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H I N T S

TOWARDS THE

TREATMENT OF URÆMIA.

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For the basis of the present article, I will somewhat arbitrarily assume that the complication of disorders included under the terms uræmia, Bright's disease, and albuminuria, arise mainly, if not exclusively, from the presence of an excess of urea in the blood. I almost believe that urea bears the same relation to albuminuria and Bright's disease that sugar does to diabetes, and urate of soda to gout. In like manner, as almost every grain of starch introduced into the human body passes through the stage of sugar, so almost every grain of albuminous substance that enters the blood, sooner or later in its way out, passes through the stage of uric acid, and, if thoroughly oxidized, escapes as urea, carbonic acid and water. As want of oxidation of sugar is the cause of the diabetic diathesis, and a want of oxidation of the urates and their consequent accumulation in the textures and the blood is the cause of the gout-diathesis, so is an increased formation and deficient excretion of urea the cause of the uræmic-diathesis. The number of substances that are formed between albumen and urea are vastly

more numerous than between starch and carbonic acid; but whatever their number, uric acid is the penultimate, and urea the ultimate product of oxidation. Thus, Neubauer gave 300 grains of uric acid to a rabbit, an amount which would furnish about 255 grains of urea; the rabbit passed an excess of 240 grains of urea, a result which proves that the uric acid was almost, if not entirely, converted into urea and carbonic acid. Wohler and Frerichs found the quantity of urea greatly increased when uric acid or the urates of potash or ammonia were taken; the uric acid was decomposed into urea in the system. Hence, it would seem as if some at least of the bad effects of a tendency to uræmic disease might be temporarily stayed if the normally rapid conversion of uric acid into urea could be lessened or delayed. Will acids accomplish this? Simpson thinks that an alkaloidal poison is generated in the blood in Bright's disease, and hence gives acids, especially acetic acid, because the acetates of most alkaloids readily pass out of the body. He believes that he has seen good results from large doses of vinegar. A Dr. Hansen claims to have treated twenty cases with dilute nitric acid, and to have cured eighteen; only two died, and these are said to have been complicated, one with consumption, and the other with organic disease of the liver; the eighteen cured were all recent cases. The muriate tincture of iron is known to be one of the most useful remedies, perhaps the most useful of all medicines in chronic cases.

It is well known that urea is easily transposable into, and is almost the equivalent of *cyanide of ammonia*, and it has been conjectured of late that this latter substance is the offending agent in the so-called uræmic poisoning. However this may be, urea itself is a very injurious substance when present in excess. Not only has it been shown by the experiments of Hammond and others that urea is poisonous when introduced into the blood, but Gallois has even observed its toxic properties when injected into the stomach. He threw about five drachms of urea into the stomachs of various rabbits; the animals died, all having exhibited the same symptoms, which resembled in many respects those which we observe in the human body in rapid cases of uræmia. Again, Goodfellow says, no vivisec-

tor or experimental physiologist has either extirpated the kidneys, tied the renal arteries, or destroyed the renal nerves, or in any way arrested the kidney functions, without producing the signs of uræmic poisoning. But in all cases of removal of the kidneys the animals survived for several days, and the symptoms were not observed for a considerable time after the operation. In those, however, in which in addition *urea* was injected into the blood, the symptoms invariably came on within an hour, and death occurred in from six to nine hours.

In health, urea is so rapidly removed by the renal organs, that only minute traces of it can be obtained in the blood; but if the kidneys become diseased and are no longer fitted to perform their important functions of depuration, large quantities have been detected. If spontaneous vomiting or diarrhoea does not occur, or is not artificially produced, or if free action of the skin does not take place, then epileptiform convulsions, or other nervous symptoms, or œdema of the lungs, or peri- or endo-carditis, or pleurisy may arise.

Free action of the skin is very important in uræmia, for, according to Favre, urea is a normal constituent of perspiration. Bird admits that small quantities are naturally removed from the system by the skin, and has found it abundantly in the perspiration of some persons whose kidneys are unhealthy, and absent in others. Hence, when the urea-excreting functions of both skin and kidneys are suppressed, a formidable condition arises, as in dropsy after scarlet fever, and in albuminuria arising from exposure to cold and wet. Many subjects of Bright's disease will be found to have always had unusually dry skins, to have scarcely ever perspired, even in the hottest weather. To such, a soda-bath, made with one or two pounds of sal soda in a warm bath, twice a week, is said to be useful. Would not an *acid* bath be better? Neither opium nor any of its preparations should be used as diaphoretics, for they render the urine scanty and cause retention of urea.

Attention to diet is very important in uræmia, but is, unfortunately, only available in sub-acute and chronic cases, for urea constitutes the form in which a very large, if not the largest, quantity of nitrogen is expelled from the system. The diet of a subject of Bright's disease should be as carefully

attended to as in the gouty, and a small amount of animal and vegetable albuminous and nitrogenous food only should be allowed. I am confident that I have noticed cases of recovery in which the patient was restricted to a bread and milk diet, with gruel, arrow root, and nothing more substantial than fish; while others, apparently no more diseased, who were fed on meat, beef-tea, eggs, &c., either terminated fatally or recovered very slowly and imperfectly. To make this more probable, we need only quote the experiments of Lehmann on his own person. He passed no less than eight hundred grains of urea while living exclusively on animal food; less than five hundred grains while using a mixed animal and vegetable diet; less than three hundred and fifty grains when he restricted himself to vegetables; and scarcely two hundred and fifty grains when he confined himself to purely non-nitrogenous substances, such as starch, sugar, and oil. Beigel found that healthy men, living on a very scanty diet of rolls and a kind of porridge, passed more than three hundred grains *less* than those who enjoyed a superabundant animal diet and plenty of porter. Two patients undergoing the so-called hunger-cure, excreted only from two hundred and fifty-five to three hundred and thirty grains of urea daily. A dog, taking nearly nine pounds of beef, free from fat and bone, discharged 2,850 grains, or more than six *ounces* of urea daily, while the same animal, when restricted to little more than one pound of potatoes and half a pound of fat, excreted not more than from one and a half to 2 *drachms*. Bischoff believes that the increase of urea is only limited by the power of the individual to dissolve and digest nitrogenous food. He also found that the use of gelatine as food increases the quantity of urea to a great extent. Alcohol, tea and coffee, especially the empyreumatic aromatic substance in the latter, diminish the daily quantity of urea. Eggs may prove especially injurious, as both Lehmann and Hammond produced true albuminuria in their own persons, from living exclusively on eggs; but it is true that Lehmann once succeeded in consuming no less than thirty-two boiled eggs in one day. While fasting from *solid* food, the usual amount of liquid being taken, the quantity of urea is, as a rule, at once *reduced*. In some experiments by Moos it fell

off 240 grains in 24 hours; in others 216 grains; in others only 135 grains. Of course a very limited and restricted diet must not be carried out very long at a time, except in quite robust patients. Finally, urea exists in combination with common table salt, *i. e.*, as the chloro-sodate of urea, in the blood and partly also in the urine. Wundt has tried the effect of total abstinence from chloride of sodium; his urine fell off fully one-half in quantity in five days, and became albuminous the third day. The diminution of the water of the urine was so marked as to lead to the opinion that chloride of sodium may play an important part in the diffusion of fluids. Parkes also thinks this production of albuminuria is a most important observation. It seems to him to support the idea that the freedom of healthy urine from albumen is owing to the albumen during its transit through the renal tissues and epithelium being *rendered insoluble by the action of acids* in the presence of chloride of sodium. It would hence seem important to supply albuminuric patients with a full quantity, or even an excess of both acids and table salt. Bischoff has also proved that common salt exerts an unquestionable influence in augmenting the excretion of urea.

It is scarcely necessary to prove that the urea is diminished in the urine in Bright's disease, but it may be well to state a few facts. In an acute case the urea amounted to 242 grains daily when first observed; it quickly lessened to 143 and 126 grains, and shortly before death only 55 grains were passed. This patient was very thirsty, drank largely, and gained 11 pounds in weight in three days, simply from deficient elimination of perspiration, urinary water and urea. In a chronic case French found less than 15 grains in one day; but generally about 100 grains are excreted, although occasionally and temporarily as much as 250 grains may be detected. It is evident that in the treatment of uræmia we should lessen the formation of urea in the blood and system, and increase its elimination from the kidneys, skin and bowels.

We now pass to a consideration of the medicines which increase or diminish the quantity of urea.

1. *Tartar Emetic.*—Boecker took $2\frac{1}{2}$ grains of tartar emetic daily for nine days; the urea was *lessened* about 75 grains in

each 24 hours; the only alteration of any importance in the urine was the diminution of urea. Beigel gave two persons two grains every day for four days, and found the urea invariably decreased about seventy-five grains daily. Tartar emetic is well known to be very useful in acute cases of Bright's disease; but Ackermann found it to greatly increase the quantity of urea, and apparently proportionately to the size of the dose. It may prove useful both by preventing the formation of urea and increasing its elimination.

2. *Golden Sulphuret of Antimony* increases all the constituents of the urine, and that of urea over ninety grains daily. Parkes thinks that it either increases the elimination of all the constituents of the urine, or favors the metamorphosis of nearly all the tissues of the body, or both. He regrets that this remedy has almost fallen into disuse of late, and that it has been superseded by tartar emetic, especially in chronic diseases.

3. *Muriate of Ammonia* increases all the constituents of the urine except uric acid, which it slightly diminishes; the daily *increase* of urea was about seventy-four grains, a quantity which indicates a great augmentation of metamorphosis or elimination; as it lessens the uric acid, perhaps it converts this more rapidly into urea.

4. *Citrate of Ammonia*.—Prout noticed a great increase of urea in the urine of a dyspeptic patient while taking this remedy.

5. *Liquor Potassæ*.—In several cases the amount of urea was increased, and Parkes says this occurred so constantly as to lead to the inference that this alkali really augmented the *formation* of urea. The uric acid was unaffected. Day says little is definitely known regarding the power of remedial agents in modifying the amount of urea, except that liquor potassæ has been decisively proved by the experiments of Dr. Parkes to increase its quantity. He adds, the experiments of Bœcker, Beigel and others, on this subject, are too vague and uncertain in their results to call for special notice. But doctors will disagree.

6. *Nitrate of Soda*.—According to Schenck, it increases the water of urine and the urea for the first three or four days, when they both fall below the normal standard to an extent

which balances the previous increase. It acts first as a diuretic, increasing the amount of urinary water, thus aiding the elimination of urea; but its influence is limited and temporary; it is a mere elimination, and the formation of urea in the system is not augmented. It increases the urinary water 2,700 grains for three or four days, and the urea about 60 grains; then the water falls off 3,000 grains below the previous increase, and about 1,350 grains below the normal standard; the urea fell off about 100 grains below the increase, and 45 grains below the normal quantity. One and one-half ounces of nitrate of soda were required to produce the above effects.

7. *Nitrate of Potash*.—According to Beigel, three drachms given in twenty-four hours diminished the urea slightly in one case, and greatly in two cases. Hence it either lessens the production of urea or prevents its elimination. Parkes, from one ounce given in twenty-four hours, found it to act as a diuretic, and to cause the excretion of an excess of nearly 200 grains of urinary solids.

8. *Phosphate of Soda* diminishes the urea nearly thirty grains in one day when given in 225 grain doses; it is said to retard the digestive process extremely, and diminish the amount of nutriment entering the system. It is not a disintegrating agent, but rather the reverse; it lessens both the quantity of urea and that of the insensible perspiration.

9. *Acetate of Potash*.—Bœcker took three ounces of the Prussian solution of the acetate of potash in four days, and found the quantity of urea lessened about fifteen grains; the urinary water about 440 grains. It lessens the urinary water, urea, and extractives, and the earthy phosphates in a remarkable degree, viz., to the extent of twenty-two grains per day. In another case in which the acetate of potash was taken for eleven days, the urea was diminished over sixty grains per day.

10. *Colchicum* lessens the quantity of urea and uric acid from one-seventh to one-quarter the normal quantity. Garrod found the uric acid generally, but slightly lessened. This remedy should prove either very useful or very injurious; in one case I thought it decidedly injurious, or rather discomforting, for it caused nausea and vomiting in very small doses. But in scarlatinous dropsy Dr. Maclagan frequently found colchi-

cum of much service, particularly when the urine became very scanty, and indications were given of approaching coma. He thinks that urea retained in the blood is the cause of the symptoms, and that colchicum causes its discharge. The same writer proposes colchicum in the advanced stages of Bright's disease as a means of depurating the blood.

11. *Belladonna* increases rather than diminishes the quantity of urinary water, urea and extractives.

12. *Quinine*.—Ranke has made the important observation, that twenty grains of quinine lessens very greatly, viz., about one-half, the excretion of uric acid. It does not affect the quantity of urea. There was no increased excretion of uric acid after the effect of the quinine had passed off; hence the formation of uric acid was probably absolutely lessened; as the quantity of urea was not increased, it was, of course, not converted into urea.

13. *Digitalis*.—In a case of cardiac dropsy observed by I. Vogel, 419 grains of urea were excreted before digitalis was given, and 755 grains per day subsequently; in another case the urea rose to 696 grains daily.

14. *Juniper Ointment* increased the urinary water to 114 ounces, and the quantity of urea from 339 to 622 grains.