

**Scarlatinal albuminuria and the pre-albuminuric stage, studied by frequent testing / by R. Stevenson Thompson.**

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**Publication/Creation**

London : Adlard, 1886.

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SCARLATINAL ALBUMINURIA, AND THE  
PRE-ALBUMINURIC STAGE,

STUDIED BY FREQUENT TESTING.

BY

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(COMMUNICATED BY DR. W. T. GAIRDNER, GLASGOW.)

Read November 10th, 1885.

[*From Vol. LXIX of the 'Medico-Chirurgical Transactions,' published  
by the Royal Medical and Chirurgical Society of London.*]

LONDON:

PRINTED BY

J. E. ADLARD, BARTHOLOMEW CLOSE.

1886.

R26461

THEORY OF THE EARTH AND ITS HISTORY

BY J. W. G. WILSON, F.R.S.

EDITED BY THE REV. J. W. G. WILSON, F.R.S.

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Received April 11th—Read November 10th, 1885.

I PURPOSE giving in the following paper a detailed account of observations conducted upon 180 consecutive cases of scarlet fever in the wards of the City of Glasgow Fever Hospital. The ages of the patients ranged from two to thirty-five years, the great majority (84 per cent.) being under fifteen years of age. Of the cases examined twelve died from all causes. The period of observation extended over one year (1882-83) and involved the examination of upwards of 35,000 specimens of urine. Three specimens of urine from each case under observation were examined daily from the day of admission till dismissal from hospital. The minimum period of residence imposed by the sanitary authorities was fifty-six days,<sup>1</sup> calcu-

Patients were occasionally dismissed a day or two before the completion of their term, but more frequently they were kept beyond it.

lated from the first appearance of fever. In a few chronic cases the investigations extended over a period of from five to six months. Careful notes of the condition of the urine were made daily till all traces of albumen and blood-colouring matter had disappeared; in one or two instances, however, the patient was dismissed before the return of the urine to its normal condition. The samples were collected at 6 a.m., before breakfast; at 12 noon, just before dinner; and at 8 p.m. In this way the slightest trace of any abnormal constituent could be detected within a few hours of its appearance. Every precaution as regards the cleanliness of vessels was taken to ensure accuracy in the results. To eliminate as fully as practicable errors arising in individual cases from so-called "alimentary" albuminuria, the diet was made uniform for each stage of the disease. The same object was kept in view when the above-mentioned hours were selected for collecting the urine. When thought necessary specimens of urine were examined every three or four hours; such cases were, however, exceptional.

The special interest of the investigation centred round the detection of minute quantities of blood-colouring matter, of albumen, and of organic deposits of renal derivation. For the detection of the first of these I for some time employed both the spectroscope and the guaiacum test, but soon gave up the former on account of the difficulty attending the detection by its means of very minute quantities of blood in turbid urine. The difficulty is not diminished when we turn to the microspectroscope, for although with it a single red corpuscle will give the characteristic bands, yet the time necessarily expended in the search is too great for ordinary purposes. The guaiacum test on the other hand is exceedingly delicate, simple, convenient, and reliable.<sup>1</sup>

<sup>1</sup> The method employed in using the guaiacum test was that usually followed in the Glasgow School of Medicine (see 'Finlayson's Manual') :—To a few drops of urine from the bottom of the urine-glass a drop of tincture of guaiacum is added; ozonic ether is then gradually poured into the tube until

In testing for albumen, nitric acid in the cold was chiefly relied upon on account of its convenience and the rapidity with which a large number of specimens could be tested in a comparatively short time. This test was applied by a pipette very much in the same way as in the case of the picric acid test described below. Before this inquiry was begun I had, while resident assistant in the Glasgow Western Infirmary, had ample opportunities for studying the nitric acid test for albumen and all its well-known fallacies. In cases where there was any doubt the testing was checked by boiling with the after-addition of acetic acid and also by the use of the picric acid test. Of these tests picric acid is the most delicate, and nitric acid in the cold seems to be inferior, as a rule, to the boiling test. The best results were obtained with picric acid when the urine to be tested was allowed to flow from a pipette, the point of which rested on the bottom of a test-tube containing a quantity of a saturated solution of the acid, so that it fell to the bottom without much admixture. The result was confirmed by boiling.

While working at this subject I instituted a series of comparative experiments of specimens of presumably normal urine, and in but few instances did I detect an appearance which could be readily confounded with that caused by albumen; yet it must be confessed that picric acid shares with the other two tests the peculiarity of causing, under certain circumstances, a precipitate (mucin?) very like that due to albumen. In most cases this cloud is at a little distance from the contact-surface, but occasionally the resemblance is so misleading that it might be best to reserve the picric acid test for a confirmation of the other tests or for demonstrating negative results. In certain cases when nitric acid in the cold and the test by boiling failed to detect albumen, picric acid gave the

the precipitate formed by the action of the urine on the guaiacum is completely dissolved. If blood be present a blue colour varying in intensity is developed. This seems to me the most delicate method of using the guaiacum test.

characteristic reaction, and its correctness was in most cases confirmed by evaporating the urine to a small bulk and employing the first two tests when each gave confirmatory results. Throughout the investigations I assumed, in any doubtful case, that albumen was present in a specimen of urine when characteristic appearances were got with all these tests.

I will discuss the subject under the following heads :

I. The period of occurrence of albuminuria in scarlatina.

II. The frequency of albuminuria in scarlatina.

III. The relations which blood and albumen bear to each other in the urine of scarlatinal nephritis.

IV. The so-called "pre-albuminuric stage" in scarlatinal nephritis.

V. Treatment.

## I. PERIOD OF OCCURRENCE.

For purposes of convenience it will be best in discussing this subject to divide the cases into two classes :

1. Cases of what may be called "Initial Albuminuria."
2. Cases of "Late Albuminuria."

Whether these two classes are due to the same pathological changes in the kidney, or whether the first is due to the primary febrile disturbance, and the second to recognisable, though it may be minute, vascular and cellular changes in the kidney, is a subject which, should opportunity offer, I hope to investigate further. In the meantime the various periods at which this complication of scarlet fever most frequently occurs will occupy our attention.

1. In the first class are included all those cases in which albumen was detected in the course of the first week of the illness ; in the second those in which it appeared at a later period, after the primary scarlatinal symptoms had begun to subside. This subdivision is justifiable on the

ground that patients with scarlet fever frequently suffer from two attacks of albuminuria, separated by a well-marked interval. No hard and fast line can be drawn between these two classes of cases, and it must be confessed that the distinction as regards their exact period of occurrence is arbitrary. My object in drawing the distinction is to emphasize the frequent occurrence of an interval between the two.

*Table showing Duration of the Interval between "Initial" and "Late" Albuminuria.*

Number of case in table.	Interval between "Initial" and "Late" albuminuria.	Number of case in table.	Interval between "Initial" and "Late" albuminuria.
No. 10 ...	Days 3 (5th—9th)	No. 20 ...	Days 5 (7th—11th)
„ 11 ...	„ 10 (8th—18th)	„ 21 ...	„ 3 (6th—9th)
„ 12 ...	„ 8 (7th—15th)	„ 22 ...	„ 25 (6th—31st)
„ 13 ...	„ 4 (6th—10th)	„ 23 ...	„ 3 (8th—11th)
„ 14 ...	„ 9 (7th—16th)	„ 24 ...	„ 8 (7th—15th)
„ 15 ...	„ 3 (9th—12th)	„ 25 ...	„ 20 (3rd—23rd)
„ 16 ...	„ 17 (5th—22nd)	„ 26 ...	„ 12 (5th—19th)
„ 17 ...	„ 4 (8th—12th)	„ 27 ...	„ 12 (9th—21st)
„ 18 ...	„ 8 (7th—15th)	„ 28 ...	„ 15 (4th—19th)
„ 19 ...	„ 6 (4th—10th)	„ 29 ...	„ 5 (9th—14th)

Of cases of "Initial" albuminuria I have no fewer than 40 to record out of a total of 112 cases of albuminuria of all kinds in 180 cases of scarlatina. These cases again admit of subdivision into three classes :

A. Cases running on to "Late" albuminuria without a break—9 cases. (See table, p. 20, Nos. 1—9 inclusive.)

B. Cases followed by "Late" albuminuria after a variable interval—21 cases. (See table, p. 20, Nos. 10—30 inclusive.)

C. Cases not followed by "Late" albuminuria—10 cases. (See table, p. 22, Nos. 31—40 inclusive.)

"Initial" albuminuria does not of itself seem to be a cause for great anxiety, even when the urine is for the first few days loaded with albumen and blood. It is only when it shows a tendency to join hands with "Late" albuminuria that it becomes serious, and it is only then

that one would be inclined to take into consideration the possibility of its bringing about of itself a fatal result. Cases of malignant scarlet fever are no doubt almost invariably complicated with nephritis, and the blood and albumen may be even very abundant, yet the nephritis appears to take a very subordinate part, in comparison with many of the other lesions, in bringing about a fatal termination. I have seen only one case of malignant scarlatina without accompanying albuminuria. This case was peculiar in other respects, and will be noticed later on. (See "Dropsy without Albuminuria;" p. 10.)

Nine out of the 40 cases of "Initial" albuminuria ran on without intermission to "Late" albuminuria. These were all more or less severe, like those of the next class, and in one of the latter the last traces of albumen had not disappeared on the 140th day.

In 21 cases "Late" albuminuria followed after an interval of some days, during which the urine was quite free from albumen or blood.

In 10 cases the "Initial" albuminuria passed off completely, the patient showing no further sign of nephritis after the ninth day of the fever.

2. "Late" albuminuria may come on at any time between the ninth and forty-eighth day, but is much more common at certain periods in the course of the fever than at others, and seems to have a preference for the beginning of the second, third, and, in a less degree, the sixth week.

*Table showing the Number of Cases of "Late" Albuminuria, not preceded by "Initial" Albuminuria, occurring at Various Dates of the Fever.*

Day of illness.	Number of cases occurring at given date of fever.		Day of illness.	Number of cases occurring at given date of fever.	
9th	...	5	15th	...	9
10th	...	4	16th	...	5
11th	...	1	17th	...	6
12th	...	4	18th	...	1
13th	...	3	19th	...	2
14th	...	5	20th	...	1

Day of illness.	Number of cases occurring at given date of fever.		Day of illness.	Number of cases occurring at given date of fever.	
21st	...	2	32nd	...	3
22nd	...	2	35th	...	3
23rd	...	1	36th	...	2
24th	...	1	37th	...	1
25th	...	2	39th	...	1
26th	...	1	40th	...	1
27th	...	1	46th	...	1
29th	...	1	47th	...	1
30th	...	1	48th	...	1
31st	...	1			

*Table showing the Number of Cases of "Late" Albuminuria, preceded by "Initial" Albuminuria (with an interval between) occurring at Various Dates of the Fever.*

Day of illness.	Number of cases occurring at given date of fever.		Day of illness.	Number of cases occurring at given date of fever.	
9th	...	2	18th	...	1
10th	...	2	19th	...	2
11th	...	2	21st	...	1
12th	...	2	22nd	...	1
14th	...	1	23rd	...	1
15th	...	3	31st	...	1
16th	...	1			

It will be observed that the numbers cluster about the ninth and fifteenth days. Cases arising at these periods seem the most characteristic, the albuminuria running a course usually of some length and often of great severity. Albuminuria occurring at other periods would appear to last, at most only a few days, and now and again its presence is shown merely as an occasional trace of albumen in the urine.

*Illustrations of Very Slight and Transient Albumen or Blood in Urine.*

Number on table.	Day of fever.	Total duration of albumen or blood.
46	21st	Trace on one occasion.
102	22nd and 23rd	On two days only.
82	27th	Trace on one occasion.
54	29th till 53rd	Trace occasionally.
76	31st till 33rd	Trace for three days.
87	40th and 46th	Trace on two occasions.

## II. FREQUENCY.

Of the 180 cases examined 112 or 63·2 per cent., showed signs of renal affection by the presence of albumen or hæmoglobin *i. e.* blood, in the urine, with or without dropsy, as the case might be. In some cases, however, the evidence of kidney mischief was so slight and evanescent that but for careful and frequent testing the presence of these substances would no doubt have been overlooked.

Two cases, or 1·1 per cent. in the 180, presented *anasarca*, *without albumen* showing itself in the urine. Sixty-six cases, or only 36·7 per cent. of the whole, escaped entirely.

Of the 112 cases of nephritis 55, or 49·1 per cent., were cases of pure albuminuria, while 57, or 50·9 per cent., came under the class hæmaturia.

Anasarca was observed in only 24 of the 180 cases examined. Of these, 22 suffered from very decided albuminuria, while the urine of the remaining 2 cases did not at any time show the slightest trace of albumen or blood, though these were sought for with the greatest care.

It is perhaps unnecessary to point out that 180 cases form far too narrow a foundation on which to base conclusions as to the probable frequency of the renal affection in any given epidemic of scarlet fever. The above statistics can therefore apply only to that group of cases upon which the investigations were conducted.

## III. RELATIONS WHICH BLOOD AND ALBUMEN BEAR TO EACH OTHER IN THE URINE OF SCARLATINAL NEPHRITIS; AND DROPSY WITHOUT ALBUMINURIA.

The abnormal constituents present in the urine of scarlatina patients are not the same in every case. The presence of albumen is of course the principal evidence of

renal disease ; but in many cases hæmoglobin is added in varying proportions ; and in a few of these last, albumen is *apparently* absent altogether. From this point of view I would subdivide all cases of scarlatinal nephritis as follows :

1. Those cases in which there is albumen from beginning to end without there being at any time the slightest trace of blood-colouring matter in the urine : 55 cases, or 49·1 per cent. (See in table on p. 20 all cases except those referred to in the following two classes.)

2. Those in which blood only seems to be present, and in which the albumen and blood-colouring matter increase and diminish in quantity *pari passu*, so that these constituents seem to be in the same relative proportion as in blood itself. It is in this class of cases that we sometimes find what has been called a "pre-albuminuric stage," and in which there sometimes also exists what might with equal propriety be called a "post-albuminuric stage : " 28 cases, or 25 per cent. (Nos. 16, 20, 22, 27, 40, 41, 42, 43, 44, 45, 55, 56, 58, 64, 65, 70?, 76, 77, 79, 83, 86, 90, 92, 94, 96, 99, 101, 103).

3. Those in which we have blood, as in the last class, but in which there is an excess of albumen in addition to that due to the blood. In this class of cases there is no "pre-albuminuric" and usually no "post-albuminuric stage." In a few of the cases which I have included in this class, the excess of albumen seems to disappear, leaving some blood lingering behind, and so giving rise to a "post-albuminuric stage," but in the majority of the cases the albumen appears before, or simultaneously with, the blood-colouring matter, and continues in appreciable quantity after all trace of hæmoglobin has disappeared from the urine : 29 cases, or 25·9 per cent. (Nos. 1, 4, 7, 10, 12, 15, 17, 21, 26, 28, 29, 49, 50, 60?, 61, 62, 63, 69, 71, 73, 78, 81, 88, 95, 98, 100, 104, 106, 108).

There is a group of cases (Nos. 40—45) which at first sight one would be inclined to place together as a fourth class. I refer to those in which hæmoglobin is detected by

the guaiacum test but in which albumen cannot be found in any stage by the ordinary methods of testing. The difference between these cases and those I have grouped above as Class 2 is only apparent, and in every case albumen can be detected by appropriate means. The majority present only an occasional trace of hæmoglobin, and it is only after careful concentration of the urine to a very small bulk that albumen can be demonstrated. Sometimes a trace of hæmoglobin can be detected over a period of several days, but my experience has not furnished me with a single case of true hæmoglobinuria, *i. e.* of a urine with a quantity of hæmoglobin without any blood-corpuscles, although in one or two cases a deceptive resemblance to this was caused by the presence of a small quantity of blood in a highly-coloured urine.

#### DROPSY WITHOUT ALBUMINURIA.

It is well known that some curious cases of scarlet fever occur, in which œdema of certain parts of the body is found, while no evidence of kidney mischief can be detected on examining the urine. Of such cases I have seen only two in which the swelling was at all well marked. One of these was a boy, four years of age, who was admitted to the hospital with measles. From this he was making a good recovery, when he was attacked with scarlet fever of a most malignant type, from which he died after an illness of only a few days. Two days before death the face, limbs, and trunk, presented very considerable swelling. Not a trace of albumen or blood was found in the urine, although these were very carefully and frequently tested for. The urine was scanty, high coloured, turbid and loaded with urates. There was no post-mortem examination. The second case presented very decided swelling of the face and legs, commencing on the ninth day, and lasting for from five to six days; yet the most careful testing of the urine failed to reveal the minutest trace of

albumen or blood. The patient made a good recovery, and in fact this complication seemed to cause no inconvenience whatever. Although these are the only two cases I have seen in which there could be no doubt about the existence of œdema without albuminuria, I am inclined to believe that slighter cases of the same kind are not uncommon. I have frequently seen, or perhaps I should say suspected, puffiness of the face during convalescence from scarlatina, but so slight that two observers might probably have differed about its presence. In these cases there was, of course, no albuminuria to assist in coming to a conclusion on this point.

Leaving out of sight the first case quoted, in which the alteration in the constitution of the blood, caused by an overwhelming dose of scarlatinal poison, might have been the cause of death, almost all such cases seem to make a good recovery,<sup>1</sup> *i. e.* the attack of nephritis (if the œdema be due to this) is very slight. Everyone who makes a practice of examining the urine of scarlatinal patients, even once a day, is familiar with the fact that now and then the detection of albumen in the urine is preceded, often for a day or more, by the occurrence of œdema,—of the face more particularly. If at this point the nephritis become arrested we have a case of “dropsy without albuminuria.” Nephritis without albuminuria is an uncommon condition, yet one of the existence of which there can be no doubt, and it would seem very reasonable to look upon cases of dropsy without albuminuria as simply slight cases of nephritis which have rapidly resolved, just as occurs in so many cases where the nephritis is characterised by mere traces of albumen and no dropsy. This is the more probable since we are aware that albuminuria is by no means the earliest sign of nephritis, the first rise in arterial pressure revealed by the sphygmograph preceding it, in some cases, often by a considerable interval. It is very probable that the vessels of some individuals are predisposed to permit exudation of their contained fluids into the cellular

<sup>1</sup> ‘Niemeyer’s Practical Medicine,’ Art. “Scarlatina.”

tissue on the slightest irritation by the uræmic poison, and it may be in some such manner as this that dropsy without albuminuria is produced.

IV. It will be convenient at this point to discuss the phenomena of the so-called "PRE-ALBUMINURIC STAGE." By this term I understand that what is usually meant is a stage in nephritis characterised by increased vascular tension and, as a result, the presence of blood crystalloids in the urine *before* albumen makes its appearance. The present investigations would lead me to the opinion that such a stage does not really exist, in so far at least, as the absence of albumen in the earliest stages of the nephritis is concerned. I greatly regret the loss of a number of pulse tracings which I made and of which I am unable to give copies; what was observed would lead me to agree with those who maintain the existence of a very early stage in this affection, characterised by the arterial pressure rising steadily for a period of twenty-four hours or more before *anything abnormal* can be discovered by an examination of the *urine*. I cannot therefore see my way to recognise the existence of a "pre-albuminuric stage" characterised by a rise in the blood pressure, that rise in pressure being accompanied or followed by the presence of hæmoglobin in the urine before albumen can be detected. As my table at the end of the paper shows, only ten of all the cases of nephritis observed had a "pre-albuminuric stage" within the latter meaning, whereas most cases I have observed present a rise in blood pressure before albumen or blood appears. In short, there is a "pre-albuminuric stage" in which the blood pressure rises, and this seems to exist indifferently, whether the case subsequently becomes one of albuminuria pure and simple or one of hæmaturia, and this even when the attack is mild. This fact alone is, I think, quite sufficient to lead us to reject the theory that albuminuria in its earliest stage is to be accounted for by the increase in blood pressure alone, and that this stage is characterised by the presence of blood crystalloids. It seems to me much more reasonable to look upon the rise

in the blood pressure as a secondary phenomenon, perhaps due to inefficient innervation of the vascular system, and to regard the extravasations found in the tissues of scarlatinal patients as a result of degeneration of the capillaries and smaller vessels. As above mentioned, only ten of all the cases of nephritis examined showed traces of hæmoglobin *before* albumen could be detected by the ordinary methods. I say by the ordinary methods, for that albumen is present in the urine along with the first traces of hæmoglobin I shall now endeavour to show. If the urine of the so-called "pre-albuminuric stage" of Mahomed<sup>1</sup> be rapidly evaporated in a current of cold, dry air, then filtered and tested, 1st with nitric acid in the cold, 2nd by boiling, and 3rd with picric acid as previously described, in almost all cases the characteristic reaction of albumen will be obtained. In one or two cases where nitric acid failed, after evaporation, to give the usual ring, the presence of albumen was indicated by the boiling and picric acid tests. In one or two cases, picric acid indicated a trace of albumen, while nitric acid and boiling failed to demonstrate its presence even after concentration. In these cases, however, the quantity of urine available for examination was limited, and I am confident that if the evaporation had been carried further the urine would have given characteristic reactions with all three tests. I am of opinion that if a test could be found for albumen as delicate as guaiacum is for blood, the former substance would be invariably detected in the urine of the "pre-albuminuric stage," without any concentration. This opinion is further justified by the existence of what might be called a "post-albuminuric stage." This condition was found in twenty of the patients examined. In these cases traces of blood-colouring matter were detected in the urine, long after all traces of albumen had ceased to be detected by ordinary means. In one or two cases this stage extended over a period of nearly two months, the quantity of hæmoglobin varying from time to time ; but it was always noticed that

<sup>1</sup> "Ætiology of Bright's Disease," 'Medico-Chirurg. Trans.,' vol. lvii.

when the quantity of hæmoglobin increased beyond a trace, albumen put in an appearance with the ordinary tests, thus indicating that it had probably been there all along. This stage I regard as entirely analogous to the "pre-albuminuric stage." The apparent absence of albumen in the "pre-albuminuric" and "post-albuminuric" stage is paralleled by what is often seen on examining the urine of menstruating women and by what one finds on direct experiment. From observations conducted upon a number of women whose urine was tested several times daily with great regularity, it was found that in some of the cases, at the menstrual periods, the guaiacum test revealed the presence of blood before nitric acid indicated the presence of albumen. The same peculiarity was observed as the menstrual flow was passing off. There can be no doubt that in the urine of these women albumen as well as hæmoglobin was present, the blood being altered in some of its properties, yet containing these two constituents. It cannot be doubted, I think, that the urine contained blood pure and simple, and yet only hæmoglobin could be detected by the guaiacum test, while nitric acid failed to give any reaction at all. On concentration of the urine albumen was found. The same conclusion is proved by the following experiment: If a drop of fluid blood be placed in a conical glass and normal urine gradually added, as dilution goes on albumen will be found to cease to give a reaction with nitric acid some time before the guaiacum test ceases to react with the hæmoglobin, it being understood that the mixture is allowed to rest after each dilution and that the urine to be tested for hæmoglobin is taken from the bottom of the glass. This early apparent disappearance of the albumen is what one would naturally expect, even if the nitric acid and guaiacum tests were equally delicate; for, while the albumen is dissolved and diffused throughout the fluid, the corpuscles containing the colouring matter (hæmoglobin) sink to the bottom, only a small quantity of the hæmoglobin being dissolved out by the urine. To my thinking, the facts noted above

are pretty strong evidence in favour of the existence of traces of blood pure and simple in the so-called "pre-albuminuric" and "post-albuminuric" stages, even if the presence of albumen had not been demonstrated by the method of concentration.

The next point of inquiry is as to the sediments present in the urine of the "pre-albuminuric stage." The sediment of urine passed during this stage contains both blood-corpuscles and tube-casts. In the first place the presence of corpuscles is to be expected where we have both albumen and hæmoglobin. The actual presence of corpuscles, however, is not so easy to determine by the microscope, and this is not to be wondered at when we remember that a very considerable quantity of urine of the "pre-albuminuric stage" is necessary sometimes to give the reaction with guaiacum in spite of the great delicacy of that test. It is often trying to one's patience to have to search through two or three drachms of urine, drop by drop, for corpuscles, and the difficulty is increased by the fact that if the urine be allowed to settle for too long a period, the corpuscles become altered, sometimes almost beyond recognition; yet even in these cases I have usually found a patient search rewarded by the discovery of red corpuscles, in sufficient numbers to account for the sediment reacting with guaiacum, without having to assume the presence of dissolved hæmoglobin. If such urine be repeatedly filtered through a thick layer of cotton wool and then allowed to settle, it will be found that the urine from the bottom of the glass has ceased to react with guaiacum, while the cotton wool used as the filtering medium gives the characteristic reaction, *i. e.* the cotton has separated the solid corpuscles from the fluid portion of the urine.

The following experiments indicate that the colouring matter is chiefly contained in the first instance within some protective covering, such as a cell wall or protoplasmic mass, and is only slightly in solution shortly after the urine has been passed. If urine from a case such as

we are now considering be put into a test-tube and a little of it examined, the same quantity of hæmoglobin will be found at whatever depth the urine may be taken from. If the tube be now allowed to stand for some time and the urine be again tested, the examination being conducted at different levels, it will be found that the upper layers give a less decided reaction than the lower, and that the depth of the blue colour increases as we approach the bottom, the quantities of urine and reagents being the same in each experiment. This would seem to indicate that the colouring matter is solid or of greater specific gravity than the fluid. If now the tube be shaken up every hour for a period of ten or twelve hours, and then be allowed to settle over night, it will be found that the upper layers give a reaction with guaiacum which is much more decided than that obtained with the same reagent after the urine has merely been allowed to stand for the same length of time. This seems to show that corpuscles contain the colouring matter, that these first of all settle gradually towards the bottom of the vessel, and that after a time a great part of the hæmoglobin is dissolved out, and diffuses itself throughout the fluid.

Of the many sediments besides blood-corpuscles found in the urine of scarlatinal patients, we are interested mainly in tube-casts. These I observed only three or four times in the urine passed in the "pre-albuminuric stage." They were mostly epithelial in character, and were noticed usually only a few hours before the time at which albumen was first detected. In one case tube-casts (epithelial and blood) were found very abundant in the urine six days before the detection of albumen by the usual methods. During this period guaiacum indicated the presence of blood, and white and red corpuscles were detected microscopically. In this case there was no history of previous kidney mischief.

## V. TREATMENT.

To this I shall refer very briefly. I have not been able to satisfy myself that the action of purgatives is really specific in preventing the occurrence of albuminuria. Almost every case admitted to my wards had castor oil administered every third day, so that the bowels were kept moderately free, and yet albuminuria occurred in a large proportion of the cases. Some of these were very severe, and in a few death resulted. One may be misled in regard to the efficacy of purgatives by the occurrence of what is not uncommon in scarlet fever, viz. the appearance of blood or albumen for perhaps only a few hours, which disappears without any treatment whatever. If purgatives have been used in such cases one would be apt to refer to the action of the medicine what is really part of the natural course of the disease.

Warmth and rest seem, after all, the most efficient guards against albuminuria, although these frequently fail in their object.<sup>1</sup>

I may mention here that I was in the habit of confining my patients to bed during the first four weeks of the fever, and that they were not allowed to leave the ward till a week later. By confining the diet to milk and farinacea during the first two or three weeks of the scarlatina, and allowing beef broths, &c., only when convalescence began to be established, I attempted to ward off nephritis. In thirty cases milk and farinacea were continued till the middle of the fifth week, yet nine of these cases showed signs of albuminuria; in most cases these were slight, one only being a well-marked case of scarlatinal dropsy. Whether this diminished percentage of albuminuria was due to the mild nature of the diet, or to accident, all the cases having occurred in early autumn,

<sup>1</sup> The temperature of the wards, built on the pavilion system with efficient through and roof ventilation, was maintained as near 60° Fahr. as possible.

I cannot say. The converse of this experiment I did not care to try.

After albuminuria has attacked a patient the usual treatment with purgatives and packs seems very effective in most cases.

Convulsions are best combated by chloral and chloroform, but these agents can check only the more urgent symptoms and afford time for more routine remedies to act. Benzoic acid in large doses (twenty grains every two hours) seemed to have a powerful influence, at least in some cases, in preventing the occurrence of convulsions.

In recapitulation I would recall the following points :

I. All cases of scarlatinal albuminuria may be subdivided into :

(a) "Initial" albuminuria.

(b) "Late" albuminuria.

This distinction is to some extent arbitrary, but the actual conditions found in many cases seem to justify it.

II. All cases may be subdivided into three classes :

(a) Cases of simple albuminuria.

(b) Cases of simple hæmaturia.

(c) Cases in which there are both blood and albumen, but in which albumen is in excess.

III. There is no condition of the urine which justifies the use of such a phrase as "pre-albuminuric stage." If such a term is to be used at all it should refer to the condition of the vascular system only.

IV. Lastly, red and white corpuscles and tube-casts are commonly found in the urine during the so-called "pre-albuminuric stage."

(For a report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' New Series, vol. ii, p. 11.)

TABLE

*Giving details of Observations made upon the Urine  
of 112 Cases of Scarlatinal Nephritis.*

TABLE GIVING DETAILS OF OBSERVATIONS MADE

Min. tr. = minute trace; tr. = trace; dist. = distinct; con. = considerable; ab from one date to another; (a.m.) or (p.m.) added to a date indicates that the albumen was detected at that time; otherwise it was present at some other time.

## A. Cases of "Initial Albuminuria"

No. of case.	Date of admission.	Age.	Sex.	Day of illness.		Periods at which albumen was detected. Number of illness. Abbreviations as above.
				Adm.	Dism.	
1	Dec. 15	22	F.	2nd	54th	4th tr., 5th abdt., 6th—10th tr., 41st tr.
2	Dec. 26	7	F.	5th	90th	8th (a.m.)—70th varying from tr. to con.
3	Jan. 23	6	F.	3rd	60th	5th (p.m.)—14th (a.m.) tr.—dist.
4	Jan. 30	3	F.	7th	64th	8th (a.m.) min. tr., 9th (p.m.) dist. 10th, 11th, 36th (a.m.)—38th (a.m.) tr., 58th (p.m.) tr.
5	Feb. 3	11	F.	5th	59th	5th—10th con., 35th (p.m.)—41st (a.m.) 50th, 52nd tr.
6	Feb. 7	5	F.	2nd	54th	4th (a.m.)—32nd (p.m.) varying from tr.—con.
7	Jan. 23	4	F.	1st	57th	7th (p.m.), 9th (a.m.) dist., 10th (a.m.)—14th (p.m.), 21st (p.m.), 24th (p.m.), 27th (a.m.), 32nd (p.m.), 33rd (p.m.), 34th (p.m.), 36th, 37th, 39th (p.m.) tr.
8	Apr. 5	4	F.	2nd	81st	3rd (p.m.), 4th (p.m.), 8th (p.m.), 11th (a.m.), (p.m.), 18th (p.m.) tr.
9	Apr. 16	6	M.	3rd	16th	4th—8th (p.m.) tr., 8th (p.m.)—13th dist.

## B. Cases of "Initial Albuminuria" following

10	Aug. 17	6	M.	5th	54th	5th abdt., 9th (p.m.)—29th tr.—abdt.
11	Nov. 10	3	F.	3rd	24th	8th tr., 18th—21st con., 22nd—24th tr.
12	Dec. 12	10	M.	6th	60th	7th (a.m.) tr., 15th (a.m.) dist., 39th (p.m.) tr.
13	Jan. 23	30	F.	2nd	56th	6th (a.m.), 10th (a.m.) tr.
14	Jan. 23	6	F.	3rd	66th	3rd—7th con., 16th (a.m.) tr., 18th (a.m.) tr., 22nd tr., 25th, 26th (a.m.) tr., 34th (a.m.) tr., 48th (p.m.) min. tr.—dist.
15	Jan. 23	8	F.	3rd	66th	4th—9th (p.m.) tr., 12th (a.m.), 13th (a.m.), (p.m.), 18th (p.m.), 21st (p.m.) tr., 23rd (p.m.) tr., 51st (p.m.) tr.
16	Feb. 21	22	M.	2nd	84th	3rd, 4th, 5th dist., 22nd—38th tr.—dist.
17	Mar. 2	6	M.	5th	57th	6th—8th dist., 12th (p.m.) dist.
18	Mar. 3	19	F.	6th	55th	6th, 7th tr., 15th (p.m.) con., 27th tr., 28th tr.
19	Mar. 15	4	M.	3rd	60th	4th (p.m.), 10th (a.m.) min. tr., 13th—19th tr.—dist.
20	Mar. 26	7	M.	21st	94th	3rd—7th tr., 11th (a.m.), 13th (a.m.) min. tr., 22nd (a.m.)—24th dist.

# LINE OF 112 CASES OF SCARLATINAL NEPHRITIS.

oc. = occasional; in. = initial. A dash — indicates continuance of the albumen found in the morning or evening sample of that day as the case may be; see testings.

## on to "Late Albuminuria."

Albumen detected, per day of sickness.	Duration of nephritis.	"Pre-albu- minuric stage."	"Post-albu- minuric stage."	Dropsy.	Result.	Remarks.
Dist.	5 days	None	None	Con.	Well	
None	62 days	None	None	Con.	Well	
None	9 days	None	None	None	Well	
(p.m.) tr.	4 days oc. tr.	None	None	None	Well	
None	5 days and oc. tr.	None	None	None	Well	
None	28 days	None	None	None	Well	
(a.m.) min. tr., (p.m.), 36th	8 days and oc. tr.	None	None	None	Well	
Dist., 37th						
39th (p.m.), (a.m.) tr.						
None	Oc. tr.	None	None	None	Well	
None	9 days (?)	None	None	None	Died	

## "Albuminuria" after a varying interval.

(9th—24th)	Date 20 days	None	None	Dist.	Well	
Dist.						
None	7 days	None	None	None	Died	
(a.m.) tr.	Oc. tr.	None	None	None	Well	
None	Tr. on 2 oc.	None	None	None	Well	
None	32 days	None	None	None	Well	
	Init. 5 days					
(a.m.)—48th	41 days, in.	None	None	Con.	Well	
(p.m.) tr.	5 days					
Dist. tr.—dist.	58 days, in.	None	52 days	None	Well	
	3 days					
(a.m.) con.	3 days	None	None	None	Well	
None	In. 2 days, oc. tr.	None	—	None	Well	
None	7 days and oc. tr.	None	None	None	Well	
From 3rd— 4th min. tr.	43 days	None	21 days	None	Well	Long "post-albu- minuric stage." Long - continued presence of hæmo- globin and occa- sional alb.

No. of case.	Date of admission.	Age.	Sex.	Day of illness.		Periods at which albumen was detected. Number of illness. Abbreviations as above.
				Adm.	Dism.	
21	April 5	22	F.	2nd	57th	3rd—6th dist., 9th (a.m.) min. tr., 22nd—dist.
22	April 17	19	M.	2nd	150th	2nd—6th tr., 31st (a.m.) min. tr., 56th min. 57th dist., 58th—63rd dist.
23	May 2	6	F.	1st	54th	7th (a.m.), 8th (p.m.) tr., 11th (p.m.)—15th (tr., 17th (p.m.) tr., 18th (p.m.) tr., 36th (—46th (p.m.) tr.—dist.
24	May 6	6	F.	6th	26th	6th and 7th tr., 15th (p.m.)—20th (a.m.) tr.—
25	May 11	11	F.	3rd	57th	3rd tr., 23rd (a.m.) dist., 28th (p.m.), 29th (dist., 34th (p.m.) con., 36th (a.m.) min. tr., (p.m.)—53rd (p.m.) tr.—dist.
26	June 30	15	M.	1st	?	1st, 2nd dist., 3rd min. tr., 5th (a.m.) min. 19th—84th dist.—abdt.
27	July 2	35	M.	5th	56th	5th—9th tr.—dist., 21st (p.m.) tr., 23rd (p.m.)
28	July 2	26	M.	4th	66th	4th (p.m.) tr., 19th (p.m.)—40th (p.m.) con.—41st—52nd tr., 64th (p.m.) min. tr.
29	Aug. 22	18	F.	5th	?	5th (p.m.)—9th (a.m.) tr., 14th, 15th tr., 16 41st tr.—dist.
30	Feb. 1	7	M.	21st	94th	3rd—7th tr., 11th (a.m.), 13th (a.m.) min. tr., (a.m.), 24th (a.m.) dist.

## c. Cases of "Initial Albuminuria"

31	Dec. 26	16	F.	?	?	7th (p.m.) dist., 8th (a.m.) and (p.m.) tr.
32	Jan. 29	22	F.	3rd	62nd	4th—6th (p.m.) dist., 7th (a.m.) tr.
33	Feb. 21	27	M.	4th	54th	4th—8th dist.
34	April 25	7	M.	3rd	55th	8th (a.m.) min. tr.
35	June 7	35	F.	6th	57th	7th (a.m.) tr.
36	June 28	27	M.	4th	55th	4th con., 5th tr.
37	July 2	13	F.	5th	56th	7th—9th tr.
38	July 4	26	F.	2nd	56th	2nd—5th tr.—con.
39	Aug. 14	3½	M.	5th	56th	7th (p.m.) tr., 8th (a.m.) tr.
40	Aug. 28	28	F.	2nd	55th	2nd con., 3rd dist., 4th (a.m.) tr.

## D. Cases of Hæmoglobinuria

41	Dec. 9	2	F.	10th	65th	None
42	Feb. 21	9	M.	10th	62nd	None
43	March 1	62	F.	14th	56th	None
44	April 24	6	F.	3rd	53rd	None
45	June 21	8	M.	7th	62nd	None
46	June 21	11	F.	5th	59th	None

Albumin detected, per day of sickness.	Duration of nephritis.	"Pre-albu- minuric stage."	"Post-albu- minuric stage."	Dropsy.	Result.	Remarks.
(a.m.) tr.	4 days, in. 4 days	None	None	None	Well	
dist., 3rd 57th (a.m.) 57th — 65th dist., 66th—	103 days	None	43 days	Con.	Well	
None	10 days and oc. tr.	None	None	None	Well	
None	5 days, in. 22 days	None	None	None	Died	
None	20 days and oc. tr.	None	None	None	Well	
With min. tr. abdt.	61 days, in. 5 days	None	None	Con.	Well	Case sent to country.
(a.m.)—24th (a.m.) tr.	4 days	None	24 hours	None	Well	
66th (p.m.) —con.	47 days	None	14 days	None	Well	
With tr., 14— tr.—dist.	36 days	None	None	None	Well	
1st dist.—tr., amin. tr.	43 days	None	25 days	Slight	Well	

*Followed by "Late Albuminuria."*

None	2—3 days	None	None	Dist.	Died	Malignant.
None	4 days	None	None	None	Well	
None	5 days	None	None	None	Well	
None	—	None	None	None	Well	
None	—	None	None	None	Well	
None	2 days	None	None	None	Well	
None	3 days	None	None	None	Well	
None	4 days	None	None	None	Well	
None	2 days	None	None	None	Well	
None	3 days	None	None	None	Well	

*Without obvious Albumen.*

—dist.	—	None	None	None	Well	No albumen detected till urine concen- trated.
	—	None	None	None	Well	
	—	None	None	None	Well	
(a.m.) tr., 18th dist., 18th	40 hours	None	None	None	Well	
min. tr. (a.m.), min.	—	None	None	None	Well	
(.) tr.	—	None	None	None	Well	

No. of case.	Date of admission.	Age.	Sex.	Day of illness.		Periods at which albumen was detected. Number day of illness. Abbreviations as above.
				Adm.	Dism.	
47	Nov. 10	9	F.	4th	61st	35th, 37th, 40th, 42nd, 47th, 49th, 55th (a.m.), 51st, 52nd, 53rd, 55th (p.m.), 56th, 59th, 61st
48	Nov. 13	10	F.	11th	62nd	32nd—39th tr.
49	Nov. 17	7	F.	1st	57th	39th tr.
50	Nov. 17	7	M.	4th	57th	12th—16th, 20th, 22nd, 23rd, 24th, 27th, 3 tr., on other days from 12th till 30th dist.
51	Nov. 22	12	M.	3rd	56th	17th, 23rd, 24th min. tr.
52	Nov. 23	6	M.	7th	56th	14th tr.
53	Nov. 28	9	F.	7th	56th	19th (p.m.) and 31st (a.m.) tr.
54	Nov. 28	8	F.	7th	59th	29th (p.m.), 35th (a.m.), 42nd (p.m.), 43rd (a.m.), 46th tr., 50th (p.m.), 53rd (p.m.) tr.
55	Nov. 29	22	M.	3rd	76th	32nd (p.m.) tr., 33rd abdt., 34th—38th vary., 3 tr., 38th till 42nd vary., 47th—76th vary.
56	Dec. 2	11	M.	2nd	142nd	16th (p.m.) tr., then abdt. till 77, then oc. 101st
57	Dec. 2	23	M.	7th	162nd	20th tr., 21st—48th abdt., 49th—57th dist., 5 tr., 58th—64th con., 65th—84th dist., 85th—162nd
58	Dec. 6	12	M.	4th	54th	37th (a.m.), 40th, 41st, 43rd (a.m.) tr.
59	Dec. 6	11	F.	6th	58th	16th (p.m.) dist.
60	Dec. 7	3	M.	6th	17th	15th (a.m.) tr., 15th (p.m.) till end con.
61	Dec. 7	5	M.	4th	56th	36th (p.m.) dist., 40th (a.m.) dist., 42nd (a.m.)
62	Dec. 8	10	M.	4th	82nd	36th (p.m.)—73rd (p.m.) tr. to dist.
63	Dec. 8	5	M.	5th	75th	35th (a.m.), 49th, 52nd, 54th, 58, 59th (p.m.) dist.
64	Dec. 10	20	F.	4th	55th	15th (a.m.) tr., 34th (p.m.) tr., 35th (p.m.) dist., 37th (p.m.) dist., 38th (a.m.) dist., 46th (p.m.) dist.
65	Dec. 12	3	F.	14th	68th	15th (a.m.) tr., 22nd (p.m.) con., 23rd (a.m.) dist., 37th (a.m.) dist., 39th (p.m.) tr., 45th (a.m.) dist., 52 (p.m.) tr.
66	Dec. 12	6	M.	Weeks 1½	31st	16th till end abdt.

by classified.

globin detected, number day of illness.	Duration of nephritis.	"Pre-albu- minuric stage."	"Post-albu- minuric stage."	Dropsy.	Result.	Remarks.
None	26 days	None	None	None	Well	Albumen occurred only 8 p.m., except when noted.
None	2 oc. tr.	None	None	None	Well	Traces morning.
None	Once tr.	None	None	None	Well	
83th, 29th, 30th, tr., 35th tr.	19 days	None	1 day on 35 tr.	None	Well	Albumen all at night.
226th tr.	Thrice tr.	None	None	None	Well	Albumen all at night.
None	Once tr.	None	None	None	Well	
None	Twice tr.	None	None	None	Well	
None	Occasionally	None	None	None	Well	
None	44 days	None	None	None	Well	
tr. and dist., till 77th abdt.	122 days	36 hours	36 days	Con.	Well	During "post-albu- minuric stage"
con., 77th— tr.	minute traces of albumen were observed occasionally. Duration of "post-albuminuric stage" uncertain, patient being dismissed with trace of blood.					
(a.m.) — 21st tr., 22nd —44th abdt., —75th dist., —162nd tr.	142 days	24 hours	24 hours dismissed with tr. of blood	Con.	—	
None	Oc. tr.	None	None	Slight 25th day	Well	
(p.m.) dist., th (a.m.) tr.	Once tr.	None	12 hours	None	Well	
None	3 days	None	None	Abdt.	Died	Malignant.
30, 20th dist.	Oc. tr.	None	None	None	Well	Blood and albumen to usual tests appeared at different times.
p.m.) tr., 36th )—51st (p.m.) tr.—dist.	37 days	None	None	Slight 35th, 41st	Well	Except on 35th al- bumen always at night.
(p.m.) dist., th (a.m.) tr.	Oc. tr.	None	None	None	Well	
(p.m.) — 15th and p.m.) and (a.m.) tr.	Oc. tr.	None	None	None	Well	
(p.m.) — 23rd ) dist., 23rd ) tr., 35th (a.m.) 77th (a.m.) tr.	112 hours and oc. tr.	72 hours	16 hours	None	Well	
., 16th till end	?	1 day	?	Con.	Died	

No. of case.	Date of admission.	Age.	Sex.	Day of illness.		Periods at which albumen was detected. Number day of illness. Abbreviations as above.
				Adm.	Dism.	
67	Dec. 12	10	M.	3rd	71st	9th (p.m.)—44th (a.m.) vary. from min. tr.—cons.
68	Dec. 13	4	F.	7th	75th	17th (p.m.) tr., 45th (p.m.) dist., 56th (p.m.) tr.
69	Dec. 14	4	F.	4th	65th	15th (p.m.) tr., 24th (a.m.) dist., 52nd (a.m.) con., 53rd (p.m.) dist., 56th (p.m.) tr.
70	Dec. 14	7	M.	3rd	20th	12th, 13th (p.m.) tr., 13th, 14th (a.m.) dist., 14th (p.m.)—end, abdt.
71	Dec. 14	14	M.	4th	57th	35th (p.m.), 39th (a.m.) tr.
72	Dec. 14	13	F.	8th	82nd	15th—30th dist.—cons., 35th—44th (p.m.) tr., 47th—52nd tr., 59th, 61st tr., 68th—70th min. tr.
73	Dec. 15	8	F.	1st	53rd	23rd (p.m.) tr.
74	Dec. 17	8	M.	2nd	55th	25th (a.m.) tr.
75	Dec. 27	8	M.	2nd	72nd	15th (a.m.) min. tr., 21st (a.m.) tr., 28th (a.m.) tr., 35th (a.m.) tr., 37th (a.m.) tr., 38th (a.m.) tr., 47th (a.m.) tr.
76	Dec. 27	6	M.	8th	50th	10th (a.m.) tr., 16th (a.m.) tr., 21st, 27th (p.m.) tr., 35th (a.m.) tr., 39th (p.m.) tr., 44th—49th dist.
77	Dec. 26	21	F.	4th	56th	32nd tr.
78	Dec. 29	7	F.	4th	68th	15th (p.m.)—33rd (a.m.) vary. from cons.—min. tr., 41st (a.m.) dist., 52nd (p.m.) min. tr.
79	Dec. 30	10	M.	3rd	58th	9th (a.m.), 10th (p.m.) min. tr.
80	Feb. 3	4	F.	8th	59th	12th (a.m.), 19th (a.m.) tr.
81	Feb. 10	6	F.	4th	153rd	11—109th very vary. from abdt.—min. tr.
82	Feb. 7	9	F.	2nd	64th	27th tr.
83	April 2	7	F.	14th	122nd	22nd (p.m.)—35th (a.m.) con., 35th (p.m.) tr., 39th dist., 40th—43rd (p.m.) tr.
84	April 14	7	F.	2nd	60th	47th (p.m.), 52nd (p.m.) tr.
85	April 23	8	F.	2nd	55th	46th (p.m.) tr., 51st (a.m.) tr.
86	April 25	4	M.	2nd	63rd	12th (a.m.) dist., 12th (p.m.)—17th (p.m.) abdt., 18th (a.m.), 19th (p.m.) dist., 20th (a.m.) tr.
87	April 28	5	F.	3rd	57th	40th (p.m.) dist., 46th (a.m.) min. tr.
88	May 2	14	F.	3rd	55th	15th (p.m.) tr., 41st (a.m.)—53rd (p.m.) tr.—cons.

Haemoglobin detected, number day of illness.	Duration of nephritis.	"Pre-albu- minuric stage."	"Post-albu- minuric stage."	Dropsy.	Result.	Remarks.
None	35 days	None	None	Slight	Well	Albumen usually most abdt. in m.
None	Oc. tr.	None	None	None	Well	
None	Oc. tr.	None	None	None	Well	
(p.m.)—end dist.	8 days ?	None	None	Slight	Died	Uræmia (death).
(p.m.), 34th (a.m.), 48th (a.m.) tr.	Oc. tr.	None	None	None	Well	Occasional trace of albumen and blood.
—50th tr.	56 days	None	None	None	Well	
None	Once tr.	None	None	None	Well	
(p.m.) tr.	Once tr.	None	None	None	Well	Albumen, when pre- sent, always in morning.
None	Frequent tr.	None	None	None	Well	
None	Frequent tr.	None	None	None	Died	
—33rd tr.	3 days	1 day	1 day	None	Well	Times at which al- bumen appeared very various.
(p.m.) — 43rd (a.m.) dist. — tr., 11 (p.m.) — 56th	28 days	None	10 days	None	Well	Note continued pre- sence of blood.
(p.m.) tr.	Twice tr.	None	None	None	Well	
None	Twice tr.	None	None	None	Well	
—135th very abdt. to min. tr.	124 days	None	26 days	Slight	Well	
None	Once tr.	None	None	None	Well	
(a.m.) and (p.m.), 11 (a.m.) tr., 22nd (a.m.), 30th (p.m.) (a.m.), 31st (a.m.)— (a.m.) tr., 39th (a.m.)—47th (a.m.),	25 days	24 hours	4 days	Dist.	Well	
None	Twice tr.	None	None	None	Well	
None	Twice tr.	None	None	None	Well	
tr., 12th dist., (a.m.), 17th (a.m.) cons., 18th (a.m.)—20th (a.m.) (a.m.), 20th (p.m.)— (a.m.) tr.	10 days	24 hours	16 hours	None	Well	
None	Twice tr.	None	None	None	Well	
(p.m.) dist., 20th (a.m.), 21st (a.m.) tr., 21st (p.m.)	12 days and oc. tr.	None	None	None	Well	

No. of case.	Date of admission.	Age.	Sex.	Day of illness.		Periods at which albumen was detected. Number day of illness. Abbreviations as above.
				Adm.	Dism.	
89	May 14	14	M.	8th	47th	31st (a.m.), dist.
90	June 2	18	M.	3rd	169th	21st (a.m.), 27th (p.m.) tr., 28th (a.m.), 34th (p.m.) cons., 35th (a.m.)—58th (a.m.) tr.—dist 85th (p.m.) tr.
91	June 9	14	M.	7th ?	10th ?	6th—10th dist.
92	June 19	8	F.	10th	18th	10th—18th abdt.
93	June 21	8	M.	10th	115th	10th—50th tr., except 16th, 17th dist.
94	June 21	4	F.	4th	58th	16th (a.m.)—27th (a.m.) tr.—con.
95	June 25	6	F.	6th	140th	16th tr., 17th (a.m.)—68th con.—abdt., 69th—75th dist.
96	June 26	10	M.	3rd	78th	30th (p.m.), 33rd (p.m.) min. tr.
97	June 27	7	F.	2nd	56th	42nd (a.m.) tr.
98	June 30	8	M.	3rd	59th	25th (p.m.) vary. from min. tr., 30th (a.m.), 32nd (p.m.) min. tr.
99	July 3	7	M.	14th	56th	14th, 15th, 16th tr., 18th (p.m.) min. tr., 24th—32nd tr.—con.
100	Aug. 14	3½	M.	10th	88th	15th—53rd tr.—abdt.
101	July 3	6	M.	5th	61st	14th (p.m.), 27th abdt.—tr.
102	July 21	6	M.	4th	23rd	22nd (p.m.) tr., 23rd con.
103	July 25	6	M.	21st	88th	15th—30th tr.—con.
104	Aug. 7	8	M.	7th	109th	17th (p.m.)—54th tr.—abdt.
105	Aug. 13	7	F.	9th	33rd	9th (p.m.) con., 10th (a.m.) dist., 11th—18th tr. 18th—24th con., 24th—33rd abdt.
106	Aug. 13	5	M.	10th	58th	10th—20th (p.m.) tr.—dist.
107	Aug. 17	15	M.	4th	55th	18th (a.m.), 19th (p.m.) tr.
108	Aug. 22	8	M.	10th	60th	14th—16th tr., 16th—34th tr.—con.
109	Aug. 22	9	F.	4th	54th	14th—22nd tr.—dist.
110	Aug. 28	10	F.	7th	55th	13th tr.
111	Aug. 28	?	F.	10th	53rd	17th (p.m.)—33rd tr.—con.
112	Aug. 28	5	F.	5th	56th	9th tr.

globin detected, number day of illness.	Duration of nephritis.	"Pre-albu- minuric stage."	"Post-albu- minuric stage."	Dropsy.	Result.	Remarks.
None (a.m.), 31st ) tr., 32nd )—52nd (a.m.) 52nd (p.m.)— (p.m.) tr. None —18th abdt. None	Once tr. 72 days  5 days 8 days 40 days	None 5 days  None ? None	None 28 days  None None None	None Con.  Abdt. None None	Well Well  Died Died Well	Note in this case in- crease of albumen on 16th day.
(a.m.) tr., 16th— tr.—dist., 29th at (p.m.) min. tr. (a.m.)—41st ) dist.—con., 50th tr., 62nd ) min. tr. (a.m.) min. tr., (p.m.), 29th ) tr., 30th— dist., 34th )—61st (p.m.) tr.—tr. None	16 days  59 days  46 days	1 day  None  14 days	3 days  None  27 days	None  None  None	Well  Well  Well	
—21st (p.m.) tr., (p.m.), 34th ) min. tr.—dist. —37th tr.—con.  —40th tr.—con. —20th tr.—dist. None None (p.m.) — 32nd (a.m.) min. tr.	Once tr. 11 days  23 days  38 ? days 13 days 2 days Doubtful 37 days	None None  None  ? None None None None	None None  5 days  None None None None None	None None  Con.  None None None None Con.	Well Well  Well  Well Well Died Well	
(a.m.) min. tr. —19th tr., 20th— dist., 22nd— con. (p.m.)—17th ) dist., 18th ) min. tr. None —22nd dist., ad—25th tr. None None None None	24 days  10 days  2 days 20 days  7 days Once tr. 16 days Once tr.	?  None  None None  None None None None	None  None  None None  None None None None	None  None  None None  None None None None	Died Well  Well Well  Well Well Well Well	
						Malignant.
						Note absence of dropsy with abdt. alb.

112 cases of albuminuria.

2 cases of dropsy without albuminuria.

66 cases without dropsy or nephritis.

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180 total consecutive cases of scarlatina.



