ON THE
TEMPERATURE, UREA, CHLORIDE OF SODIUM,
AND URINARY WATER
IN
SCARLET FEVER;

AND ON A
CYCLE IN DISEASE AND HEALTH.

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THESE observations were made on inmates of the Hospital for Sick Children. The patients were under the care of Dr. West, Dr. Jenner, and Dr. Hillier. I beg to avail myself of this opportunity of thanking these gentlemen for affording me every facility in the prosecution of these investigations.

These experiments were undertaken to ascertain what relationship exists between the urinary excreta and the temperature in scarlet fever; and this paper is intended to be a sequel of my former paper on 'Ague' published by this Society.

The temperature is given in charts. The variations of each day are separated from each other by a red line, and

at the head of the column thus formed the day of the disease is given.

Above the temperature, five columns are given ; the first, gives the hour of the day ; second, gives the day of the month ; third, the daily amount of urea ; fourth, the daily amount of chloride of sodium ; fifth, the daily amount of urinary water. The urea and chloride of sodium are given in grammes ; the urinary water in cubic centimetres.

The urine was analysed daily ; and the amounts of the different constituents for twenty-four hours are put down on the day on which the urine was collected, and therefore belong to the previous day ; thus, when subsequently I refer to the urine of any day, I of course mean the urine collected on the morning of the following day.

The urea and chloride of sodium were analysed by Liebig's volumetric method. The chloride of sodium was not got rid of, but the usual allowance was made in estimating the quantity of urea.

The following are the subjects treated of :—1st. The temperature and its relationship to the urinary excreta. 2nd. The urea. 3rd. The chlorides. 4th. The urinary water. 5th. The albumen in the urine. 6th. The blood in the urine. 7th. A cycle in disease. 8th. A cycle in health, and its relation to the cycle in disease.

On the temperature in scarlet fever.

The duration of the elevation of the temperature varies ; thus, in seven cases it fell on the fifth day of the disease, in four cases on the tenth day, in two cases on the fifteenth day, in one case on the twentieth day, in two cases on the fourth day, in one case on the sixth day, and in two other cases the temperature fell so gradually, that it was impossible to say exactly on which day it reached its normal point.

It thus appears that in the large majority of cases the temperature falls on the fifth, tenth, fifteenth, or twentieth day, that is either on the fifth or a multiple of the fifth day of the disease ; so constant indeed is this, that if the

temperature should remain high on the fifth, tenth, or fifteenth day, we may look forward to a continuation of the fever for another five days. Further, in those cases in which the temperature continues high till the tenth, fifteenth, or twentieth day, it generally experiences a depression on the fifth day preceding its complete fall; for instance, if the temperature falls permanently on the fifteenth day, there generally occurs a depression of variable amount on the fifth and tenth days.

After each of these falls the temperature may rise again, reaching a point during the second five days, as high as, or higher than it did during the first five days, as in Cases 8, 17, 18, and 22. In other cases, after the fall on the fifth day, the temperature remains at this point till the following tenth day, on which day it experiences another abrupt fall, or it may gradually decline, passing almost imperceptibly into the normal temperature, reaching this point on the tenth day, as in Cases 5, 7, 16, 8.

Each of these falls in the temperature is accompanied by an improvement in the state of the patient, which is always in proportion to the extent of the fall. If the temperature again rises, the patient again relapses, but if it remains at the point it reached at its first fall the improvement is permanent.

The temperature does not usually attain the same height daily during each of the five days, but the point reached gradually increases during the second and third days, and then falls again towards the fifth; in some cases, however, it goes on increasing till the fourth day, and then experiences an abrupt fall on the fifth. It thus appears that the temperature (*i. e.* the fever) forms arcs or cycles, lasting over a period of five days. The height the temperature attained varied greatly in different cases; in some the elevation was just appreciable, in others it reached 105° Fahr.

Of seventeen cases that came early under notice, the average maximum temperature was a little over 103°. As might be expected, the temperature reached a higher point in the cases of long duration.

In some cases the highest elevation was attained on the first day, but in the severer cases it generally reached its highest point on the second or third, and perhaps not till the sixth or even the eleventh day.

Subsequent to the great fall experienced on the fifth, tenth, or fifteenth day, the temperature often remained over a variable period rather too high, the period being in some cases fourteen or fifteen days; the degree of elevation also varied, in some cases (Case 1) being between 100° and 101° , but more frequently between 99° and 100° . This slighter elevation of the temperature in most cases formed cycles of five days, as in Cases 2, 6, 10, and 11. In Case 11 this occurred after the second elevation on the twenty-sixth day.¹

This slight subsequent elevation of the temperature, if of any persistence, is coincident with a continuance of the lesions produced by the scarlet fever; as, for instance, of the sore throat, or of the enlargement of the gland, or from discharge from the ears, &c.

There is no connection between the duration of the primary high temperature and the subsequent slighter one; thus, it can be seen (Case 1) that in some cases, where the great fall in the temperature occurred on the fifth day, a long subsequent slight elevation occurred; it must, therefore, have depended on the constitutional state of the patient. It certainly sometimes precedes Bright's disease.

At a variable period after the scarlet fever, a subsequent high rise in the temperature not unfrequently occurred, due to intercurrent disease. In many cases the nature of the intercurrent disease was determined, in other cases nothing capable of causing the elevation of the temperature could be discovered.

The day of the disease (counting from the commencement of the scarlet fever) varied. In the cases of albuminuria

¹ It must be borne in mind that in counting the second cycle of five days we must not take in the day of the fall, as this belongs to the previous cycle, but must begin to count from the day after this.

it began on the seventh, nineteenth, twentieth, twenty-third, twenty-ninth, and thirty-third days.

In those cases in which the elevation was probably due to heart disease, it began on the eighth day. In those cases in which the cause could not be determined, it began in one case on the eighth and in the other on the tenth. In one case of urticaria and chicken-pox it began on the sixth day. In a case of tuberculosis, on the ninth. The degree of the elevation of the temperature varied thus :

4 cases	ranged between	102° and 103°
3	„	103° and 104°
4	„	104° and 105°
1 case	it was	. 105½°.

The duration of the elevation varied ; thus, in—

2 cases	the temperature	fell on the	second day.
1 case	„	„	fourth day.
3 cases	„	„	fifth day.
1 case	„	„	sixth day.
1	„	„	tenth day.
1	„	„	eleventh day.
1	„	„	thirteenth day.

The cause of the elevation also varied.

In 6 cases	it was due to	albuminuria.
In 1 case	„	tuberculosis.
In 1	„	chicken-pox.
In 2 cases	„	heart disease.
In 2	„	it was uncertain.

On examining the previous cases, it will be seen that the rise in the temperature due to an intercurrent disease either fell on the fifth day from the commencement of its rise, or on the fifth day from the commencement of the scarlet fever ; that is to say, the secondary rise in some cases adopts the cycle existing previously, or checks this and determines another.

Thus, in Case 1 the elevation lasted five days, and fell on

the twenty-seventh day of the disease, counting from the commencement of the scarlet fever.

In Case 17 the elevation fell on the fifth and tenth days from its own commencement, and as it began on the sixth day of the scarlet fever, it fell on the fifteenth day of that disease.

In Case 19 the secondary elevation fell on the fifth day from its own commencement.

In Case 22 it fell on the fifth, tenth, and twentieth days from its own commencement, and on the twelfth, seventeenth, and twenty-seventh of the scarlet fever. In this case I have counted the second rise from the eighth day, the two previous days being part of a previous cycle of the scarlet fever.

In the following cases the elevation caused by the intercurrent disease lasted a variable number of days, but fell on the fifth day, counting from the commencement of the scarlet fever.

Case 6.—It fell on the fourth day from its own commencement, on the tenth from the commencement of the scarlet fever.

Case 12.—It fell on the second day from its own commencement, on the twentieth from the commencement of the scarlet fever.

Case 20.—It fell on the thirteenth day from its own commencement; on the twentieth from the commencement of the scarlet fever.

In this case I have considered the second rise due to the intercurrent disease; to begin on the eighth day, and the two previous days to belong to the previous cycle of the scarlet fever.

Case 25.—It fell on the second day from its own commencement; on the twentieth from the commencement of the scarlet fever.

Case 26.—It fell on the sixth day from its own commencement; on the fifteenth, and again on the twentieth, from the commencement of the scarlet fever.

It is thus seen that the subsequent rise in the temperature

due to intercurrent inflammations, &c., strictly follow out the cyclical law, only one exception occurring; this was Case 23, in which the temperature fell on the sixth day from the commencement of the secondary rise, and on the thirteenth day from the commencement of the scarlet fever.

Sometimes after the fever had declined a sudden slight elevation occurred, limited to one day, and often to a few hours of the day, the patient being next day in the usual health and the temperature normal.

In 1 case it rose to $102\frac{2}{3}$ on the twenty-fifth day,	} Counting from the commence- ment of the scarlet fever.
In 1 „ „ $100\frac{1}{2}$ „ fifteenth day,	
In 1 „ „ 101 „ eleventh day,	

On the daily variations of the temperature.—In some cases the temperature remained at much the same height throughout the day; in other cases it fell a variable amount in the morning, and again rose during the day, forming a daily arc or cycle. The former generally occurred in the severer cases and at the commencement of the disease, and the latter at the termination, and may be taken as a sign of improvement. The time of the day at which the temperature reached its highest point varied between 9 a.m. and 11 p.m.; from 2 to 8 appears to be the most frequent hours. Two patients died from the immediate effects of the fever; one died on the fourth day of the disease; one died on the eighth day of the disease.

On the urea.

From the above cases it appears that the quantity of urea undergoes no increase with the elevation of the temperature, that is, during the fever days. If, indeed, we accept 800 grms. of urea per kilogramme of weight as the amount normal per diem in children, it often suffered a great diminution.

It may, however, be objected that this is too high; and, secondly, that in many of the previous cases the urea falls

with the decline of the temperature, and that this shows that it had previously undergone an increase.

It may be fairly assumed, I think, that the amount of urea voided by these patients during the last ten or fifteen days of their residence in the hospital was not in excess of the quantity in health, especially where the examination extended over a long period (thirty or forty days), at which time the quantity of urea could not have been affected by any previous retention during the fever. Indeed, it appears to me that, leading a quiet, hospital life, and often spending the time in bed, that this amount is too low; but even accepting this amount as normal to the patient, on no occasion was the quantity of the urea increased during the elevation of the temperature; often, indeed, it was below it. This is shown in the following table, in which I have first given the daily average amount of urea per kilogramme of the fever days, and that of several of the last days during which the analyses were made.

Case 3.	From the second to the fourth day inclusive	. 0.477
"	" tenth to the twenty-eighth day inclusive	0.687
Case 4.	" sixth to the ninth day inclusive	. 0.527
"	" nineteenth to the thirty-second day inclus.	0.706
Case 10.	" second to the third day inclusive	. 0.569
"	" twelfth to the twenty-seventh day inclus.	0.642
Case 18.	" second to the thirteenth day inclusive	. 0.552
"	" twentieth to the thirty-first day inclusive	0.634
Case 20.	" tenth to the twelfth days inclusive	. 0.561
"	" twentieth to the thirty-sixth day inclusive	0.551

That the subsequent decrease in the amount of the urea is not due to the decline of the temperature is seen in some cases, as the 18th and 20th, in which the urea falls about the same time as in the other cases, in spite of a continuation of the elevation of the temperature, as the temperature in these cases continued high a long time after the decline of the urea; this disassociation of the urea and the temperature plainly shows that the decrease in the amount of the urea is independent of the temperature, and therefore their occa-

sionally occurring at the same time in no way shows that there was an increased elimination during the fever.

After the first few days the urea invariably falls, reaching point often considerably below the normal amount; thus, in—

Case 1.	The average daily amount per kilogramme, from the sixth to the fourteenth day inclusive, was .	0·417
„	The normal amount was .	0·642
Case 3.	The average daily amount per kilogramme, from the sixth to the ninth day inclusive, was .	0·400
„	The normal amount was .	0·687
Case 4.	The average daily amount per kilogramme, from the eighth to the fourteenth day inclusive, was .	0·422
„	The normal amount was .	0·706
Case 10.	The average daily amount per kilogramme from the fourth to the eleventh day inclusive, was .	0·457
„	The normal amount was .	0·642
Case 18.	The average daily amount per kilogramme, from the fifth to the sixth day inclusive, was .	0·439
„	The normal amount was .	0·634
Case 20.	The average daily amount per kilogramme, from the tenth to the nineteenth day inclusive, was .	0·417
„	The normal amount was .	0·551

A diminution of this kind usually occurs after the subsidence of fevers, due probably to the appetite not being completely restored, and also to the food being more thoroughly assimilated and tissue change not being so active.

But in these cases of scarlet fever the above explanation will not, I think, hold; for, first, the diminution in the urea usually lasts only over a few days after other fevers, whilst in these cases it often remained for many. Secondly, we have previously seen that there is no increase in the amount of the urea coincident with the increase in the temperature, and thus, probably, there is retention in the system, either of urea or some product capable of producing urea. In similar cases of retention in typhoid fever we have a subsequent increase in the amount of the urea, instead of the diminution. Thirdly, it has been before stated that the great diminution occurs quite independently

of the temperature, sometimes even when the temperature for several days remains at even 103° .

Thus I have tried to show that—First, there is no increase in the amount of urea during the fever. Second, that, subsequent to the fever, there is a great diminution of the urea, &c. Third, that this diminution cannot be explained in the usual manner. May the following be the explanation—namely, that the contagion has a similar action on the kidneys to that on the skin, tongue, and fauces, for we find in the urine epithelium from the bladder, pelvis of the kidney, and from the kidney itself, during the fever days. It may be objected that the impaired functional activity of the kidneys lasts longer than the rash, but the organs involved do not at once recover their normal condition on the disappearance of the rash, as is seen in the case of the tongue and fauces.

In most of the cases, especially where the convalescence was slow, the children became puffy about the face, there being, however, no pitting on pressure; this occurred without the appearance of albumen or blood in the urine; perhaps this may be accounted for by the retention of urea in these cases being unusually marked.

On the occurrence of acute Bright's disease after the fever the urea was variously affected; in some cases it was greatly diminished in quantity.

Case 1.—The temperature rose on the twenty-third day to $102\frac{2}{3}^{\circ}$, and then gradually fell during the following three days; on the fifth day it was normal again. Daily average amount per kilogramme, from the sixth to the twenty-first days inclusive, 0.464. During the following four fever (inflammatory) days, 0.373. The urea immediately regained its full quantity; thus, from the twenty-seventh to the thirty-fifth it was, per kilogramme, 0.641.

In the above case the albumen never amounted to more than a mere trace, and thus, probably, did not, to an appreciable degree, interfere with the quantitative analysis; the albumen lasted only during the five days of elevation of temperature, and hence, if it had any effect on the analysis,

it must be to give too great an amount of urea, and thus the diminution in the amount of urea will be greater than that given.

Case 12.—In this case, on the occurrence of the inflammation, blood (with a very large amount of albumen) was found in the urine; the albumen was removed by animal charcoal. The rise in the temperature occurred on the nineteenth day (105); on the following day it fell to 99 again. From the eighth to the eighteenth days inclusive, average daily amount of urea was 9·185. On the twenty-second day it was 1·875; on the twenty-third day it was 0·510.

I have given the total amount above, not the quantity per kilogramme, as they are so small during the above two days.

Case 24.—The urea was estimated quantitatively only till the twelfth day; after this it was discontinued till the sixty-third day, but, during the time, the patient had a severe attack of Bright's disease, with much blood and a large amount of albumen. On the fiftieth day she was much improved, on the sixty-first there was scarcely any anasarca, and from the sixty-third to the sixty-eighth the merest trace of albumen in the urine. Average daily amount of urea, per kilogramme, from the fifth to the twelfth days inclusive, 0·582. Average daily amount of urea per kilogramme, from the sixty-third to the sixty-eighth days inclusive, 0·268.

The last case not only shows how large the diminution often is, but that it may continue over a very long period, and long after active disease in the kidney has ceased.

Case 25.—Observations were made for eight days; on each day there was a variable amount of albumen, which was removed by animal charcoal; the temperature on three occasions rose gradually, over a space of three days, from normal to 105; the urea showed no corresponding increase on these days. The average daily amount for the eight days was only 10·241 grains. His weight was not taken, but assum-

ing 26 kilogrammes, for each kilogramme there was 0·093 grms.

In other cases no diminution occurred on the occurrence of the inflammation; thus, Case 25, on the twenty-ninth day, Bright's disease supervened, judging by the sudden elevation of the temperature, and the appearance of albumen and blood in the urine, yet, notwithstanding, the amount of urea continued as it was before or very nearly so. Thus, from the sixteenth to the twenty-eighth days inclusive, the average daily amount per kilogramme was 0·523 grms. From the twenty-ninth to the thirty-fourth inclusive it was 0·488 grms.

On the chlorides.

The chlorides were never absent from the urine that was analysed; the quantity, however, was always much diminished during the fever days; thus, in—

Case 3, the daily average amount per kilogramme, from the second to the fourth day, was	.	.	0·032
Case 10, the daily average amount per kilogramme, from the second to the fourth day, was	.	.	0·054
Case 20, the daily average amount per kilogramme, from the first to the fourteenth day, was	.	.	0·080
Case 24, the daily average amount per kilogramme, from the fifth to the twelfth day, was	.	.	0·093

During the three or four days following the fever the quantity of chloride increased gradually; thus, in

Case 3, the average daily amount per kilogramme, from the fifth to the eleventh day, was	.	.	0·093
Case 10, the average daily amount per kilogramme, from the fifth to the eleventh day, was	.	.	0·125

After this they became normal in quantity; thus, in

Case 3, the average daily amount per kilogramme, from the tenth to the twenty-fifth day, was	.	.	0·210
Case 10, the average daily amount per kilogramme, from the thirteenth to the twenty-seventh day, was	.	.	0·228

In one case of Bright's disease the chlorides suffered scarcely any diminution in their quantity during the fever days; thus, in Case 1—

Average daily amount per kilogramme, from the twenty-third to the twenty-sixth day (fever days) . . .	0·110
Average daily amount per kilogramme, from the twenty-seventh to the thirty-fourth day (non-fever days) . . .	0·134

It still remains doubtful whether the chlorides are eliminated as a secretion, or merely as a solution in the urinary water; if it be secreted by the kidney through any diminution in the secretive power of the kidney, it should show itself in a diminution of the amount of the chloride of sodium.

In the case given above there was a decided diminution in the amount of urea during the fever days of Bright's disease, and this, I have attempted to show, was due to diminution in the secretive power of the kidney. But in this case the chloride of sodium was scarcely diminished; thus, this single case would go to show that the urea passes out in the form of a solution. The close relationship also between the amount of chloride and the urinary water tends to prove the same conclusion.

On the urinary water.

During the fever days the amount of urinary water varies very greatly; thus, in—

Case 10, the average daily amount per kilogramme was	11	c.c.
„ 3,	„	12 „
„ 4,	„	18 „
„ 20,	„	20·2 „
„ 18,	„	35·3 „
„ 24,	„	66 „

During the subsequent non-fever days the amount also varied somewhat; thus, in—

Case 2, the average daily amount per kilogramme was 17 c.c.			
„ 18,	„	„	22 „
„ 24,	„	„	23 „
„ 3,	„	„	25.9 „
„ 4,	„	„	26 „
„ 10,	„	„	28.4 „
„ 20,	„	„	27.6 „
„ 25,	„	„	29.4 „

These last quantities may, I think, be taken as the amount usual per kilogramme in children; this gives an average of 24.6. I am aware this is much below the amount usually received; thus, Dr. Parkes¹ gives 59 c.c. The above quantity agrees very closely to the amount given by Dr. Parkes per kilogramme in adults.

If this assumption be correct, it follows that often, during the fever days, there is no decline in the amount of urinary water, and in some cases there is a very large excess.

On the albumen in the urine.

The albumen appears at two different periods; first, during the fever, and second, later—about the third week—at which time it is often much larger in quantity, longer in its duration, and accompanied by a second elevation of the temperature.

1st. Its appearance during the fever days, out of twenty-one cases in which the urine was examined.—In only one did any albumen occur; it was slight in amount, and was present on the fifth and sixth days. It must be borne in mind, however, that in many of these cases several of the fever days had elapsed before their admission.

2nd. Its appearance during convalescence of eighteen patients who were in the hospital for a considerable time.—Seven had albumen during the period; three other cases are given; these were admitted with albuminuria.

¹ 'On Urine,' p. 44.

The time of its appearance varied ; thus —

In Case 6 it appeared on the ninth day.

- „ 25 „ eighteenth day.
- „ 12 „ twentieth day.
- „ 1 and 19 „ twenty-third day.
- „ 11 it first appeared on the eleventh day, but after a day or two it discontinued, and reappeared on the twentieth.

The duration of the albuminuria varied ; thus in—

Case 1, it lasted three days.

- „ 6, „ eleven days.
- „ 25, „ twenty days.
- „ 11, „ more than twenty-seven days.
- „ 19, „ „ forty-three days.
- „ 12, „ „ forty-nine days.

Taking the elevation of the temperature as a test of the severity of the inflammation, it is seen that there is no necessary connection between the intensity and duration of the inflammation and the duration of the albumen in the urine. This can be seen by comparing the following table with the one above :

Case 1, the temperature reached 102, and lasted four days.

- „ 6, „ 103, „ three days.
- „ 25, „ 104, „ one day.
- „ 19, „ 102³, „ four days.
- „ 12, „ 105, „ one day.

Moreover, there is no necessary relationship between the temperature and the amount of the albumen. This can be seen by comparing the following table with the one above :

Case 1, very slight trace.

- „ 6, an enormous amount.
- „ 25, very slight trace.
- „ 19, very large quantity.
- „ 12, a large quantity.

The albumen appears in the urine very soon after the elevation of the temperature ; thus, in —

Case 1, the temperature rose on the twenty-third day ; albumen appeared on the twenty-third day.

Case 6, the temperature rose on the seventh day ; albumen appeared on the ninth day.

Case 11, the temperature rose on the eleventh day ; albumen appeared on the eleventh day.

Case 12, the temperature rose on the nineteenth day ; albumen appeared on the twentieth day.

On blood in the urine.

Relationship between the elevation of the temperature and the appearance of blood in the urine :

1st. No blood may follow the rise of the temperature. Case 1, there was no blood. Case 6, never smoky ; urine not examined microscopically.

2nd. In those cases in which blood appeared its appearance was always preceded by a rise in the temperature. Case 11, temperature rose on the twentieth day ; blood appeared on the twenty-first. Case 12, temperature rose on the nineteenth day ; blood appeared on the twentieth. Case 25, temperature rose on the twenty-ninth day ; blood appeared on the twenty-ninth. .

The blood in some cases continued long after the decline of the temperature ; thus, the continuance of blood cannot be taken as evidence of a continuation of the inflammatory action of the kidney ; thus, in Case 11, the temperature fell on the twenty-seventh ; the blood continued in the urine till the thirty-seventh day. Case 12, the temperature fell on the twentieth ; the blood continued in the urine till the twenty-first day. Case 19, the temperature fell on the thirty-seventh ; the urine contained blood till after the sixty-fifth day. Case 25, the temperature fell on the thirtieth day ; the urine contained blood till the forty-first day.

Relationship between the blood and the amount of albumen in the urine.

1st. A very large amount of albumen may occur in the urine without any blood, as in Case 6.

2nd. Blood, even to a large amount, may exist with the slightest trace of albumen; and if the blood-corpuscles be allowed to settle to the bottom of the vessel, the supernatant fluid may give no evidence of any albumen by heat and nitric acid, as in Cases 25 and 30.

The cases given were seldom dropsical to the extent of pitting; they, however, often looked puffy in the face. Seven cases gave no pitting on pressure; one case very slight; one case the body pitted deeply on pressure.

In some cases the second elevation of the temperature was followed by a puffiness.

In one case the patient was puffy about the face, without any elevation of the temperature or other evidence of Bright's disease.

In some cases the puffiness about the face preceded the rise of the temperature one or two days. In other cases the rise in the temperature preceded the puffiness¹ for a variable number of days; thus, in Case 6, six days; Case 11, three days; Case 12, one day.

On a cycle in disease.

In these cases it appears that the temperature does not run an equable course, neither remaining at the same temperature throughout, nor observing a period of elevation and decline, but forms arcs or cycles composed of a variable number of days, each cycle, however, being composed of the same number of days in the same patient.

We see from the cases given that no number of days

¹ When I use the term puffy, there was no pitting of the body on pressure.

composing the cycle is peculiar to any disease, but that five days is the most common in all.

In rare cases, in the same patient the number of days composing the cycle may change.

For a further account of the cycle in disease, I must refer to the account given of the temperature.

On a cycle in health.

We have seen that in fevers the temperature forms cycles, and as the variations in the temperature are due to the variations in the amount of tissue change, it follows that we must have a cycle of tissue change. Does such a cycle exist in health? I think it probable, and that this determines the cycles in fever, and not the disease itself, for—

1st. In the same disease the cycle may be composed of a different number of days, the cycle, however, remaining constant in the same patient. If the disease determined the cycle, we should expect it to be composed of the same number of days in all patients, whilst we can readily conceive different people to have a different cycle.

2nd. Different diseases (as scarlet fever, followed by Bright's disease, heart disease, chicken-pox, &c.), occurring in the same patient, adopt the same cycle.

3rd. Not unfrequently after the decline or during the decline of the scarlet fever a second elevation of the temperature occurred, due to some intercurrent disease. This second elevation of the temperature lasted over a very variable number of days, but, with one exception, it fell on either a fifth day from its own commencement or on a fifth day from the commencement of the scarlet fever.

In the latter case the intercurrent elevation of temperature, if of some duration, forms cycles, the first of which cycles only is irregular, the subsequent ones being composed each of five days. If the intercurrent inflammation determined the cycle, we should have expected its first cycle to have lasted five days also, instead of which it appears to adopt a previously existing one; but having commenced in

the middle, it is composed of a shorter number of days. This will be more clearly shown by a typical case.

A case of scarlet fever in which the temperature forms cycles of five days, having again fallen to the normal temperature, is followed on the twenty-second day by another elevation, due to intercurrent disease; this experiences a fall on the twenty-fifth, thirtieth, thirty-fifth, and fortieth days from the commencement of the scarlet fever. The three last cycles of the intercurrent disease being each composed of five days, shows that the normal cycle is one of five days, and that the one which immediately preceded them, composed of only four days, is irregular, but only with regard to its commencement, as its fall takes place on a fifth day from the beginning of the scarlet fever.

The previous elevation of temperature of the scarlet fever affords data from which we can calculate the subsequent cycles, and the intercurrent inflammation corresponds exactly with these, with the exception of the elevation of temperature of the imperfect cycle, which begins in the middle of one, showing that diseases adopt previously existing cycles. In the other case, in which the intercurrent inflammation falls on the fifth day from its own, and not from the fifth day from that of the scarlet fever, it is probable that the intercurrent disease cuts short the immediately preceding cycle, but another one commencing it adopts this.

It may, however, be said that this cyclical condition preceding and influencing any subsequent inflammation was established by the preceding scarlet fever; this I think improbable, for the following reasons:

(A) If the disease determines its cycle, it appears difficult to me to conceive that it should be amenable to the influence of a previous disease, whilst it is readily explained by the supposition that both are influenced by a cycle existing in health.

(B) It is difficult to conceive how the scarlet fever should affect the cycle of a subsequent intercurrent disease, occurring

as it sometimes did, so many days afterwards, in some cases the subsequent elevation not occurring till the thirtieth day.

(c) In a case of pneumonia, the temperature of which I took, the first cycle was composed of six days ; this was followed by a cycle of ten days (two five days' cycles) and by a five days' cycle. This is a case similar to those occurring after Bright's disease, in which the elevation began probably in the middle of a cycle ; but in this case there was no preceding fever to give rise to a cycle which could modify the subsequent elevation, and as it began probably in the middle of a cycle, of course this implies its previous existence, that is, in a state of health.

It may be said this cyclical variation in health can be at once put to the test by taking the temperature in health, and seeing if any such variation exists. But in speaking of cyclical changes of tissue, I mean nitrogenous tissues solely, of which the temperature in fevers is the exponent ; for in fevers probably the hydrocarbons are not at all attacked, for it is said the amount of carbonic acid is not increased, and I have attempted to show in a previous paper that in ague the temperature holds the closest correspondence to the amount of urea excreted, that is, to the amount of nitrogenous matter consumed.

But in health the temperature is largely derived from the combustion of the hydrocarbons of the body, and thus it cannot be taken as a guide to the change occurring in the nitrogenous tissues ; indeed, in health it is probable that the hydrocarbons and the nitrogenous tissues are reciprocal.

Dr. Parkes tells me he has noticed that the urea in Bischoff's and Voet's experiments observed cyclical variations.

Thus, I think it probable that in health we have cycles of tissue (nitrogenous) changes, and in fevers we have the same greatly increased. But if this correspondence holds good between the cycle of health and disease, it is probable that it holds as to the constituent parts of the cycle ; and if so, we have a daily cycle in health corresponding to that in fevers, but of a less degree.

If the above views be correct, it follows that in fevers we have but an increase of the normal tissue change, amenable to the ordinary laws of health.

On the temperature in fevers.

On looking over the cases given, it will be seen that in some the temperature remains almost permanent at an elevated point ; in others there are daily elevations and falls of variable intensity ; the persistence of the elevation of the temperature occurs during the most severe period of the fever ; as it improves, the highest point the temperature reaches may remain the same, but the daily fall increases, this being often the earliest indication of improvement. This has been already noticed in typhoid, but it also holds good in scarlet fever, but to a less degree, partly owing to the fever throughout its course being severe, not having a period of slow increase and decline ; however, even under these circumstances, it is not so marked as in typhoid fever.

The manner in which the temperature becomes persistent during the more severe time of the fever appears to me to be the following.

There is originally a daily rise, or perhaps it is limited to a part of a day ; but as the fever increases in severity, not only does the extreme elevation of the temperature increase, but also the duration of the daily fit ; indeed, after the temperature has attained a variable height, it ceases to rise higher, but the duration of the rise continues to increase.

Thus, suppose it possible to isolate a distinct fit, consisting of the rise and fall of the temperature, in a severe case the temperature, not having had sufficient time to reach its normal point on one day, would encroach on the following ; but there occurring another rise on the second day, before the previous rise has had time to complete its fall, the temperature of the two days coalesce at a certain point, and the longer the duration of the separate fits the higher will be the point at which they will coalesce. These steps are best followed in typhoid fever, in which, at the commence-

ment and decline of the fever, we often have a complete daily fit, in some cases rising from the normal temperature to 105° , and again falling to the normal temperature; this may be repeated for several days;¹ as however, the fever increases in severity the daily falls in the temperature diminish till the fever becomes almost persistent in severity.

The same occurs also in miasmatic fevers. In these, when not severe, we have daily a complete fit; but as the fits increase in severity the fever becomes continuous, and as it again declines it first becomes remittent, and ultimately intermittent.²

From the above it follows that, theoretically, we have no such thing as continued fever.

On looking over the above case, it will be seen that the time of the day at which the elevation of the temperature begins varies greatly; thus, it may begin early in the morning, and in rare cases its commencement may be postponed till 4 p.m. or even 9 p.m. If fevers be merely an exaggeration of the normal daily cycles, it follows the commencement of the fever will correspond to the commencement of the normal cycle of that day; this will account for the various hours of the day at which the fever first begins. In scarlet fever we can fix the commencement of the attack with the greatest precision, as is well known; it may begin at almost any hour of the day; thus, in the cases given, it began in one case at 1 a.m., two cases during the morning, one case at 11 a.m., three cases at 12 a.m., one case at 2 p.m., four cases at 5 p.m., one case at 10 p.m., one case during the night.

By observing the variation in the elevation of the temperature, we may learn the variations in health; from this we see that the period of the day at which the temperature reaches its maximum varies greatly on different days of the

¹ Not only have we in these cases a distinct fit as regards the temperature, but also as regards the symptoms, there occurring in these cases a distinct hot and sweating stage daily.

² 'Wood,' vol. i, p. 240.

Case 1. Henry Mayhew.

No 1A

Henry Maylin, Cont'd.

No 1 B

same case ; thus, it may reach its maximum at 9 a.m., or as late as 10 p.m., or at any other intermediate hour.

Dr. Edward Smith has shown that there is a daily capacity for increased tissue change. He has endeavoured to show that this occurs during midday ; from the above cases it appears that it may occur at any hour of the day.

The cases from which the preceding deductions are made are now added. I have been obliged to omit many of the charts of temperature, owing to the great expense. The Council of the Society, have, however, kindly allowed me to retain the most typical.

CASE 1 (see Diagrams 1, *a* and *b*).—Henry Maylin, æt. 6 ; weight, 16 kilogrammes. He was seized at 5 p.m., May 1st, with shivering, and complained of some sore throat ; during the night he was heavy and feverish.

The rash appeared on the second day of the disease, and disappeared on the eighth. The rash was strongly marked on the second day of the disease ; from that time it gradually faded.

Desquamation began on the sixth day of the disease, was completed generally between twenty-second and twenty-sixth days, though some still continued on the hands and feet on the twenty-ninth day. The desquamation was most marked under the clavicles and over the pubes.

The conjunctivæ were very much injected on the second day of the disease ; this then declined, and ceased on the seventh day.

The glands at the angle of the jaw were found to be rather enlarged on the second day. From the sixth to the eighth days inclusive they were still more enlarged, and, indeed, increased in size till the twenty-third day. On the twenty-sixth day they had begun to diminish. Glands down the upper half of the neck posterior to the sternomastoid were rather enlarged and shotty till the twenty-sixth day of the disease, when they were found to be normal. Glands in groins were found to be enlarged on the second day ; they increased in size till the seventh day inclusive,

after which they diminished, and became normal between the twenty-second and twenty-sixth day of the disease.

The tongue was thickly coated on the second day; from the fourth to the sixth inclusive it was of the well-marked strawberry kind; after this it improved, and became normal on the eleventh day.

The tonsils were vividly red and swollen till the fourth day; all redness had disappeared on the eleventh day, but they were found still enlarged on the twenty-fourth day.

The boy's appetite improved on the fourth day, and remained good till the twenty-second; on the twenty-eighth day it again became excellent.

Heart was healthy on the sixth day; no other note was made until the eleventh day, when systolic basic murmur was heard audibly at the second left cartilage; this continued audible till the fourteenth day, and disappeared suddenly on the fifteenth; from this time to the time of his dismissal from the hospital his heart sounds continued normal.

Some cough was noticed on the seventh day of the disease; on the twenty-second day it was very troublesome, and had all the character of hooping-cough, and continued so till the time of his discharge.

The boy was delirious only on the night of the second day of the disease.

Urine.—The urine was examined daily; no albumen was found till the twenty-fourth day, on which day there was a very distinct cloud on boiling and adding nitric acid; after this it decreased in quantity and disappeared on the twenty-seventh day; subsequent to this the urine always remained free from albumen; no blood nor casts were detected.

General appearance.—Till the tenth day the lips were dry, and the boy heavy; after this he steadily improved, though very slowly so, till the nineteenth day, when he flagged again, and on the twenty-second was puffy about the face, and the angles of his mouth and along the nose were ulcerated; after the twenty-third day he improved, though he still looked puffy till the twenty-sixth day. There was no distinct pitting on pressure any time.

Diet.—Second day, beef tea 1 pint, milk 1 pint, wine 4 oz.; seventh day, pudding diet, wine 3 oz.; eleventh, wine 2 oz.; thirteenth day, fish; twenty-first, second meal diet, 2 oz. of meal, 3 oz. of potatoes.!

CASE 2.—Henry Johnson; height, 3 feet $1\frac{1}{2}$ inch; weight, 10 kilogrammes. The child was seized during the night of the 23rd of May.

The rash appeared on the second day of the disease, disappeared on the seventh.

Desquamation, which was slight and very superficial, began on the tenth day, still continued on the feet on the twenty-ninth day. Glands at the angles of the jaw were rather enlarged, even on the twenty-ninth day. Glandula concatenatæ were not enlarged till the ninth day; on that and the following day both they and the glands at both angles were enlarged; on the twelfth day they were normal on the right side, but continued enlarged on the left till the twenty-third. Glands in groins were shotty till the tenth day.

Tongue was very red with prominent papillæ from the fourth to the sixth day inclusive; it then improved, and became normal between the fourteenth and nineteenth days.

Fauces, &c., were red and swollen on the fourth; after this the parts improved, and were normal on the tenth day. Appetite was pretty good on the fifth day; after this it continued excellent.

Heart was healthy throughout.

Lungs.—There was some sonorous rhonchus on the fourth, fifth, and sixth days.

Urine was examined daily; it never contained any albumen.

General appearance.—Throughout the time he was under observation he looked quite well.

Diet.—May 26th, milk 1 pint, beef tea 1 pint, bread and butter; 31st, pudding diet; June 4th, broth diet; 10th, second meal diet; 16th, pudding diet, milk half pint.

Table showing the daily amount of urea, chloride of sodium, and urinary water, excreted.

Day of disease.	Urea.	NaCl.	Water.
	Grammes.	Grammes.	
Fifth	5·642	1·313	185 c.c.
Sixth	6·120	2·486	255
Seventh	8·100	4·050	360
Eighth	8·100	4·225	360
Ninth	7·965	1·485	270
Tenth	10·660	3·382	410
Eleventh	9·190	2·480	310
Twelfth	6·045	1·782	310
Thirteenth	7·695	2·389	405
Fourteenth	6·840	1·680	380
Fifteenth	Lost	Lost	Lost
Sixteenth	8·625	1·983	345
Seventeenth	8·407	1·778	295
Eighteenth	6·697	1·081	235
Nineteenth	4·702	1·650	165
Twentieth	7·055	2·695	245
Twenty-first	7·875	2·250	250
Twenty-second ...	7·370	1·650	220
Twenty-third	8·360	1·650	220
Twenty-fourth ...	8·750	2·625	250
Twenty-fifth	10·867	3·450	345
Twenty-sixth	7·095	2·257	255
Twenty-seventh ...	10·075	3·332	310
Twenty-eighth ...	9·440	2·802	295
Twenty-ninth	7·685	2·030	290
Thirtieth	8·000	1·875	250

The temperature reached its lowest point on the fifth day of the disease.

CASE 3.—John Franklin, æt. 11 years 6 months; assumed weight, 30 kilogrammes. The boy has felt poorly during the last fortnight, complaining of headache and sickness, but continued at his work till January 17th, on which day he vomited once or twice, and on the same evening the rash appeared.

Rash was general, second, third, and fourth days. Disappeared on fifth.

Desquamation began on the hand and leg on the eighth day, was general by the sixteenth; patient discharged on the

twenty-ninth. Desquamation then completed, except on the limbs.

Tongue thickly coated with white fur on the second day, was strawberry from the fourth to sixth inclusive. After this it improved.

The tonsils, pharynx, &c., were very red on the second and third days. They improved from the sixth.

The appetite improved on and after the sixth day.

The boy improved in appearance greatly on the fifth day.

The urine never contained any albumen.

Table showing the daily amount of urea, chloride of sodium, and urinary water excreted.

Day of disease.	Urea.	NaCl.	Water.
	Grammes.	Grammes.	
Third	11·160	0·465	310 c.c.
Fourth	15·624	1·176	420
Fifth	16·175	1·290	430
Sixth	Lost	Lost	.....
Seventh	11·882	2·425	485
Eighth	13·563	3·255	775
Ninth	15·960	3·657	665
Tenth	6·676	1·862	245
Eleventh	15·750	7·000	700
Twelfth	13·982	6·098	595
Thirteenth	14·965	8·200	820
Fourteenth	16·877	5·887	785
Fifteenth	15·562	7·750	750
Sixteenth	19·080	4·402	795
Seventeenth	22·370	4·698	895
Eighteenth	22·372	6·969	1010
Nineteenth	23·205	6·915	.....
Twentieth	19·550	6·375	850
Twenty-first	21·750	4·575	750
Twenty-second ...	22·230	6·184	780
Twenty-third	24·000	6·400	800
Twenty-fourth ...	22·500	8·190	900
Twenty-fifth	22·312	6·512	875
Twenty-sixth	25·440 .	.....	1060
Twenty-seventh ...	23·010	6·016	885
Twenty-eighth ...	19·500	4·950	825
Twenty-ninth ...	27·502	6·755	965

The temperature reached its lowest point on the sixth day of the disease.

CASE 4.—William Stephens, æt. 5; height, 3 ft. 1 inch; weight, 14 kilogrammes. On April 25th he vomited, complained of sore throat, and had a slight cough. On April 26th he had a slight blush of redness all over him; this increased in intensity till April 28th. Admitted on the sixth day of the disease; all the rash had disappeared, leaving a yellowish mottling. No desquamation occurred till the twenty-fifth day, when there was slight superficial but decided desquamation on the thighs, legs, and dorsum of feet; none on the soles of the feet, slight also on both shoulders. No further note was taken till the twenty-ninth day, when all desquamation had ceased.

Glands at the angles of the jaw were very much enlarged from the sixth to the nineteenth inclusive; they then declined, but still were too hard on the twenty-ninth.

Neck, first noted on the seventeenth, and to the twenty-second inclusive they were enlarged, that is to say, those close to the head, those immediately above the clavicle, were normal.

Groin, from the sixth to ninth inclusive, they were enlarged, hard, and shotty; they then declined, and on the twenty-fifth were normal in size, but too hard. On the twenty-ninth the left were normal, but the right were still too hard. On the seventh and eighth days were seen several red, hard elevations, about the size of peas, not unlike bug-bites, but without any central black spot or trace of bite; these were surrounded by a little ring of redness. The alæ of his nose were excoriated, and discharged at the time of admission, and continued in much the same state till the twelfth day, when it was rather better, but still remained red and excoriated till the twenty-fifth day, when they were all but healed.

Tongue thickly coated; tip and edge red, with prominent papillæ, sixth to eighth day inclusive; fur cleared off from the anterior part, but did not leave it red, on the ninth; from the eleventh day inclusive it was normal.

Tonsils.—Tonsils, uvula, &c., very deeply injected and swollen, whole posterior fauces covered with a thick, tena-

cious, opaque-looking membrane, from the sixth to eighth day inclusive. The redness then declined and the membrane thinned away, till, on the fourteenth, the membrane was replaced by a more purulent-looking matter. On the fifteenth the parts were decidedly better, and on the nineteenth they were normal.

The child's appetite was bad till the eighth day inclusive; it then improved, and after the ninth day continued excellent.

Heart healthy throughout.

Some sonorous rhonchus on the seventh, eighth, and ninth days; lungs otherwise healthy.

Throughout the time he was in hospital the child looked tolerably well; rather pale.

Urine at no time contained any albumen.

The child was admitted on the sixth day of the disease. On the sixth day the temperature rose to $102\frac{2}{3}$; on the seventh to $102\frac{2}{3}$; on the eighth to $100\frac{2}{3}$; on the ninth to 100; and on the tenth to 99. After this it daily rose to 99 till the nineteenth day.

Table giving the daily amount of urea, chloride of sodium, and urinary water excreted.

Day of disease.	Urea.	NaCl.	Water.
	Grammes.	Grammes.	
Seventh	7·477	.. ..	245 c.c.
Eighth	10·080	.....	320
Ninth	5·740	.....	205
Tenth	6·240	.....	240
Eleventh	5·290	.....	230
Twelfth	6·977	.....	325
Thirteenth	5·945	.....	290
Fourteenth	4·857	.....	355
Fifteenth	6·300	.....	420
Sixteenth	8·600	.....	400
Seventeenth	7·540	.....	580
Eighteenth	8·225	.....	470
Nineteenth	8·505	2·391	315
Twentieth	10·360	3·420	380
Twenty-first	10·450	3·420	380
Twenty-second	11·895	.....	390
Twenty-third	11·025	.....	315

Day of disease.	Urea.	NaCl.	Water.
	Grammes.	Grammes.	
Twenty-fourth ...	12·425	.....	350 c.c.
Twenty-fifth	10·020	.....	380
Twenty-sixth	Lost	.....	.....
Twenty-seventh...	8·640	2·764	270
Twenty-eighth ...	10·370	3·400	340
Twenty-ninth ...	9·715	2·827	290
Thirtieth	7·525	1·128	215
Thirty-first.....	6·880	1·612	.....
Thirty-second ...	9·310	4·650	490

CASE 5 (see Diagram 4).—Charles Macdonald, æt. 5½. Seized on September 25th; rash first appeared on the 27th; sore throat on the 26th. Rash was universal, and most remarked over the legs on the fourth day, then declined, and only a slight punctiform redness on the legs on the eighth day of the disease. Desquamation began about the ears and trunk on the eighth day. Glands at the angles of the jaw and in the groins were enlarged. Numerous sudamina noticed on the fifth day.

Tongue devoid of fur, rather red; papillæ rather prominent on the fourth day; tongue pale on the fifth and eighth days, and was normal on the eleventh.

Fauces, &c., rather red, but not swollen, on the fourth day. The redness disappeared, but they were rather swollen and covered with muco-purulent matter on the fifth day; natural on the eighth; no note taken between fifth and eighth days.

Appetite never bad.

Urine examined daily to the sixteenth day. No albumen at any time in the urine.

A very slight attack. Marked improvement was noticeable, however, with each fall of the temperature.

CASE 6 (see Diagram 3).—Thomas Stephens, æt. 4. Rash appeared on the second day of the disease, and lasted only one day. Desquamation began on the eleventh day. It had all but ended on the seventeenth day. On the third

Case 5. Charles Macdonnell.

H. Westrich.

Case 6. Thomas Stephens.

day the child greatly improved, and continued to mend till the seventh day, when he became restless and dull. On the eighth day numerous wheals of urticaria appeared on his arms; these continued to appear till the eleventh day, on which day they had all disappeared.

Urine was tested daily. On the ninth day there was a slight cloud of albumen; tenth, ditto; twelfth, there was a very large quantity of albumen; thirteenth, enormous amount of albumen; fourteenth, ditto; fifteenth, the quantity of urine greatly increased, the albumen less; sixteenth, ditto; seventeenth, no albumen in the urine; eighteenth, distinct cloud discovered; nineteenth, slightest trace; twentieth and twenty-first, no albumen.

On the twelfth day the child was drowsy; on the fifteenth he was rather puffy about the face. At no time was there any pitting of the legs nor face on pressure.

Heart always healthy.

CASE 7.—Duchatel, male, æt. 5 years 6 months; was seized on October 12th, between dinner- and tea-time. Rash appeared on the thirteenth; on the third day of the disease the temperature reached 103° ; on the fourth, $102\frac{2}{3}$; on the fifth, $100\frac{1}{3}$; on the sixth, 101; on the seventh, 100; on the eighth, $98\frac{2}{3}$; on the ninth, 99; on the tenth, 98.

CASE 8.—Welsh, male, æt. 3 years 6 months. On the ninth day of the disease the highest temperature was $102\frac{1}{3}$; on the tenth, $101\frac{2}{3}$; on the eleventh, $103\frac{1}{3}$; on the twelfth, $102\frac{2}{3}$; on the thirteenth, $103\frac{1}{3}$; on the fourteenth, $101\frac{2}{3}$; on the fifteenth it fell throughout the day, and reached $99\frac{4}{5}$, and continued afterwards at about this temperature.

CASE 9.—Eliza Brown, æt. 11 years. Rash appeared on the second day. The urine contained no albumen during her stay in the hospital. On the second day of the disease the temperature rose to 102; on the third, 102; on the fourth, 99; and continued at this last temperature on all the following days.

CASE 10.—Anne Johnson, æt. 7; height, 3 ft. $5\frac{1}{2}$ in.; weight, 16 kilogrammes. She first complained of some sore throat at dinner-time, May 25th, but continued in other respects in her usual health till tea-time, when she lay down and complained of headache and chilliness. During the night she was feverish and vomited.

The rash appeared on the second day of the disease, and disappeared on the sixth. Desquamation began on the sixth day of the disease, and was almost completed on the twenty-seventh. Some miliary vesicles were observed on the third day. The conjunctivæ were injected on the second and third days of the disease.

The glands at the angles of the jaw were never enlarged. The glandula concatenatæ were rather enlarged and hard till the twelfth day, when they were found to be normal. In the groins they were enlarged to the size of peas and beans; they became normal between the sixteenth and nineteenth days.

The tongue was very little affected; it was red, with prominent papillæ at the tip and edges, till the seventh day, and was normal on the twelfth.

The throat was vividly red and rather swollen on the second and third days. It became healthy on the eighth.

The appetite was bad till the seventh day, when it improved.

Heart was healthy till the fifth day, when a slight systolic basic murmur was heard. This disappeared between the twenty-second and twenty-seventh days.

The child was slightly delirious on the nights of the second and third days.

The urine was examined daily. It never contained any albumen.

General appearance.—The child never appeared at any time at all oppressed by the fever.

Diet.—May 26th, beef tea 1 pint, milk 1 pint, wine 4 oz. 28th, omit wine. 31st, pudding diet, milk 1 pint. June 4th, broth diet. 10th, meal diet.

The child was admitted on the second day of the disease.

On the second day of the disease the temperature rose to $102\frac{2}{5}$; on the third, 102; on the fourth, $100\frac{1}{5}$; on the fifth, $99\frac{2}{5}$; and continued to rise daily to this last temperature till the tenth, when it only reached 98.

Table giving the daily amount of urea, chloride of sodium, and urinary water.

Day of disease.	Urea.	NaCl.	Water.
	Grammes.	Grammes.	
Third	9.112	0.798	225 c.c.
Fourth	9.100	0.900	200
Fifth	6.075	0.911	135
Sixth	8.997	1.982	305
Seventh	6.090	1.450	290
Eighth	6.772	1.827	315
Ninth	Lost	.....	.....
Tenth	7.680	2.400	480
Eleventh	7.695	2.025	450
Twelfth	7.905	2.325	405
Thirteenth	9.625	4.012	535
Fourteenth	10.875	4.350	580
Fifteenth	7.800	2.640	480
Sixteenth	8.407	2.075	415
Seventeenth	8.797	3.191	345
Eighteenth	8.400	3.990	420
Nineteenth	8.062	3.082	375
Twentieth	10.500	5.250	700
Twenty-first	11.812	3.370	375
Twenty-second	9.360	2.470	260
Twenty-third	11.000	3.212	440
Twenty-fourth	12.255	4.827	645
Twenty-fifth	11.115	3.700	390
Twenty-sixth	11.375	4.225	650
Twenty-seventh	12.670	4.870	650
Twenty-eighth	12.420	3.510	540

CASE 11.—George Gibbs. No note was made of the date of the commencement, but merely of the day on which the rash appeared; this I have assumed to be the second day.

The rash disappeared on the eighth day; desquamation began on the eighth day, and was mostly completed on the twenty-seventh day. Some still remained on the feet and ankles till the thirty-ninth, and on the soles of the feet till the forty-seventh day.

Glands.—At the angles of the jaw they were enlarged; began to diminish on the eighth day, but were still somewhat enlarged on the thirty-first.

Groins, here they were so much enlarged as to be visible; they began to diminish on the ninth day, but were still spotty on the thirty-first.

Urine.—No albumen before and on the eleventh day; slight cloud on the twelfth; increased in quantity on the thirteenth; slight cloud from the fourteenth to the sixteenth inclusive; none on the seventeenth; none till the twentieth, on which day a large quantity was discovered. Still more albumen, urine smoky, on the twenty-first; albumen less, rather smoky, on the twenty-third; much more smoky on the twenty-sixth; very smoky, less albumen, on the twenty-seventh and twenty-eighth; less smoky on the twenty-ninth and thirty-first; not smoky, a slight cloud of albumen, on the thirty-fourth; very slight on the thirty-fifth; smoky, rather dense cloud of albumen, on the thirty-sixth and thirty-seventh; albumen less on the thirty-eighth; not smoky, and only slight cloud of albumen on the thirty-ninth and fortieth, and continued so to the forty-sixth day.

General condition.—Progressed favorably till the night of the eleventh, when he complained greatly of pain in the left ear, which continued during the twelfth day. Was puffy about the face, and pitted over the forehead on the twenty-second. This increased somewhat till the thirty-first day inclusive, and then declined.

Temperature.—On the second day of the disease the temperature reached to $102\frac{4}{5}$; on the third, $103\frac{3}{5}$; on the fourth, $101\frac{1}{5}$; on the fifth, $99\frac{3}{5}$.

It continued to rise daily to this point till the eleventh day, when it rose to 101. From the twelfth to the seventeenth days inclusive it never rose higher than $99\frac{3}{5}$.

The temperature was not taken on the eighteenth and nineteenth, but on the twentieth day it reached to $105\frac{1}{5}$; on the twenty-first, $99\frac{3}{5}$; on the twenty-second, $101\frac{1}{5}$; on the twenty-third, $99\frac{3}{5}$.

It then continued at about 99 till the twenty-sixth day

when it again rose to $103\frac{2}{3}$. From the twenty-seventh to the fortieth day it remained at about 99.

CASE 12.—Ann Swinson ; height, 3 feet 6 inches ; weight, 16·3 kilogrammes. She was admitted for supposed caries of the crest of the ilium. The scarlet fever developed itself whilst she was in the hospital.

On March 25th she had sore throat, and flagged. On the 27th, a doubtful rash was seen. She had no desquamation, and the reality of the nature of the disease was considered doubtful till the renal affection presented itself.

On the nineteenth day of the disease, between 6 and 7 a.m., seized with vomiting and shiverings ; the evening before she was pretty well. At the time of my visit she was oppressed, drowsy, very pale, and puffy. She complained of much frontal pain, and had lost her appetite. Pulse 176, respiration 48. Wounds about the ilium looking as before. Lungs were healthy. During the morning she perspired very profusely, and at 12 a.m. her trunk was covered with minute sudamina.

On the twentieth day was much improved ; complained of no pain anywhere. Rather drowsy ; appetite very bad ; pulse 116, very weak ; wounds looking much the same. Last night, about 7 p.m., complained of much pain in right foot ; there was no redness nor swelling, but it was very tender. This morning there is a deep-red blush over the malleoli, and this part is very tender. Appetite very bad.

On the twenty-first she was less puffy, complained of no pain ; pulse 132, feeble. Redness over the right ankle increased in intensity and area ; the wounds about the crest of the ilium were looking well ; appetite was better than yesterday ; less drowsy.

Twenty-second.—Passed a restless night ; still rather puffy ; ankle more swollen, very red, and painful ; pulse 108, weak ; lungs healthy ; heart, first sound at the apex murmurish.

Twenty-third.—Matter pointing over the outer malleolus ; appetite a little better ; still puffy looking.

Twenty-fourth.—Much the same ; first sound of the heart at the apex dull.

Twenty-fifth.—Swelling extending up the leg.

Twenty-sixth, 3 a.m.—Active vomiting came on, greenish colour, accompanied with diarrhœa ; lips and tongue rather dry ; soft systolic apex murmur ; ankle opened.

Twenty-eighth.—Much thin discharge from the wound at the ankle ; redness very much less ; no sickness, no diarrhœa.

Thirty-first.—Face pasty looking ; tongue dry ; discharge from ankle less. No pitting of any part of body, except right foot ; distinct apex systolic murmur.

Thirty-second.—Decidedly better.

Subsequently active tubercular deposition took place in her lungs.

Urine.	Urea.	Quantity.	Albumen.
5-30, March 27th, to 10 a.m., March 28th	4.779	117	
Fifth day, March 28th and 29th ...	4.720	.....	Shade.
Sixth	3.877	235	Slight shade.
Seventh	5.037	310	Slight shade.
Eighth	6.020	430	Slight shade.
Ninth	7.59	660	Rather more.
Tenth	7.450	745	Shade.
Eleventh	11.325	1175	Shade.
Twelfth	11.325	1175	Shade.
Thirteenth	8.712	1025	Shade.
Fourteenth	9.776	1185	Shade.
Fifteenth	9.150	915	Shade.
Sixteenth	8.085	735	None.
Eighteenth	10.442	585	None.
Nineteenth	7.995	390	None.
Twentieth.—Smoky, red colour .....	.....	.....	Abundant.
Twenty-first.—Slightly smoky .....	.....	.....	Very abundant.
Twenty-second	1.875	110	Fills two thirds of the tube.
Twenty-third	0.510	60	Fills two thirds of the tube.
Twenty-fourth.—Albumen much less	.....	85	
Twenty-fifth.—Urine contains casts and uric acid, and also kidney-epithelium.			
Twenty-sixth.—Albumen much more abundant.			
Twenty-seventh.—Albumen much more abundant.			

Case 16. Ellen Kepping.

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On the twenty-second and twenty-third days the albumen was removed by shaking up the urine with animal charcoal.

She was readmitted on the seventy-eighth day; the urine still contained abumen.

Temperature.—On the third day the temperature reached $100\frac{3}{5}$; on the fourth, $98\frac{3}{5}$; on the fifth, $98\frac{3}{5}$; on the sixth, $98\frac{1}{5}$; on the seventh, $100\frac{1}{5}$; on the eighth, $100\frac{1}{5}$; on the ninth, $100\frac{3}{5}$; on the sixteenth, 99; on the seventeenth, 97; on the eighteenth, $98\frac{3}{5}$; on the nineteenth, 105; on the twentieth, 100; on the twenty-first, $101\frac{3}{5}$; on the twenty-second, $103\frac{1}{5}$; on the twenty-third, $101\frac{4}{5}$; on the twenty-fourth, 102; on the twenty-fifth, $100\frac{2}{5}$; on the twenty-sixth, $100\frac{2}{5}$; on the twenty-seventh, $101\frac{4}{5}$; on the twenty-eighth, $102\frac{1}{5}$.

CASE 13.—Charles Ebett, æt. 3 years 9 months. The commencement of the disease in this case was not noted, but merely the first appearance of rash. This I have assumed to be the second day.

This was a very slight case.

Temperature.—On the second day of the disease the temperature rose to $101\frac{3}{5}$; on the third, $99\frac{4}{5}$; on the fourth, $99\frac{2}{5}$; on the fifth, $97\frac{4}{5}$; on the sixth, $97\frac{3}{5}$.

CASE 14.—Matilda Browne. The lowest temperature occurred on the fifth day, the temperature falling from $102\frac{3}{5}$ to 100.

CASE 15.—Sarah Hewett, æt. 7. She was seized on 7th, shortly after breakfast. The rash appeared on the second day.

The temperature on the third day rose to 101; on the fourth, to 100; on the fifth, to 99.

CASE 16 (see Diagram 4).—Ellen Kipping, æt. 11. Seized Monday, September 30th, with vomiting, diarrhœa, anorexia, and complained of sore throat. Rash first noticed on October 1st. It was intensely marked. It had nearly

disappeared from the whole body on the seventh. Desquamation began on the ninth, about the forehead and labia. Tongue was rather furred on the second day, thickly coated on the third; after this it was of the strawberry character to the ninth inclusive; after this no notes were made.

Fauces were vividly red, but not swollen, to the fifth day inclusive, and improved on the eighth.

Conjunctivæ were injected till the seventh day inclusive.

Glands at the angles of the jaw were slightly enlarged; more so in groins.

Urine was tested till the ninth day; on the fifth and sixth there was a slight trace of albumen.

The child was rather delirious during the fourth and fifth nights.

Appetite was very bad till the sixteenth, when it improved somewhat.

This was decidedly a sharp attack. The rash was strongly marked. She was very heavy and prostrate till the fifth day, when she very greatly improved, and then continued to mend.

CASE 17 (see Diagram 5).—Maria Hodge, æt. 2 years 2 months. Scarlet fever, urticaria, chicken-pox. The child had an attack of measles three weeks before her admission into hospital. The attack lasted about a week, and then she appeared quite well again. On July 19th was quite well during the day, but was very restless during the night. Next day the rash appeared, and she was feverish and had no appetite. Rash at the time of admission was slight everywhere, but most marked on the legs. It disappeared from the face, chest, and abdomen on the fifth day, and from the legs and arms on the seventh. In this case the rash on the arms and legs was much localized, and caused hard, spotty elevations, some the size of a small pea; it was in these that the rash remained so long.

Desquamation.—Face, none; trunk, none. Legs, appeared on the folds of thighs on the eighth, and disappeared on the ninth. Appeared on the arms slightly on the ninth, dis-

Case 17. Maria Hodge.

appeared on the tenth ; on the sixteenth there was some on the palms of the hands.

On the seventh day of the disease a wheal of urticaria was noticed ; a few more appeared on the eighth and ninth. They consisted of elevations about the size of peas, pale, semi-transparent, hard, and surrounded by a ring of redness an inch in diameter.

On the seventh a vesicle of chicken-pox was seen on the chest, followed by a few others till the twelfth day inclusive. These, instead of drying up and healing, ulcerated and became surrounded by much swelling. The ulcers began to heal on the fifteenth day.

Alæ of nose became excoriated with a thin, sanious discharge on the seventh, continuing much the same till the thirteenth, when it improved gradually to the eighteenth day.

Tongue thickly coated, red on the third day, then cleaned ; papillæ were prominent on the anterior part still on the fifteenth ; was normal on the ninth.

Fauces, &c., very red and swollen, fourth and fifth days ; still more so, and covered with muco-purulent-looking matter, on the sixth to eighth inclusive. They then improved, and were almost normal on the eighteenth.

Appetite improved on the fourth day, and continued good after the fifth.

Glands at the angles of the jaw were not enlarged ; on the third day began to enlarge ; on the fourth they increased in size, till the enlargement was visible on the eighth ; they then decreased, and were almost of natural size on the eighteenth. In groin they were first enlarged on the fifth day, and continued slightly enlarged till the ninth, after which they were of normal size.

Urine was examined daily till the twenty-ninth day ; no albumen was at any time discovered.

The child appeared to be in a very delicate state and the lips were very dry on the third, cracked and swollen on the eighth and ninth ; they then improved somewhat.

On the fifth day a decided improvement, however, was noticed ; on the sixth, seventh, and eighth, was not so well

again; vomited. She continued very poorly and heavy during the eleventh and twelfth. After this the child improved.

CASE 18.—Eliza Cunningham, æt. 7; assumed weight, 16 kilogrammes. The patient was in the hospital for epilepsy at the time of her seizure. On April 24th, at 11 a.m., she complained of headache and sore throat; soon after, she vomited. After this she appeared to be in her usual health till 4 p.m., when she again vomited, and on being undressed to be put to bed the rash was detected.

Thus the rash appeared on the first day, and disappeared on the eighth day.

Desquamation began on the ninth day and had ceased everywhere on the twenty-eighth day, except on the hands and feet.

Eyes were much injected with some muco-purulent-looking discharge from the second to the sixth day inclusive; it then declined, and ceased on the eleventh day.

Glands.—Angles of jaw were enlarged from the second to eleventh days inclusive, then the swelling declined, and disappeared between the twenty-fourth and twenty-eighth.

The glands of the neck were also enlarged, hard, and spotty.

Groins.—A little hard on the second day, enlarged on the third; still more, so as to be visible, during the fourth and fifth; then the swelling declined, and ceased between the twenty-fourth and twenty-eighth days.

Numerous ecchymoses noticed under the clavicles and in groins on the fourth and fifth days.

Some miliary vesicles appeared on the fourth and fifth days.

Sudamina appeared on the eighth day, and were still more numerous on the ninth.

The child was delirious during the night of the first to the fourth inclusive.

Tongue was thickly coated with a creamy fur, the papillæ being prominent on the second and third day. Well-marked

strawberry on the fourth and fifth; it then improved, and was natural on the seventeenth.

Fauces, &c., were very red; on the second day after this the parts improved, and were almost normal on the sixth, continuing, however, a little red and flabby till the tenth.

Heart and lungs healthy throughout.

Pulse was found to be irregular on the twenty-fourth to twenty-eighth days; no other notes made.

General appearance.—Child was heavy and dull on the second day; lips were dry and excoriated on the third; looked better on the fourth day; was decidedly so on the fifth; sat up in bed and played. Then improved till the ninth, when she looked puffy and was rather drowsy. This continued till the twelfth inclusive. After this she improved, though she long continued to be very pale.

There was no albumen in her urine at any time.

Diet.—April 27th, beef tea 1 pint, milk 1 pint, wine 4 oz. May 4th, pudding diet, wine 3 oz. 11th, fish, wine 2 oz.

Temperature.—On the second day of the disease it reached 105; on the third, $105\frac{1}{5}$; fourth, $104\frac{2}{5}$; fifth, $102\frac{2}{5}$; sixth, $102\frac{2}{5}$; seventh, $103\frac{1}{5}$; eighth, $101\frac{1}{5}$; ninth, 101; tenth, 101; eleventh, $100\frac{2}{5}$; twelfth, $99\frac{2}{5}$; thirteenth, $99\frac{4}{5}$; fourteenth, $99\frac{2}{5}$; fifteenth, $98\frac{3}{5}$. It continued at about $98\frac{3}{5}$ till the twenty-third day, after which it was not taken.

Table showing the daily amount of urea and urinary water.

Day of disease.	Urea.	Urinary water.
	Grammes.	
Third	13.950	450 c.c.
Fourth	14.550	485
Fifth	15.240	635
Sixth	8.972	485
Seventh	8.910	810
Eighth	10.290	980
Ninth	5.898	715
Tenth	5.665	515
Eleventh	5.197	385
Twelfth	6.050	550
Thirteenth	4.567	435

Day of disease.	Urea.	Urinary water.
	Grammes.	
Fourteenth.....	6·825	350 c.c.
Fifteenth	7·312	325
Sixteenth	6·195	590
Seventeenth	8·550	450
Eighteenth.....	Lost	.....
Nineteenth.....	10·135	280
Twentieth	10·360	280
Twenty-first	9·350	275
Twenty-second ...	10·767	365
Twenty-third.....	9·657	365
Twenty-fourth ...	10·725	330
Twenty-fifth	11·700	325
Twenty-sixth	12·240	360
Twenty-seventh...	9·460	220
Twenty-eighth ...	9·800	245
Twenty-ninth.....	11·812	315
Thirtieth	6·982	245
Thirty-first.....	7·020	390
Thirty-second ...	12·410	730

CASE 19 (see Diagram 6, *a* and *b*).—Anne Lynch, æt. 3 years 3 months. On April 28th she had rigors. Lost her appetite, and subsequently was very thirsty.

On April 29th the rash appeared. She never complained of sore throat. The rash disappeared on the tenth day.

Desquamation began on the seventh day; it had mostly ceased on the twenty-fourth, but still continued on the heel on the forty-third day of the disease. It also continued on the palms of the hands till the thirty-sixth day.

Numerous miliaria were observed over the whole body, except the hands, arms, and feet, on the fourth and fifth days.

Glands at the angles of jaw were rather enlarged on the third and fourth days, and greatly so from the fifth to the eighteenth days inclusive, those on the right side being the most so. They decreased in size from the twenty-second, though on that day they were as large as a chestnut. They were still enlarged on the fifty-first day.

The glandula concatenatæ on both sides were enlarged.

In the groin they were rather enlarged from the third to

Case 19. Anne Leach.

Nº 6^A

W. West/ Lach.

Anne Leach, *Cont'd.*

the twenty-ninth day; after this they decreased, and were normal on the thirty-sixth.

Tongue was red, with prominent papillæ on the fourth. It then improved, and on the eighth and ninth it was pale and smooth. After the sixteenth day it was normal.

Fauces, &c., lividly red; tonsils much enlarged, and covered with exudation; much muco-purulent-looking fluid over the posterior fauces from the third to the ninth day inclusive. They were less red, and some exudation was observed on the posterior surface of the uvula on the eleventh day. The tonsils were so swollen as almost to meet on the thirteenth and fourteenth days. A small ulcer was noticed on the palate from the sixteenth to the eighteenth days inclusive. The swelling diminished in size from the twenty-second, and were almost natural on the twenty-fourth.

Appetite was bad till the fourteenth day inclusive. It was excellent from the eighteenth to the twenty-ninth inclusive. On the thirty-third it was bad again, and continued so on the thirty-fourth and thirty-fifth, after which it improved again.

A discharge from the right ear began on the thirty-sixth, and continued till the forty-third day.

Heart was healthy throughout.

Some sonorous rhonchus heard in the lungs on the fifth day.

There was no pitting of the forehead, sacrum, nor legs, on pressure, at any time.

General appearance.—The child was oppressed till the eighth day. After this she improved, and continued pretty well till the thirty-fourth day, when she became very ill again. She was very drowsy from the thirty-third to the thirty-sixth day inclusive.

Urine was examined daily on the twenty-third for the first time; a distinct cloud of albumen was noticed.

Twenty-fourth.—More abundant.

Twenty-sixth.—Still more abundant.

Twenty-seventh.—After boiling and being allowed to stand, the coagulated albumen filled one third of the tube.

To-day, for the first time examined microscopically, a little blood was found, and some uric-acid crystals.

Twenty-eighth.—Albumen fills one half of the tube.

Twenty-ninth.—Albumen same in amount; urine contained blood; casts waxy and granular.

Thirtieth.—Urine very smoky; albumen about the same; contained blood and casts.

Thirty-first.—Of a red colour, evidently due to blood; albumen the same; contained casts, blood, and uric-acid-crystals.

Thirty-second.—Less smoky; albumen a little less; blood, uric acid, casts.

Thirty-third.—Albumen fills one fourth of the tube. Blood appears to be much more abundant; casts and uric acid.

Thirty-fourth.—Albumen same, judging by the colour and the amount of deposit; the blood much more abundant.

Thirty-fifth.—Same.

Thirty-sixth.—Albumen fell one third of tube; urine still redder; casts, with blood, pus, and kidneys; epithelium imbedded in them, also some free from corpuscles.

Thirty-seventh.—Urine very much better, much less red; deposit of blood much less abundant; albumen occupies about one seventh of the tube; cast and pus-cells.

Thirty-eighth and thirty-ninth.—Ditto.

Forty-first.—Albumen less now, merely smoky, and rather red; albumen fell one twelfth of tube.

Forty-second.—Urine better.

Forty-fourth.—An abundant cloud of albumen; urine still pinkish and smoky.

Forty-sixth.—Not smoky. Rather abundant cloud of albumen.

Forty-seventh.—Much more smoky again.

Forty-eighth.—Blood appears to be much more abundant again. Rather thick cloud of albumen. Microscope—blood-casts and plenty of kidney-epithelium.

Forty-ninth.—Still worse, redder, and brown. Very abundant precipitate of blood. Abundance of urine passed.

Fifty-first.—Still very smoky and red.

Fifty-second.—Still very red, and copious deposit of blood. On boiling did not get a trace of albumen.

Fifty-third.—Ditto.

Fifty-fourth.—Ditto but got a decided cloud of albumen, when urine shaken so as to mix the blood with it.

Fifty-fifth.—Same.

Fifty-sixth.—Decidedly better, scarcely smoky. No deposit of blood.

Fifty-seventh.—Urine still less smoky; amount of albumen greatly increased.

Fifty-eighth.—Not smoky; an abundant cloud of albumen.

Sixty-first.—Not smoky; albumen rather less.

Sixty-third.—Urine abundant; distinct cloud of albumen.

Sixty-fifth.—Again red and smoky, with rather abundant cloud of albumen.

Urine always abundant.

CASE 20.—Louisa White; height, 3 feet 5 $\frac{1}{4}$ inches; weight, 15·4 kilogrammes. She was in the hospital with a slight attack of chorea, and was discharged on account of the prevalence of diphtheria, but was very soon readmitted with scarlet fever.

She was seized with sore throat on March 12th. The rash appeared on the same day, and on the first day the rash was over the whole body except the feet.

Second day it reached the feet, elsewhere declining. Disappeared from the face on the third day; from the forearm on the fourth; from the legs on the fifth; from the shoulders and all the body, except immediately beneath the clavicles and over the pubes, on the sixth, and on the seventh it had universally disappeared.

Desquamation began on the seventh day on the face and neck; on the eighth day it implicated the entire trunk and arms; on the ninth it began on the palms of the hand; on the fourteenth on the thighs; sixteenth, on the fore legs, and at the same time it was completed everywhere else except on the hands.

Twenty-ninth.—Almost completed on the palms.

Thirty-sixth.—Still desquamating on the soles of the feet.

The conjunctivæ were injected on the first, second, and third days.

Glands (angle of jaw.)—They were rather enlarged on the first day; they increased in size till the tenth day; between this and the twenty-sixth they became normal.

Glands in the groins were much enlarged, so as to be visible, and on thirty-first day were still enlarged.

Glands of neck were also enlarged.

Tongue red, with patches of fur, on the first day. From the second to eighth inclusive it was strawberry; on ninth and tenth day pale, and rather dry. Became moist on sixteenth, and then was a little red, and continued so to thirty-sixth, when it was still smooth in the centre.

Fauces red and inflamed on the first day; increased in size, so that the tonsils almost met, till the third. On the fourth the parts were covered with a tenacious-looking membrane. On seventh, besides the above membrane, there was much muco-purulent-looking fluid. On tenth, tonsils were less swollen; after this declined till on the fifteenth its parts were only slightly swollen and red.

No delirium on the first night. Delirious during the second, third, and fourth nights.

Appetite very bad till the ninth day, when it improved and continued good afterwards.

Lips, nose, &c.—First day sordes on lips; this continued, and on the fifth, lips were drier and the alæ of the nose became red and excoriated. After the eighth day these improved somewhat, but nose continued red and excoriated and the lips dry till the twenty-fifth day.

Choreac movements became worse somewhat on the third, fourth, and fifth days. Much better on sixth, and ceased on the seventh; continued so till the twenty-seventh, when they were slight, and then disappeared again, not returning up to the time of her dismissal. Her movements, however, throughout were awkward.

Child was very ill and did not improve till the tenth day, when a slight improvement was noted, and convalescence after this was very slow till the twenty-eighth day, when a decided improvement was noticed.

No albumen in the urine at any time.

Temperature.—On the tenth day the temperature rose to $103\frac{3}{5}$; on the second, to $103\frac{2}{5}$; on the third, to $102\frac{3}{5}$; on the fourth, to $100\frac{2}{5}$; on the fifth, to $100\frac{3}{5}$; on the sixth, to $101\frac{3}{5}$; on the seventh, to $100\frac{3}{5}$; on the eighth, to $101\frac{3}{5}$; on the ninth, to $102\frac{2}{5}$; on the tenth, to $102\frac{3}{5}$; on the eleventh, to $102\frac{1}{5}$; on the twelfth, to $101\frac{1}{5}$; on the thirteenth, to $99\frac{3}{5}$; on the fourteenth the temperature continued about 99 till the fortieth day.

Table showing the daily amount of urea, chloride of sodium, and urinary water.

Day of disease.	Urea.	NaCl.	Water.
Second	7·370	0·440	220 c.c.
Third	10·650	0·600	300
Fourth	10·608	1·035	345
Fifth	9·800	0·980	280
Sixth	9·300	1·035	345
Seventh	9·300	1·705	620
Eighth	9·347	1·110	370
Ninth	8·200	1·840	400
Tenth	5·880	1·120	280
Eleventh	7·425	1·320	330
Twelfth .....	.....	Lost.	.....
Thirteenth	7·245	.....	345
Fourteenth	7·065	2·363	305
Fifteenth	4·140	1·350	180
Sixteenth .....	.....	Lost.	.....
Seventeenth	7·567	.....	322
Eighteenth	5·200	.....	200
Nineteenth	7·227	.....	245
Twentieth	5·565	.....	210
Twenty-first	7·055	.....	415
Twenty-second	7·930	.....	305
Twenty-third	7·287	.....	275
Twenty-fourth .....	.....	Lost.	.....
Twenty-fifth	11·100	.....	555
Twenty-sixth			
Twenty-seventh	5·865	.....	345
Twenty-eighth	6·410	.....	435
Twenty-ninth	7·827	.....	505
Thirtieth	9·067	.....	585
Thirty-first	10·005	.....	435
Thirty-second	8·580	.....	520
Thirty-third	8·100	.....	360
Thirty-fourth	6·743	.....	415
Thirty-fifth	12·610	.....	485
Thirty-sixth	11·760	.....	480
Thirty-seventh	8·500	.....	500

CASE 21.—Anne Neil. Rash appeared on the 27th April. No rash at any time on the face.

Chest.—Numerous reddened, elevated papillæ, from the second to the fifth day inclusive. After this it declined, and had disappeared on the ninth.

Abdomen.—Same as on chest, except that it commenced to decline on the fifth, and some slight rash still continued on the ninth day.

Legs the same as the abdomen.

Desquamation.—No note was made on the ninth and tenth days, but on the eleventh it was slight on the chin and chest.

Glands at both angles of the jaw were enlarged slightly on the second day; those on the left side continued slightly enlarged till the thirteenth, when they were normal; those on the right side, after the second day, increased greatly in size, and were still so on the thirteenth. Glands down the neck were also greatly enlarged. In groin they were so enlarged as to be visible. The enlargement commenced on the second and declined on the fifth.

Tongue thickly furred on the second; this cleared off, and left the strawberry tongue on the fourth; this continued till the eighth inclusive; the papillæ then became less prominent, but on the fourteenth tongue was still beefy.

Fauces, &c., very red and much swollen, from the second to fourth inclusive; this was still more marked from the fifth to seventh; on the latter day the parts were very much more red and swollen. On the eighth the redness and swelling began to decline, and the parts were covered with muco-purulent-looking matter. On the thirteenth day they were still swollen and red.

Abundance of sudamina were observed on the chest and abdomen on the second day.

Appetite was rather bad on the fourth day; after this it slowly improved till the eighth day, when it was again bad, but improved on the thirteenth.

The child throughout was in a very low condition. Lips were dry from the first; alæ of nose became red and exco-

Case 22. Margaret Peacock. $\text{Aet } 5\frac{1}{2}$

riated on the sixth, and continued so throughout. Lips were greatly swollen, cracked, and bleeding, on the ninth day; on the fifteenth they were better.

Bowels.—From the fifth to the ninth had three or four liquid motions daily; on the fourteenth day the motions were less frequent.

Child died suddenly on the night of the sixteenth.

Post-mortem.—The lymphatic glands generally of the body were loaded with tubercle, and the small intestines extensively ulcerated. There was old cretified tubercle in the lungs; none of recent origin.

Temperature.—On the second day it rose to $103\frac{2}{5}$; on the third, to $104\frac{3}{5}$; on the fourth, to $103\frac{4}{5}$; on the fifth, to $103\frac{3}{5}$; on the sixth, to $102\frac{3}{5}$; on the seventh, to $102\frac{4}{5}$; on the eighth, to $102\frac{2}{5}$; on the ninth, to 103 ; on the tenth, to $103\frac{2}{5}$; on the eleventh, to 104 ; on the twelfth, to $103\frac{3}{5}$; on the thirteenth, $102\frac{1}{5}$; on the fourteenth, $101\frac{4}{5}$; on the fifteenth, $101\frac{2}{5}$; on the sixteenth, $101\frac{2}{5}$.

CASE 22 (see Diagram 7).—Margaret Peacock, æt. $5\frac{1}{2}$. Seized at 1 a.m., September 9th. Rash appeared on the same day. She first complained of sore throat on September 2nd, but remained in her usual health till the 9th. Rash was universal on the first, and disappeared on the fifth day.

Desquamation began on the chest, abdomen, and arms on the twelfth day; began on the legs on the sixteenth, and on the same day was completed on the chest; ceased on the abdomen and legs between the twentieth and twenty-seventh days, and still continued on the hands on the twenty-seventh.

Alæ of nose in this case were excoriated.

Conjunctivæ injected from the first to third day inclusive.

Lips were dry and covered with sordes from the first to twelfth day inclusive.

Glands at the angles of the jaw were enlarged on the first, and continued so to the ninth. On the tenth and twelfth the swelling had increased greatly, extending on the

face over the parotid gland; on the thirteenth it began to diminish, but continued to be enlarged even on the twenty-seventh. Glands in groin were enlarged on the sixteenth day; after this no note of their condition was made.

Tongue, rather furred on the first; fur cleared off, but left the tongue dry and brown, on the third; remained so and was cracked till the eleventh day inclusive; on the thirteenth it was moister; on the sixteenth was clean, continuing so afterwards.

Fauces, &c., red and covered with mucus on the first and third; were still redder on the fourth. Redness was less, but swelling more, on the fifth to ninth inclusive; the parts then improved, and were normal on the sixteenth.

Body covered with sudamina on the ninth. Appetite improved on the ninth day.

Lungs healthy throughout.

Heart was healthy on the ninth. No note was made after this till the eleventh, when a distinct murmur was caught, audible at base and apex, most so at the base. It became much less distinct at the apex on the twelfth; the murmur continued throughout.

Never any albumen in her urine.

Child continued very poorly till the ninth day, when she improved, and continued from this time to mend.

CASE 23.—Sophia Pattenson, æt. 5½. On September 12th, after tea, she was seized with vomiting and pain in the head. On September 13th the rash appeared; was universal. According to the mother, it declined on the 15th September (fourth day). It disappeared from the whole body on the seventh.

Desquamation began on the face on the seventh; on the chest and abdomen on the eighth; on the legs between the thirteenth and seventeenth days; on the palms on the tenth; was very active on the chest, abdomen, and the arms, on the seventeenth, and was completed on the twenty-first; still continues on the legs and hands on the twenty-fourth day.

Glands at the angles of the jaw were normal till the ninth day, when they became swollen and very painful on the left

side; they decreased in size from the eleventh, but still remained much enlarged on the seventeenth day. Glands in groin were enlarged on the fifth day, and resumed their normal size between the thirteenth and twenty-first days.

Tongue clean throughout.

Throat normal throughout.

Appetite was middling on the sixth day, and improved after this.

Lungs always healthy.

Heart.—A distinct systolic murmur, audible at base and apex, on the eighth; ceased at the apex but continued audible at the base, and was inaudible at either cartilage from the ninth to the thirteenth inclusive. No murmur was audible on the seventeenth nor twenty-first day. No notes were taken in the intermediate days.

No albumen in the urine at any time.

The child was cheerful on the fifth; on the sixth became heavy, drowsy, and fretful, passed a restless night on the eighth. After the ninth day she improved again rapidly.

Temperature.—On the fifth day it reached 100; on the sixth, $99\frac{2}{3}$; seventh, $99\frac{1}{5}$; eighth, $104\frac{1}{3}$; ninth, $103\frac{1}{3}$; tenth, $102\frac{2}{3}$; eleventh, $102\frac{2}{3}$; twelfth, $102\frac{2}{3}$; thirteenth, 100; fourteenth, $98\frac{2}{3}$; fifteenth, $98\frac{2}{3}$. It remained at about 98 till the twenty-fifth day.

CASE 24.—Mary Hugden, æt. 11; weight, 25·5 kilogrammes. Patient was seized with sore throat on November 23rd; rash appeared on the 24th. Rash was well out and universal till the seventh day inclusive; then declined, and, on the tenth, there was a mere trace.

Desquamation began on the face on the seventh; began on the hands on the ninth; on the twelfth it was universal.

Tongue was dry and glazed on the seventh; moister, eighth and ninth.

Sweated profusely on the night of the eighth and ninth. Appetite improved on the tenth.

Observations were then discontinued till January 22nd (sixty-first day). During this interval she had much blood

and albumen in the urine. On the sixty-first day she was very pale, scarcely any anasarca.

A small amount of albumen occurred in the urine from the sixty-third to sixty-eighth days inclusive; after this the urine was not examined.

The temperature in this case was not taken after the twelfth day; from the fifth to the twelfth days inclusive the temperature varied between 103° and 104° .

Table giving the daily amount of urea, NaCl, and urinary water.

Day of Disease.	Urea.	NaCl.	Water.
	Grammes.		
Sixth	17·550	3·565	1486 c.c.
Seventh	18·487	4·006	2175
Eighth	15·200	2·968	2375
Ninth	13·450	2·220	1850
Tenth	14·437	1·788	1875
Eleventh	14·265	1·902	1585
Twelfth	15·096	2·294	1480
Thirteenth	10·400	0·357	650
Sixty-third	6·570	.....	595
Sixty-fourth	6·864	3·630	660
Sixty-fifth	9·086	4·543	770
Sixty-sixth	6·420	.....	600
Sixty-seventh	5·050	2·127	370
Sixty-eighth	7·155	3·445	530

CASE 25.—Emma Walsham, height, 4 ft. $1\frac{1}{2}$ in.; weight, 23·6 kilogrammes. Sore throat noticed on April 3rd; rash appeared on the third day. She came under notice on the sixteenth day of the disease. On that day there was copious desquamation over the neck; on the eighteenth day it involved the chest, abdomen, and thighs; on the twenty-first it began on the palms of the hands; on the twenty-eighth it had ceased on the arms; on the thirty-second it was completed on the chest; also on the abdomen on the thirty-sixth. On the thirty-ninth desquamation only

observed on the feet, and here it was still continued on the forty-fourth day.

Tongue was pale, and some of the papillæ rather prominent when admitted.

The glands at the angles of the jaw reached their normal size between the twenty-ninth and thirty-ninth days. On the forty-fourth they were still shotty in the groins.

Heart and lungs healthy throughout.

On the twenty-seventh day the child was noticed to be puffy about the face (she had been up for several days); twenty-eighth, kept in bed; puffy about eye, and continued so. On the thirty-first day was very feverish, and, during the night, she was delirious.

Urine.—Seventeenth day.—No albumen.

Eighteenth.—A shade.

Nineteenth to twenty-sixth inclusive.—No albumen.

Twenty-seventh.—A shade.

Twenty-eighth.—More distinct; no blood.

Twenty-ninth.—Ditto, ditto.

Thirtieth.—Distinct cloud of albumen. Some blood detected by microscope.

Thirty-first and thirty-second.—No albumen. Some blood detected.

Thirty-fourth.—Smoky, but scarcely a trace of albumen.

Thirty-fifth.—Slightest cloud of albumen. Blood less.

Thirty-sixth.—No albumen. Blood less.

Thirty-seventh.—Slight trace of albumen. Some blood.

Thirty-ninth to forty-first inclusive. No albumen, but blood-discs seen.

From forty-second day to time of dismissal, no blood nor albumen.

Temperature.—The patient was admitted on the sixteenth day of the disease; from this date till the twenty-seventh day inclusive, it remained normal. On the twenty-eighth, it rose to 100; on the twenty-ninth, to 104 $\frac{2}{3}$; on the thirtieth, to 98 $\frac{3}{5}$; and, on the thirty-first, to 99 $\frac{3}{5}$. After this it continued between 98 and 99 till the forty-sixth day.

Table giving the daily amount of urea and urinary water.

Day of Disease.	Urea.	Water.
	Grammes.	
Seventeenth	7·875	750 cc.
Eighteenth.....	15·360	960
Nineteenth.....	Lost.	...
Twentieth	13·322	730
Twenty-first	12·320	880
Twenty-second ...	11·000	500
Twenty-third.....	12·247	710
Twenty-fourth ...	11·870	625
Twenty-fifth	14·550	430
Twenty-sixth.....	13·120	410
Twenty-seventh...	12·905	445
Twenty-eighth ...	12·200	610
Twenty-ninth.....	11·560	680
Thirtieth	11·505	885
Thirty-first.....	13·037	745
Thirty-second ...	9·955	610
Thirty-third	11·407	585
Thirty-fourth.....	12·800	800
Thirty-fifth	10·406	925
Thirty-sixth	14·899	908
Thirty-seventh ...	13·680	1140
Thirty-eighth.....	12·325	850
Thirty-ninth	14·700	700
Fortieth	15·505	585
Forty-first	15·502	385
Forty-second	16·065	595
Forty-third.....	17·381	675
Forty-fourth	16·500	600
Forty-fifth	13·870	730

CASE 26 (see Diagram 8).— Mary Anne Dall, æt. 2 years 2 months, was first seized at 5 p.m. of Sept. 11th. Rash appeared on the afternoon of Sept. 12th.

At the time of admission there was a slight rash over the whole body, papilliform; this left the chest on the eighth day; abdomen, leg, and arms, on the seventh.

Glands at angles of jaws and groins, were slightly enlarged, till the tenth day inclusive.

The throat was red and swollen on the sixth, after this it improved, and was much better on the tenth.

Tongue was furred on the seventh, clean on the eighth day.

Case 26. Mary Ann Dally.

Nº 8.

W West Lake

Case 29. James Kelly. At 9 years, 4 months.

Nº 9.

W. West. 12th.

Heart and lungs were always healthy.
No albumen in the urine at any time.

CASE 27.—Mary Wright, urine never contained any albumen. Child died on the fourth day of the disease.

Temperature.—On the second day, it rose to $104\frac{4}{5}$; on the third, $104\frac{3}{5}$; on the fourth, $104\frac{3}{5}$.

CASE 28.—Mary Clarke, æt. 5 years 3 months. July 9th, in the morning the child was chilly, in the evening she complained of headache.

July 11th, rash first noticed.

Rash was strongly out over the whole body, till the sixth day inclusive, then diminished, and disappeared from the legs and arms on the eighth, and on the same day it was very slight on the rest of the body.

Miliary vesicles appeared on the fourth day, increased in quantity till the sixth inclusive, occurring on neck, chest, abdomen, and thighs. All trace of them was gone on the seventh.

Child vomited several times a grass-green coloured matter on the fourth and fifth, none on the sixth.

There was no albumen in the urine at any time. Was first delirious on the night of the fifth, this continued nightly till time of her death. She had a very putrid smell on the eighth day. Died on the eighth day.

The temperature throughout varied between 103° and 105° .

CASE 29 (see Diagram 9).—James Kelly, æt. 9 years 4 months, admitted Feb. 2nd; ill first, Jan. 27th.

Feb. 3rd.—Slept excellently; pulse much better, tongue still furred; puffy about face; legs pit slightly, very distinct cloud of albumen in urine removed by two grammes of animal charcoal. To-day he had a muco-purulent discharge from nose.

4th.—Hot air bath $\frac{3}{4}$ hour, perspired freely, albumen in

urine same, uric acid, various shapes, globular, lozenge, some casts.

5th.—Much better ; warm bath five minutes.

6th.—Wishes to get up, urine uric, no casts, albumen.

7th.—Not so well, appetite less, legs pit on pressure, very puffy about face, much more albumen in urine ; hot air bath 6 p.m., perspired greatly.

8th.—Says he feels better ; tongue thickly furred, very puffy about face and eyes, quantity of albumen in urine much increased ; hot air bath 6 p.m., *in as usual*, half an hour ; perspired freely.

9th.—Decidedly less albumen in urine, more puffy about face.

10th.—Face and legs certainly much more œdematous, nothing so well to-day ; drowsy.

12th.—Very sick ; 2·30 foamed at mouth, groaned, face distorted into numerous grimaces, passed his fæces and urine, and had twitching of arms. Fit lasted quarter of an hour ; he never became conscious, fit returned in twenty minutes.

5 p.m. Unconscious ; eyes open, foaming at mouth, groans occasionally ; hot air bath, and mustard poultice over his loins.

5·20. Another fit ; fit continued till 8 p.m. ; he died at 12·20 p.m.