

OBSERVATIONS  
ON THE  
EFFECT OF DIET, REST, EXERCISE, ETC.,  
IN CHRONIC NEPHRITIS.

BY  
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THE patient on whom these observations were made has suffered from chronic phthisis for several years; and is known to have had albumen in the urine at least since October, 1876. On June 16th, 1877, he was seized with an attack of what might be called acute albuminuria commencing after a chill, with lumbar pains resembling those of lumbago, slight shivers, total loss of appetite, headache, and fever. There was no œdema; on one day there was repeated vomiting. On the day of the attack he had hæmoptysis to the amount of at least a tablespoonful, probably induced by hurrying to catch a train, the weather at the time being very warm. On the following day the signs of a localised pneumonia in the lower lobe of the right lung were discovered. The symptoms and physical signs of moderate acute pneumonia with albuminuria persisted for ten days, declining from about the seventh day. The patient remained in bed from June 16th till

June 27th. The urine was smoky for the first four days, and had a peculiar odour. It was very little, if at all, diminished in quantity, but loaded with albumen, and on one day of a specific gravity of 1.050. No blood-corpuscles or casts were discovered; and it may be mentioned that in a similar subsequent attack, the urine was very carefully examined by an experienced chemist for the colouring matter of the blood, but none was found, nor, *à fortiori*, any blood-corpuscles.

The patient has had several attacks of the same kind, though their true character was only recognised in 1877. The first (?) occurred in April, 1875; and there were others of short duration in August, 1875, July, 1876, and October, 1876. There was also an attack in May, 1877, in which the "smokiness" of the urine lasted exactly four days.

From these details it will be seen that the case has features of special interest apart from the experiments on which this paper is founded, but we do not propose to enter further into them at the present time.

*First Series of Observations.—Ordinary diet and conditions.*

In July, 1877, as an examination of the urine revealed a considerable amount of albumen, the patient was advised, (and we must here take the earliest opportunity of expressing our extreme obligation to Dr. Lauder Brunton for many most important suggestions most kindly and willingly given us), to have repeated analyses of his urine made, with a view to determine the variations, under ordinary diet and conditions generally, in the proportions of albumen and urea in it, and the amount of the latter passed in the twenty-four hours.

By *ordinary diet* is meant a moderate amount of meat, with vegetables, abundance of milk and farinaceous food, and no stimulants. By *ordinary conditions* is meant daily walking exercise, short of great fatigue, with rest in bed from about 10 p.m. to 7.30 a.m.,

The results of these preliminary experiments for each day are embodied in Table I, but we give the means of the whole set of observations here.

1. *The mean total amount of urine passed was by day* = 740 cubic centimetres (8 days' mean), and *by night* 387 cubic centimetres (mean of seven days' observations); the urine passed with the daily motion not being collected, but probably amounting to at least 200 cubic centimetres more.

2. *The mean proportion of albumen was by day* one eighth, and *by night*  $\frac{1}{13.3}$ , reckoned from the observations of eight and seven days respectively.

3. *The mean weight of urea* in grammes in 10 cubic centimetres of urine was .475 (four days' observations) *by day*; and .263 (three days' observations) *by night*.

The albumen was estimated by the usual clinical method, as it was impossible to use the accurate one of drying on a weighed filter over sulphuric acid *in vacuo* and weighing, on account of the time and labour involved. *The specific gravity* was unfortunately not taken at this time.

*Second Series of Observations.—Milk and vegetable diet ; no meat ; ordinary conditions.*

On July 24th, after the preceding observations of the urine had been carried on consecutively for ten days, during which the patient took only the ordinary moderate diet described above, the diet was further limited, and no meat allowed for three days. The only strictly nitrogenous food besides milk was toast for breakfast, and a little tart-paste at dinner. *Butter, bacon-fat, ham-fat, potatoes, carrots, cabbage, and rice pudding* were eaten freely. The results of this second series of observations are given in Table II, but they may be stated generally as follows, as compared with those of the preceding days.

1. *The mean proportion of albumen* for the three days, July 24th, 9 a.m., to July 27th, 9 a.m., was *by day*  $\frac{1}{7.3}$  (against one eighth on ordinary diet), and *by night*  $\frac{1}{19.3}$  (against  $\frac{1}{13.3}$  on ordinary diet).

2. *The mean weight of urea was by day* .193 grammes in 10 cubic centimetres of urine; against .2475 grs., on ordinary diet during the four preceding days (5 determinations *per diem*); and *by night* .24 grs.; against .263 grs. on ordinary diet).

3. *The mean total amount of urine passed was* 718 cubic centimetres *by day* (against 740 cc. on ordinary diet); and 413 cc. *by night* (against 387 cc. on ordinary diet).

On the whole, therefore, the results were not very decided either way, and they may be summed up thus:—The proportion of *albumen* was slightly higher by day than on the days when meat was allowed, and lower by night. The *urea* was decidedly diminished by day and slightly by night. The *volume* of urine was less by day and greater by night. It should be stated that a note, appended to the analyses of the second and third days, remarks that “the general impression to the eye on first boiling” was “that there was less albumen in the urine on these days.” The patient’s *temperature* was taken regularly at 8 a.m., 5 p.m., and 10 p.m., but presented no special abnormality. The *maximum* observed was 99° F. in the evening; and the *minimum* observed was 97° F. in the morning.

It should be further noted, with reference to later experiments with milk and non-nitrogenous diet, that moderate exercise was taken as usual during this second series of observations. The point of this statement will be clear when we come to speak of the influence of *rest*.

### *Third Series of Observations.—Ordinary diet and conditions.*

From July 27th to September 15th, no further exact observations were made; but they were resumed and continued regularly from the latter date until October 8th, the albumen and urea being estimated and the specific gravity and volume of urine noted usually five times a-day. The results obtained will be found *in extenso* in Table III. For purposes of

comparison with the results of the experiments next to be related, a statement of *means* for the whole number of days of *ordinary diet* during this second period is also given in Table IV.

*Fourth Series of Observations.—Experiments with absolute milk diet.*

The albumen having ranged on September 15th and 16th between one fifth and one fourteenth, with a mean of one sixth on September 15th, and of one eighth on September 16th, with ordinary diet; the patient was put for two days, September 17th and 18th, on *absolute milk diet*, exercise being permitted. Four and a half pints of milk were taken on September 17th, when the albumen sank to one sixteenth and one thirtieth; and four pints on the second day, September 18th, the albumen being further reduced to one thirtieth, one fortieth, and a trace. No analyses of the urea were unfortunately made on the first day (17th), but on the first night (18th) the urea fell to  $\cdot 14$  gramme in 10 cc.; on the second day (18th) the mean of five analyses gave  $\cdot 164$  gr.; and the analysis for the second night (19th)  $\cdot 185$  gramme. The specific gravity was also low, ranging from  $1\cdot 006^{\circ}$  to  $1\cdot 010^{\circ}$  on the two days, instead of  $1\cdot 016^{\circ}$  to  $1\cdot 017^{\circ}$ . On the other hand, as might have been expected, the volume of urine was large, being 940 cc. by day, and 385 cc. by night on the first, and 1190 cc. by day, and 610 cc. by night on the second day of observation. (The mean volume on ordinary diet had been 722 cc. by day and 484 cc. by night.)

The detailed statement of these results is furnished in Table V.

On the second day the patient complained of a sensation of unsatisfied hunger, and of sinking, and declared that he could not continue an absolute milk diet very long. We must, however, confess that the quantity of milk allowed was probably too small.

The general conclusion to be drawn from these experiments

is much in favour of an absolute milk diet. Considering that few patients in moderate health can tolerate a purely fluid diet for any length of time, the result of this series of experiments suggests that the diet in albuminuria should consist of milk, at any rate, as far as can be borne. In subsequent experiments which will be immediately related, ordinary diet *plus* water was tried against ordinary diet *plus* milk. The result, which was not in favour of the addition of milk to ordinary diet, but rather the opposite, would appear to indicate that, in order to produce a diminution of the amount of albumen in chronic Bright's disease, milk must be given not to *supplement*, but to *replace* to a certain extent, the articles of ordinary diet.

On September 19th, after discontinuing the milk and returning to ordinary diet, the albumen rose from a trace to one seventh and one eighth, in the hours from 8 a.m. to 10.30 p.m.; and to one sixteenth in the night of September 20th. From 8 a.m. on that day to 9.15 p.m. it ranged between one sixteenth and one sixth, the reason for the latter high figure being hereafter to be discussed. The specific gravity rose on September 19th and 20th, from 1.010° to 1.015° and 1.020°; and the urea from .164 to .256 (day of 19th), .29 (night of 20th) and .28 (day of 20th).

*Fifth Series of Observations.—Experiments with excess of eggs in the diet.*

On September 21st, the effect of an *excess of eggs* in the diet was tried and continued for two days. The following articles of food were alone permitted:—Eggs boiled, fried, and in the form of omelettes, fat bacon, baked apples, turnips, potatoes, brocoli, grapes, a little toast and bread, and milk in small quantities only as a drink.

The results of these observations, which are embodied in Table VI, may be stated generally as follows:—

On the first *day* the albumen between 8 a.m. and 9.15 p.m. ranged between one eighth and one twelfth, with a mean of

$\frac{1}{9\frac{1}{2}}$ ; the urea represented a mean of .248 grs. per 10 cc.; and the mean specific gravity was 1.019°. The means of the same *night* till 8 a.m. were:—albumen, one fourteenth; urea, .26, and specific gravity 1.020°. During the second *day*, up to 10.15 p.m., the albumen ranged between one eighth and one eleventh, with a mean of  $\frac{1}{9\frac{1}{2}}$ ; the urea between .20 and .26, mean .225; and the specific gravity between 1.014° and 1.020°, mean 1.017°. In the *night*, till 7 a.m., the albumen was one thirteenth; the urea .28; and the specific gravity 1.020°.

Thus, the results of these two days' experiments are by no means in favour of a diet of eggs; and, as a fact, if compared with the mean results obtained by mixed ordinary diet, are, if anything, in favour of the latter, especially on the second day of observation. This will be more readily appreciated if the results observed under the two different kinds of diet are arranged side by side, as in Table VII.

*Sixth Series of Observations.—Experiments with ordinary diet, with water in place of milk.*

On September 24th, in order to compare together the effects of ordinary diet with water, of the same diet with milk, and of an absolute milk diet, the patient was ordered four pints of spring water, with meat, vegetables, bread, butter, and fruit *ad libitum*, during the twenty-four hours from 9 a.m. of the 24th, till 9 a.m. of the 25th. The results are given in Table VIII, from which it will be seen that during the *day* the albumen ranged between one fifth and one fifteenth, with a mean of one tenth; the specific gravity was 1.013°; and the urea .26 grs. per 10 cc.; and that during the *night*, the albumen was a trace; urea .16; and the specific gravity 1.010°. The comparison of these results with those obtained under ordinary diet with milk, and with an absolute milk diet is given in Table IX.

On the whole the result of the experiment with ordinary diet and water is, if anything, better than of that with ordinary

diet and milk, but both are decidedly inferior to the results obtained with absolute milk diet. The question wherein consists the intrinsic value of milk in a case like the present, must be left for others to answer. Is it that the proportions of the various elements are so accurately adjusted in this perfect food? or is it that assimilation is rendered easier by the dilution of its ingredients?

*Seventh Series of Observations.—Experiments with non-nitrogenous diet.*

From September 28th, 8 a.m., till the 30th, 8 a.m., an exclusively non-nitrogenous diet was tried, consisting of mashed potato, water-arrowroot, fried cabbage, boiled rice, fat bacon, butter, and water. It is unfortunate that the results of the first day's experiments are to some extent vitiated by the fact that part of the urine was lost, owing to two watery stools passed in the forenoon after a seidlitz powder taken to relieve constipation and headache. The results of this series of observations are embodied in Table X.

The means of the two days, compared with the means of the combined observations of ordinary diet, are contained in Table XI.

A comparison of these figures clearly indicates a reduction in the amount of albumen excreted on the days when no nitrogen was ingested. It appears to be a further interesting fact, that the effect of the withdrawal of nitrogenous food on the excretion of albumen *does not cease with the restoration of nitrogen to the diet, but persists for a certain period afterwards*. Thus when nitrogen had been restored on September 30th, the urine of the morning collected at 1 a.m. contained a trace only (recorded as one one-hundredth), that of 4.15 p.m. one sixteenth, and that of 8.45 p.m. one fifteenth. Next day, at 11 a.m., one thirtieth albumen was registered, at 2.10 p.m. one fourteenth, and at 4 p.m. one tenth. These observations are set forth in Table XII.



This behaviour seems to be explicable on the assumption that the albumen which passes out of the blood into the urine is, ordinarily, in part at least, the residue of a *luxus*-consumption of nitrogenous food. Hence, when nitrogen is withdrawn for a time, and then restored, the organism has to make good its losses during the period of abstinence, and the albumen does not reappear in the urine in its original quantity until this process is more or less completed.

*Eighth Series of Observations.—The effect of rest.*

Still more interesting and important than the above observations were the results obtained by placing the patient in the recumbent posture for twenty-four hours, in a state of nearly perfect rest. These are embodied in Table XIII; and in Table XIV will be found the mean amounts of albumen, &c., from noon to noon, of October 1st and 2nd—the day preceding that on which the patient rested; of October 2nd and 3rd—the day of rest; and of October 3rd and 4th—the day following the period of rest.

A complete account of the state of the urine during the three days following the day of absolute rest is given in Table XV.

The results of the experiment on rest stated in words are as follows:—1st. The albumen was lower (apparently) than on any other day on which observations were made. 2nd. The amount of urine passed was greater than on any other day observed, viz., 1090 cc. 3rd. The urea by night was less than normal.

The diminution in the excretion of albumen during rest in this experiment receives support from the observations made on the same patient as to the reduction of the same excretion during the night. A comparison of the relative excretion of albumen during the two periods of day and night invariably show a marked diminution during the latter period; in fact, the mean excretion was occasionally as high as one seventh during the day, and only a trace (reckoned as one

one-hundredth) in the subsequent night; and, though the reduction might in the latter case be partly due to the albumen circulating since the last meal at 8 or 9 o'clock having already been in part excreted with the last urine passed before going to bed, so that the remainder would be excessively diluted by the large quantity of urine voided during the night, this argument would be scarcely applicable to an experiment like the above, during which the patient was taking his regular meals, and digestion was going on, and yet scarcely any albumen passed out of the blood. The observation that lying *in bed* has a beneficial effect on cases of chronic desquamative nephritis was made long ago by Dr. Bright ("Cases and Observations illustrative of Renal Disease," 'Guy's Hospital Reports,' April, 1840, p. 160), and has lately been confirmed by Bartels ("Krankheiten des Harnapparates," Ziemssen's 'Handbuch,' Band 9, zweite Auflage, 1877, s. 363); though the latter does not regard the rest as the cause of the benefit derived, but ascribes it to the uniform warmth of the bed, which by dilating the vessels of the skin relieves the renal circulation. The patient in the above experiment did not, however, lie in bed during the first part of the twenty-four hours from noon to bedtime, 10 p.m., October 2nd, but lay on a sofa in his clothes without being kept particularly warm. Moreover, repeated observations in this case have shown that exertion increases the amount of albumen; so much so that it can be predicted with almost absolute certainty that a long walk or much bodily exertion will nearly double the amount of albumen excreted. The effect not only of exercise, but also of food and cold upon the amount of albumen in Bright's disease, has attracted the attention of that excellent observer, Dr. George Johnson, though he only alludes to it in a general manner in the following passage, which was not known to us when our experiments were made. He says ('Lectures on Bright's Disease,' 1873, p. 131, Lecture 7):—

"A convincing proof and illustration of the effect of exercise, food, and cold upon the amount of albumen in the urine is afforded by the fact that in most cases of albuminuria, the

urine passed after rest in bed and before breakfast contains much less albumen than that secreted after exercise in the open air and after an ordinary meal." In Virchow's 'Archiv,' Band lxxii, Heft 2, Leube has lately described some examinations of the urine of a number of soldiers, where in a few cases it was found that albumen appeared *after severe marching* and disappeared again in a few hours.

Dr. Lauder Brunton too, has, in a valuable paper in the 'Practitioner,' on "Arsenic in Albuminuria," June, 1877, reported the case of a patient who sometimes only had albuminuria when he exerted himself much, or when he did mental or bodily work *in the morning*, while in the afternoon he could do similar work without bringing on the albuminuria.

Hence our case is by no means an isolated one as far as the effect of exercise upon the albuminuria is concerned, and we can well understand that if exertion will sometimes cause albumen to appear in apparently healthy men, *à fortiori* it will be more likely to do so in cases where the kidneys are manifestly diseased. A discussion of the *modus operandi* of exercise on the renal circulation would be out of place here, but the experiments of Stockvis should make us very careful before we explain it by increased arterial pressure. In any case, only a partial explanation of the phenomenon seems at present possible, and we have referred to the subject at such length here, chiefly with a view to call the attention of the profession to the importance of rest as a therapeutic measure in albuminuria, a measure which it appears to us has been partly underestimated and partly misunderstood.

#### *Ninth Series of Observations.—Experiments with digitalis.*

To see whether increased arterial tension affected the excretion of albumen, on October the 6th, *infusion of digitalis* was given to the patient. Much stress is not laid on the result, as, although the pulse was reduced from 92 to 76, the increase in the amount of albumen observed was not so great as to be certainly due to the effect of the digitalis. The

result of these experiments will be found in Table XVI. We also give the figures for several days without digitalis, for comparison, in Table XVII.

Whether in this experiment the albumen was really increased by the digitalis or not, there can be very little doubt that the amount of urine secreted, 1420 cc., was greater than on the three previous days and the day after. As giddy feelings were complained of by the patient, and for other reasons, it was thought better not to press the digitalis very hard, or to continue it longer.

*General Conclusions from the whole Number of Observations.*

To sum up these experiments, we seem justified in arriving at the following conclusions in this case:—

1st. That the amount of albumen was reduced by absolute milk diet, and by absolute non-nitrogenous diet.

2nd. That the effect of the milk diet was not merely apparent, and due to the albumen being more than ordinarily diluted, for ordinary diet with an equal quantity of water did not produce the same result.

3rd. That eggs in excess did not appreciably reduce the amount of albumen.

4th. That the effect of a non-nitrogenous diet was not immediate, and that it persisted some time after nitrogen was reingested.

5th. That absolute rest remarkably reduced the amount of albumen; and,

6th. That increase of arterial tension by digitalis possibly increased its excretion. (See, however, *note in Appendix.*)

There are three points on which a few words still remain to be said. They are:—

1. The effect of abstinence from meat in the second series of observations, compared with later experiments on an exclusive diet of milk and vegetables and bread, carried out in November and December, 1877, and set forth in Table XVIII.

2. The effect of wine.
3. The effect of exercise.

1. *The effect of non-nitrogenous diet.*—It will be remembered that in the second series of observations meat was excluded from the diet, with the result that the proportion of albumen was somewhat higher ( $\frac{1}{7.3}$ ) by day than the mean (one eighth) of ordinary diet; and decidedly lower by night ( $\frac{1}{19.3}$  against  $\frac{1}{13.3}$ ). In the later similar prolonged observations the amount of albumen has been much less, as the results of seven consecutive days, contained in Table XVIII, will prove. At the same time the patient took only the most gentle exercise, except in the instances to be mentioned under the head of exercise. Are the different results in July and December to be explained (a) by less exercise being taken and more rest in the recumbent posture; (b), by the beneficial effect of milk and vegetable diet not being apparent in the first case owing to too short a trial; or, (c), to general improvement in the state of the kidneys?

2. *The effect of wine.*—On July 21st, the albumen had ranged for two days at  $\frac{1}{9.3}$ . After two glasses of Moselle at dinner (6.30 p.m.) the amount suddenly rose to one fifth; the next morning at 6 a.m. it was one eighth. During the analyses of the urine of *ordinary diet* in the first series of observations, this is the only instance of so high a figure.

On September 20th, at 4.45 p.m., the albumen was one tenth. After half a glass of port wine it was one sixth at 9.15 p.m. At 7 a.m. next day it was one sixteenth.

On September 25th two glasses of champagne were drunk at 7 p.m. At 10.30 there was one eighth, and in the urine of the night to 8 a.m. one twelfth albumen.

Similarly, half a glass of Madeira at 7 p.m. was followed by one fourth albumen at 8.30 p.m., there having been only one tenth at 4 p.m., and one sixteenth in the subsequent night.

*On the other hand*, it is to be noticed that although no

wine had been taken, one fifth was noted on July 24th, on September 15th and 24th (2.15 p.m. water only drunk), and October 4th (after curry); while on September 29th, after one glass of Madeira at 6.30 p.m., the albumen was only one fifteenth instead of one sixteenth as at 2.30 p.m. and 6.30 p.m. (but non-nitrogenous diet); and on September 30th, after half a glass of Madeira at 1.30 a.m., one sixteenth (ordinary diet).

3. *The effect of exercise.*—So very little severe exercise was taken during the first and second series of experiments, that it is only occasionally that any decided effect from it can be traced.

On September 24th, however, after half an hour's walk and much standing all the morning, the albumen rose suddenly to one fifth, falling at 5.30 p.m. to one fifteenth, and at 9.45 p.m. rising again to one twelfth.

In some later observations in which the diet was limited to milk and vegetables for some weeks, the effect of exercise was much more decided. Thus, on November 21st, after a tiring walk of one hour and a half, with climbing a steep ascent the albumen rose to one seventh at 9 p.m., after it had ranged for many days between one twelfth and a trace.

On December 2nd, after going to morning-church and standing a good deal, one eighth was noted at 2.20 p.m., the average amount at the same hour on many days before and after being one fifteenth to a trace.

On December 9th, under similar circumstances, the albumen, which was one fourteenth at 10.40 a.m., rose after church to one ninth at 2 p.m., and fell at 5.30 p.m. to one twenty-eighth, and at 9 p.m. to one sixteenth.

Whether these variations are really due to the exercise taken we do not presume to say definitely. They certainly however agree with the other observations in this particular case, and with those of the authorities referred to earlier in our paper.

## APPENDIX.

*Note to paragraph 6, page 254.—On the Effect of Digitalis upon the Excretion of Albumen.*

We should not at first expect the albumen to be increased by raising the arterial blood-pressure with digitalis. Venous congestion is (according to Stockvis) the cause of albuminuria depending on alterations in the circulation. (Brunton, l. c., p. 430.) But digitalis may cause more albumen to appear by first lowering the blood-pressure in the glomeruli owing to spasmodic contraction of the renal arterioles through some specific influence on the latter, which Brunton and Power have discovered to exist. ('Proceedings of the Royal Society,' 1874, No. 153.) This lowered blood-pressure is attended with a diminished secretion, or even arrest of the secretion, of urine; and there has been found to be a general inverse relation in albuminuria between the amount of urine secreted and the amount of albumen (Brunton, l. c., and our own observations), so that when, as in renal disease, albumen is being continually excreted, if the amount of urine is diminished by digitalis, *à fortiori*, the amount of albumen will possibly be increased.

In the following charts an attempt is made to represent graphically the absolute amount of albumen passed per hour, during the various series of observations. The values in these charts have been obtained by multiplying the total volume of urine passed during (say) the day by the proportion of albumen, and dividing the result by the number of hours. For example, on July 16th the absolute amount of albumen passed per hour was—650 cc. (urine)  $\times \frac{1}{8}$  (albumen)  $\div 14.5$  (hours), =5.600 cc.



**CHART I.**—Showing the absolute amount (by volume in cubic centimetres) of albumen passed *per* hour, day and night, (1) under ordinary conditions of diet and exercise, during the eight days and eight nights *preceding* the first series of experiments—July 16—23 inclusive; and (2) under ordinary conditions of exercise, but on a milk and vegetable diet only, during the four days of the first series of experiments.

**CHART II.**—Showing the absolute amount (by volume in cubic centimetres) of albumen passed *per* hour, day and night, during the various subsequent experiments, arranged chronologically.

The varieties of diet and of conditions are indicated at the bottom of the chart.

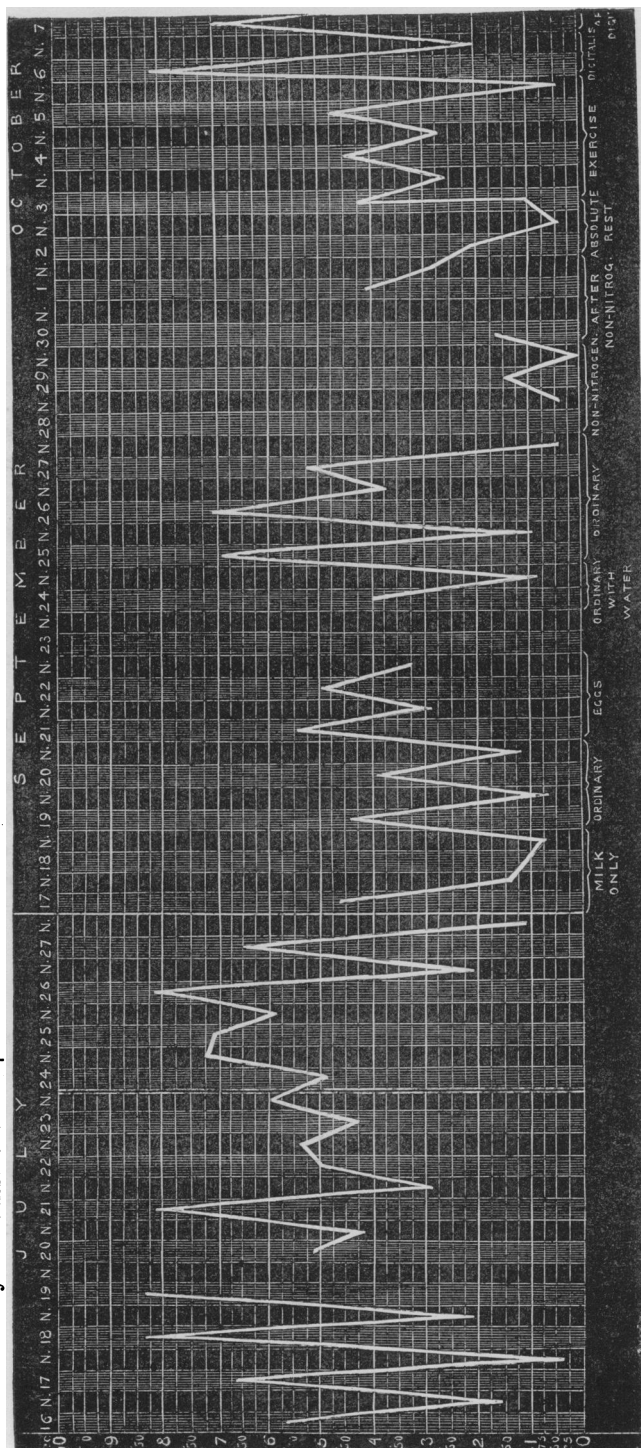




TABLE I.—*Showing the results obtained on ordinary diet and under ordinary conditions. First time.*

Date.	Total urine in cc.		Urea in 10 cc.		Albumen, mean of.		Sp. gr.	
	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.
1877 July 14.....	...	...	...	...	$\frac{1}{7}$ nearly	$\frac{1}{12}$	Not deter- mined	Not deter- mined
„ 15.....	...	...	...	...	$\frac{1}{8}$	$\frac{1}{12}$	„	„
„ 16.....	650	200	...	...	$\frac{1}{8}$	$\frac{1}{14}$	„	„
„ 17.....	860	320	...	...	$\frac{1}{8}$	Trace	„	„
„ 18.....	960	400	...	...	$\frac{1}{8}$	$\frac{1}{20}$	„	„
„ 19.....	840	No de- termination	...	...	$\frac{1}{7}$	Trace	„	„
„ 20.....	665	400	·31	...	$\frac{1}{8}$	$\frac{1}{10}$	„	„
„ 21.....	875	480	·26	·28	$\frac{1}{7.5}$	$\frac{1}{18}$	„	„
„ 22.....	650	400	·20	·30	$\frac{1}{8}$	$\frac{1}{8}$	„	„
„ 23.....	430	510 (mixed urine)	·22	·21 (mixed urine)	$\frac{1}{7}$	$\frac{1}{8}$ (mixed urine)	„	„

TABLE II.—*Showing the results obtained on a nearly non-nitrogenous diet and milk and under ordinary conditions.*

Date.	Total urine in cc.		Urea in 10 cc.		Albumen, mean of.		Sp. gr.	
	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.
1877 July 24.....	495	620*	·19	·27*	$\frac{1}{7}$	$\frac{1}{8}$ †	—	—
„ 25.....	825	540*	·19	·24*	$\frac{1}{8}$	$\frac{1}{10}$ †	Not deter- mined	Not deter- mined
„ 26.....	835	390	·20	·22	$\frac{1}{7}$	$\frac{1}{15}$	„	„
„ 27.....	760	320	·24	·26	$\frac{1}{8}$	$\frac{1}{20}$	„	„

\* Mixed urines of 10 p.m. and night.

† Last urine at night mixed with that of the night.

TABLE III.—*Showing the results obtained on ordinary diet and under ordinary conditions. Second time.*

Date.	Total urine.		Urea in 10 cc.		Albumen, mean of.		Sp. gr.	
	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.
1877								
Sept. 15.....	—	—	—	—	—	$\frac{1}{8}$	—	—
„ 16.....	—	—	—	—	†	$\frac{1}{8}$	†	1015
„ 19.....	610	500	·18*	·16	Trace§	$\frac{1}{8}$	1010	1015
„ 20.....	181	610	·29	·28	$\frac{1}{16}$	$\frac{1}{11}$	1020	1017
„ 25.....	765	900	·16	·21	Trace	$\frac{1}{8}$	1010	1011
„ 26.....	420	820	·24	·24	$\frac{1}{16}$	$\frac{1}{8}$	1020	1017
„ 27.....	450	760	·30	·24	Trace	$\frac{1}{10}$	1020	1016
„ 30.....	300	630	·20	·20	Nil	$\frac{1}{16}$	1020	1014
Oct. 1.....	410	830	†	·20	†	$\frac{1}{16}$	1020	1015
„ 3.....	†	†	†	†	†	†	†	†
„ 4.....	410	600	·28	·24	$\frac{1}{16}$	$\frac{1}{8}$	1020	1019
„ 5.....	450	920	·29	·27	$\frac{1}{16}$	$\frac{1}{16}$	1020	1018
„ 7.....	610†	790	—	—	$\frac{1}{16}$	$\frac{1}{8}$	1015	1017
„ 8.....	440	—	—	—	$\frac{1}{17}$	†	†	†

\* After absolute milk diet.

† No determination.

‡ After digitalis.

§ Traces reckoned as  $\frac{1}{16}$ .TABLE IV.—*Giving the means of the results obtained in*  
TABLE III.

Albumen.		Urea in 10 cc.		Specific gravity.		Total urine.	
Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.
$\frac{1}{16}$	$\frac{1}{16}$	·226 grm.	·242 grm.	1016	1017	722	484
12 days' observations	11 days' observations	9 days' observations	—	11 days' observations	10 days' observations	10 days' observations	10 days' observations

Note.—The mean excretion of albumen is lower in the second than in the first series of observations on ordinary diet; and the secretion of urine is somewhat higher by night. Does this point to improvement in the condition of the kidneys?

TABLE V.—*Showing the results obtained from a diet of milk only (Sept. 17th and 18th to 8 a.m. 19th).*

Date.	Quantity of milk taken.	Albumen.	Sp. gr.	Urea in 10 cc.	Quantity of urine in cc.	Remarks.
Sept. 17 (from 8 a.m.)	4½ pints	$\frac{1}{18}$ , $\frac{1}{20}$	1008, day; 1010, night	No determination	Day = 940; night = 385	...
Sept. 18	4 pints	$\frac{1}{30}$ , $\frac{1}{40}$ , to a trace	1006, day; 1010, night	Mean = .164 grms.; Maximum = .185 grms.; minimum = .14 grms.	Day = 1190	Sensation of unsatisfied hunger and sinking
Sept. 19 (7 a.m.)	...	Trace	1010	.185 grms. mean of night	Night = 610	...

TABLE VI.—*Showing the results obtained on a diet consisting largely of eggs, fried, boiled, and in omelette; along with the following other articles, viz. fat bacon, baked apples, potatoes, brocoli, turnips, grapes, a little toast and bread, with milk as a drink.*

Date.		Mean of albumen.	Urea in 10 cc.	Sp. gr.	Total urine in cc.
Sept. 21 .....	8 a.m.—9.15 p.m.	$\frac{1}{8}$ — $\frac{1}{12}$	.248 grms.	1019	575*
„ 21, 22...	9.15 p.m.—8 a.m.	$\frac{1}{12}$	.26 „	1020	430
„ 22 .....	8 a.m.—10.15 p.m.	$\frac{1}{8}$ — $\frac{1}{11}$	.20-.26 „	1014—1020	640
„ 22, 23...	10.15 p.m.—7 a.m.	$\frac{1}{12}$	.28 „	1020	370

\* Urine passed with stool before breakfast was not measured and is not included.

TABLE VII.—*Showing the mean results obtained under egg diet as compared with the mean results under ordinary diet.*

		Albumen.	Urea.	Sp. gr.
1. Egg diet.....	Sept. 21 (day)	$\frac{1}{3 \cdot 2}$	·248	1019
Ordinary diet .....	Mean of many days	$\frac{1}{3 \cdot 2}$	·226	1016
2. Egg diet.....	Sept. 21—22 (night)	$\frac{1}{1 \cdot 2}$	·260	1020
Ordinary diet.....	Mean of many nights	$\frac{1}{2 \cdot 3 \cdot 3 \cdot 3}$	·242	1017
3. Egg diet.....	Sept. 22 (day)	$\frac{1}{3 \cdot 5}$	·225	1017
Ordinary diet.....	Mean of many days	$\frac{1}{3 \cdot 2}$	·226	1016
4. Egg diet.....	Sept. 23—23 (night)	$\frac{1}{1 \cdot 5}$	·280	1020
Ordinary diet.....	Mean of many nights	$\frac{1}{2 \cdot 3 \cdot 3 \cdot 3}$	·242	1017

TABLE VIII.—*Showing the results obtained on ordinary diet with water instead of milk.*

Date.	Water drunk.	Albumen.	Sp. gr.	Urea.	Amount of urine in cc.
Sept. 24— Day to 9·45 p.m....	4 pints	$\frac{1}{3}, \frac{1}{3}, \frac{1}{1 \cdot 5}, \frac{1}{1 \cdot 2}$	1013	·26 grms.	570
Night .....	...	Trace	1010	·16 „	765

TABLE IX.—*Showing the comparative results obtained under ordinary diet with water, ordinary diet with milk, and absolute milk diet.*

	Albumen.		Urea.		Specific gravity.		Urine in cc.	
	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.
Ordinary diet with water...	$\frac{1}{10}$	Trace	·26	·16	1013	1010	570	765
Ordinary diet with milk ...	$\frac{1}{6\frac{1}{3}}$	$\frac{1}{23\frac{1}{3}\frac{1}{3}}$	·226	·242	1016	1017	722	484
Absolute milk diet.....	$\frac{1}{4\frac{1}{8}}$	Trace	·155	·185	1006	1010	1190	610

TABLE X.—*Showing the results obtained on a non-nitrogenous diet, consisting of mashed potato, water-arrowroot, fried cabbage, boiled rice, water, fat bacon, and butter.*

Date.	Albumen.	Sp. gr.	Urea.	Amount of urine in cc.	Remarks.
Sept. 28.— Day .....	$\frac{1}{20}, \frac{1}{18}$ mean = $\frac{1}{18}$	1011	·236	Not deter- mined ac- curately	Two watery stools after seidlitz powder.
Night .....	Trace	1015	·24	450	
Sept. 29.— Day .....	$\frac{1}{18}, \frac{1}{15}$ Mean = $\frac{1}{15\frac{1}{2}}$	1015·5	·25	315	
Night .....	None	1020	·20	300	

TABLE XI.—*Showing the means obtained under a non-nitrogenous diet as compared with the means under ordinary diet with milk.*

Date.	Albumen.	Sp. gr.	Urea.	Amount of urine in cc.
Sept. 28.—Non-nitrogenous diet.				
Day .....	$\frac{1}{18}$	1011	·236 grms.	—
Night .....	$\frac{1}{100}$	1015	·24 „	450
Sept. 29.—Non-nitrogenous diet.				
Day .....	$\frac{1}{10.5}$	1015	·25 „	315
Night .....	No albumen	1020	·20 „	300
Average of many days, on ordinary diet with milk.				
Day .....	$\frac{1}{9.2}$	1016	·226 „	722
Night .....	$\frac{1}{25.3}$	1017	·242 „	484

TABLE XII.—*Showing the results obtained when the patient had returned to ordinary diet, on the days following the non-nitrogenous diet, and indicating the probable persistence of the effect of the latter.*

Date.	Albumen.	Sp. gr.	Urea.	Amount of urine in cc.	Remarks.
Sept. 30—					
Day .....	trace, $\frac{1}{10}, \frac{1}{18}$	1014	·20	630	...
Night ...	No determination	1020	No determination	410	...
Oct. 1—					
Day .....	$\frac{1}{30}, \frac{1}{10}, \frac{1}{4}$	1016	·21	...	Albumen $\frac{1}{4}$ was after wine
Night ...	$\frac{1}{18}$	1019	·29	450	...

TABLE XIII.—*Showing the results obtained under the conditions of absolute rest and ordinary diet from noon, Oct. 2, to noon, Oct. 3.*

Date.	Albumen.	Sp. gr.	Urea in grms.	Quantity of urine in cc.
Oct. 2—				
Day .....	$\frac{1}{16}$ , $\frac{1}{16}$ , trace	1013	·22	1090
Night .....	Bare trace	1011	·20	430
Oct. 3—				
Day to noon .....	Trace	1013	·21	410

TABLE XIV.—*Showing the mean amounts of albumen from noon to noon of the day preceding the day of absolute rest, of the day of rest, and of the day following the day of rest.*

Date.	Albumen.			Urea.			Specific gravity.			Total urine in cc.		
	Day.	Night	Day.	Day.	Night	Day.	Day.	Night.	Day.	Day.	Night.	Day.
Oct. 1—2	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{16}$	·21	·29	·19	1016	1019	1012	630	450	160
„ 2—3	$\frac{1}{8}$	$\frac{1}{10}$	Less than $\frac{1}{100}$	·21	·20	·21	1013	1011	1013	930	430	410
„ 3—4	$\frac{1}{10}$	$\frac{1}{8}$	$\frac{1}{11}$	·20	·28	·20	1016	1020	1017	440	410	160

TABLE XV.—*Showing the results obtained on ordinary diet with exercise ; for comparison with TABLE XIII.*

Date.	Albumen.	Sp. gr.	Urea.	Amount of urine in cc.
Oct. 3—				
Day from noon .....	$\frac{1}{12}, \frac{1}{10}, \frac{1}{9}$	1016	·20	440
Night to 8 a.m. ....	$\frac{1}{18}$	1020	·28	410
Oct. 4—				
Day to 9.30 p.m. ...	$\frac{1}{18}, \frac{1}{11}, \frac{1}{9}, \frac{1}{8}$	1020	·24	600
Night to 8.30 a.m....	$\frac{1}{18}$	1020	·29	450
Oct. 5—				
Day to 10.30 p.m. ...	$\frac{1}{10}, \frac{1}{12}, \frac{1}{20}$	1017·5	·27	920
Oct. 6—				
Night to 8 a.m. ....	Trace	1016	·28	440

TABLE XVI.—*Showing the results obtained from the administration of digitalis, with exercise and ordinary diet.*

Date.	Hour.	Albumen.	Sp. gr.	Inf. digitalis.	Quantity of urine in cc.	Pulse.	Urea.
Oct. 6	11 a.m.	$\frac{1}{8}$	1014	2 drachms.	110	92	*
"	2.30 p.m.	$\frac{1}{9}$	1012	—	280	85	*
"	3.40 p.m.	—	—	1½ drachm	—	88	*
"	5.30 p.m.	$\frac{1}{8}$ scarcely	1018	—	180	76	*
"	10.30 p.m.	$\frac{1}{8}$	1015	1½ drachm	240	76	*
"	Night till 4 a.m.	$\frac{1}{20}$	1015	—	300	—	*
"	Night 4—8 a.m.	$\frac{1}{20}$	1015	—	310	—	*
Oct. 7	10.45 a.m.	$\frac{1}{9}$	1016	—	110	—	*
					Total 1420		

\* signifies—No determination.



**TABLE XVII.**—*Showing the comparative results obtained without and with digitalis.*

## WITHOUT DIGITALIS.

Date.	Albumen.		Urine in cc.	
	Day.	Night.	Day.	Night.
Oct. 3 . .	$\frac{1}{12}, \frac{1}{10}, \frac{1}{8}$	$\frac{1}{16}$	440	410
„ 4 . .	$\frac{1}{16}, \frac{1}{11}, \frac{1}{8}, \frac{1}{8}$	$\frac{1}{16}$	600	450
„ 5 . .	$\frac{1}{10}, \frac{1}{12}, \frac{1}{20}$	$\frac{1}{100}$	920	440
WITH DIGITALIS.				
„ 6 . .	$\frac{1}{8}, \frac{1}{8}, \frac{1}{8}, \frac{1}{8}$	$\frac{1}{30}$	810	610
„ 7 . .	$\frac{1}{8}, \frac{1}{8}, \frac{1}{8}, \frac{1}{8}$	$\frac{1}{17}$	790	440

TABLE XVIII.—*Showing the results obtained as regards the proportion of albumen on milk diet with vegetables from December 1st to 8th.*

Date.	8 a.m.	Noon.	2.30 p.m.	5 to 6 p.m.	7.30 p.m.	9 to 10 p.m.
Dec. 1 .....	*	Trace	$\frac{1}{18}$	$\frac{1}{20}$	*	$\frac{1}{18}$
„ 2 .....	*	$\frac{1}{18}$	$\frac{1}{18}$ after church	$\frac{1}{18}$	*	$\frac{1}{18}$
„ 3 .....	*	Cloud	Cloud	$\frac{1}{30}$	Cloud	$\frac{1}{18}$
„ 4 .....	Faintest cloud	Faint cloud	„	Faint cloud	*	$\frac{1}{18}$
„ 5 .....	„	Trace	*	Trace	$\frac{1}{18}$	Faint trace
„ 6 .....	Faint cloud	$\frac{1}{18}$	Faint cloud	$\frac{1}{30}$	*	Trace
„ 7 .....	*	$\frac{1}{18}$	$\frac{1}{18}$ (4 p.m.)	$\frac{1}{30}$	*	$\frac{1}{17}$
„ 8 .....	Faint haze	Cloud	Cloud	$\frac{1}{30}$	*	$\frac{1}{18}$

N.B.—“Cloud” means no precipitate. “Trace” means a deposit not covering bottom of test-tube.

\* means no determination.