did not say whether the mother of his patient had ever had the disease. If the mother had ever had scarlet fever then his case may be taken as an exception to the law that in general communicable diseases produce antitoxins or antibodies in the blood and that these being also present in the milk confer a certain amount of immunity on the nursing child. If this mother never had scarlet fever then this case is a confirmation of the law rather than an exception to it. Dr. Van Derslice, however, is correct in believing that previous disease in the mother does not always confer immunity on the nursing baby. I recently saw a case of measles in a nursing baby six months old and I know that this baby's mother once had the measles. I have been in the habit of examining the urine of my scarlet-fever patients every two or three days, but I think that Dr. Kerley's plan is a better one. I commend especially his plan of leaving the necessary test tube and reagent at the home of each patient.

DR. W. W. BUTTERWORTH, New Orleans: Dr. Morse brought out the fact that the nephritis is due to the toxemia and it seems to me the part of wisdom not to use drugs that would only tend to precipitate such a condition. For that reason I would be opposed to the use of chlorate of potash. I think that possibly the blood picture will help us to clear up the matter of diagnosis. Our experience has led us to believe that sodium sulphite or sulphurous acid may have some value as a prophylactic in this condition. It can not have any injurious effect. If it is given to children in whose surroundings scarlet fever exists, my conviction is that none of these children will develop the disease.

DR. B. H. BLAIR, Lebanon, Ohio: I agree with Dr. Kerley as to the limited infectiousness of the disease in the early period of scarlet fever, also that it diminishes in infectiousness after three weeks. I also believe in the danger of communicating the disease from the nasal discharge or from the discharge in otitis media so common in these cases, and also the discharge from a suppurative adenitis. I should like to ask whether it is possible by the reaction of the urine to determine whether a case of hemorrhagic nephritis is the result of scarlet fever. Hemorrhagic nephritis, I understand, more often follows scarlet fever than it does diphtheria. I had a case a few years ago that I thought was diphtheria. There was no eruption and no desquamation. A hemorrhagic nephritis developed, but an ounce of urine was voided within twenty-four hours and on boiling it became consolidated. There was a general edema and edema of the lungs. Was that case one of scarlet fever rather than of diphtheria?

DR. T. B. COOLEY, Detroit: The question has been raised whether there is any possibility of a specific diagnosis of scarlet fever. I want to call attention to Schereschewsky's recent work on a blood reaction in scarlet fever analogous to that observed by himself and Forst in syphilis. This was published in one of the late numbers of the *Münchener medicinische Wochenschrift*, and seems to me promising. Another thing of importance is the observations made in the London fever hospitals on the infectiousness of the later desquamation. They have been releasing patients in the late stages of desquamation, and there has been no increase in the number of "return cases." They lay more stress on the infectiousness of discharge from the nose, throat and ear. It is a question whether desquamation *per se* is ever infectious.

DR. C. G. KERLEY, New York: In reviewing the 515 cases I had no idea of going in detail. I attempted only to give the results in some essential points. As to the late desquamation

not being infectious I made that statement advisedly. Whether it is wise to teach it is another thing. What we all want is the truth. I have repeatedly seen children during the latter stages of desquamation play with their fellows and other unprotected children in their own family, and these unprotected children did not take the disease. There must be some definite time, however, when a child who has had scarlet fever may return to his usual life. It is a safe rule that this time shall be at the completion of the desquamation period. In both of the cases of secondary desquamation in the child referred to, many unprotected children were exposed and not one developed the disease. One of these was in a summer hotel where the child came into contact with dozens of the unprotected children. The determination whether we have a streptococcus or Klebs-Loeffler infection to deal with will not help us very much. Only last year I had two cases of streptococcus membranous laryngitis. Examination of the membrane failed to show the diphtheria bacilli. Three other cases of this nature have been reported. I believe that in all severe cases the non-milk diet is the best one. The diphtheria antitoxin is of value only if there is a Klebs-Loeffler infection. There is absolutely no reason why it should be used under any other conditions.

As to the use of chlorate of potash, the danger from its use has been greatly over-estimated. When used in rational dosage, instead of being of danger to the kidneys I believe that, when there is marked angina, it tends to prevent nephritis. I believe that when we keep the throat as free as possible from infectious material we are doing much to ameliorate the general condition. The throat is unquestionably a distributing center for the contagium and other infections. If chlorate of potash had had the effect on the kidneys that is credited to it, the combination of chlorate of potash and iron used in thousands and thousands of cases of scarlet fever and diphtheria would have resulted in the death of nearly all to whom it was given. The chlorate in small doses, two to four grains at two-hour intervals, six doses in twenty-four hours, whether in measles, scarlet fever or other illnesses, has no more effect in producing nephritis than has diphtheria antitoxin in producing paralysis. As to the use of cold air I did not mean to imply that I undress the child, put him before a window, and let cold air blow on him. Such a procedure is not necessary in order to give the child fresh air.

DR. C. F. WAHRER, Fort Madison, Iowa: No less a man than Senator, of Heidelberg, advised the use of bacon-rind. I would not insist on bacon-rind; in fact, I advise the use of lard, with some mild antiseptic, as boric or salicylic acid, but the bacon-rind is better than nothing. I do not know whether we find more cases of hemorrhagic nephritis following scarlet fever than we do following diphtheria, but I believe that there are. Scarlet fever and diphtheria are very much alike in many respects, and we have many of the same sequelae, so that it is not necessary for the doctor to assume that he had a case of scarlet fever without the eruption. We know that cases of diphtheria, diagnosed by the presence of the Klebs-Loeffler bacillus, have been followed by nephritis.

## CHILDREN OF THE TUBERCULOUS.\*

THEODORE B. SACHS, M.D.

CHICAGO.

A study of autopsy statistics, with reference to occurrence of tuberculous lesions at various periods of human life, discloses a vast discrepancy between the great frequency of postmortem evidence of tubercle infection and the rate of mortality attributable to the disease itself.

The figures drawn from postmortem findings vary according to the source of material, age at death, infer-

\* Read at the Fourth Annual Meeting of the National Association for the Study and Prevention of Tuberculosis, held in Chicago, June 5-7, 1908.