A Course of Lectures ON URINE, URINARY DEPOSITS, AND CALCULI.

DELIVERED AT THE PATHOLOGICAL LABORATORY,
DURING THE SESSION 1857-58.

BY

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LECTURE IV.

URINE IN DISEASE. *Arrangement of the Subject. Diathesis.*

EXCESS OR DEFICIENCY OF WATER AND THE ORGANIC CONSTITUENTS PRESENT IN HEALTH. *Excess of Water: Diabetes Insipidus: Deficiency of Water: Increased Acidity of Urine: Principles of Treatment: Nitric Acid in the Urine: Ammonia: on Detecting Urea in the Blood or Serum: on Detecting Ammonia in the Breath: Urea: Excess of Urea: Deficiency of Urea: Colouring Matter: Excess of Uric Acid and Urates: Principles of Treatment: Extractive Matters: General Remarks on the Increase of the Organic Constituents, with Analyses: Analyses of Urine in Chorea: Analyses of Urine in Skin-Disease.* EXCESS OR DEFICIENCY OF THE INORGANIC CONSTITUENTS PRESENT IN HEALTH. *Chloride of Sodium: its Diminution in Acute Inflammations: Sulphates; Increase in Cases of Chorea, Rheumatic Fever, etc.: Influence of Remedies: Alkaline Phosphates; Increased Secretion of Alkaline Phosphates in Inflammation of the Brain; Analyses; Earthy Phosphates; Increase in the Urine of Cases of Mollities Ossium; Analyses.*

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EXCESS OR DEFICIENCY OF THE INORGANIC CONSTITUENTS.

IN disease, the inorganic salts vary greatly in quantity. Sometimes the saline constituents are very deficient. This deficiency may depend upon the nature of the food, or it may be due to the formation of a diminished proportion of some of the salts in the organism. The sulphates, and the phosphates in part, being formed in the body, will vary under many circumstances. In some conditions of the system, when much disintegration of tissue takes place, a greater quantity of sulphur and phosphorus is oxidised, and the corresponding acids are formed in unusually large proportion, and excreted in the urine. In certain inflammatory conditions of the system, it would appear that the chloride of sodium, being required at the seat of these changes in considerable quantity, is prevented from passing off from the system in the urine. In certain cases of disease of the kidney, it is important to notice if the proportion of the saline constituents to the organic matter is very much increased. In some states of renal disease, in which the secreting structure of the kidney is so much impaired that the separation of urea and organic matter is very much interfered with, a proportion of saline matter considerably larger than the urine contains in health, escapes.

Let me now draw your attention to some of the most important variations in the excretion of saline matter in disease.

Chloride of Sodium. The fluctuations observed in the quantity of common salt excreted in the urine are very great even in health. The circumstances which affect the proportion of chloride of sodium are very numerous, and these are greatly increased in disease. It was found by Redtenbacher, many years since, that in pneumonia the quantity of chloride in the urine gradually decreased as the inflammation advanced; and that in many instances, when the lung became hepatized, not a trace could be detected in the urine. Some years ago, I determined quantitatively the amount of chloride in the urine from day to day in cases of acute pneumonia, and the following case illustrates very well the changes which occur in the urine in this affection.

The patient was a plasterer, aged 24, and was under the care of Dr. Budd. On the third day of the disease, there was dulness two inches below the left mamma in front, and behind over the space below the spine of the scapula. Bronchial breathing and bronchophony were audible over the lower angle of the scapula. Expectoration viscid, frothy, and slightly rusty; pulse 144, small and weak; respirations, 52.

On the fourth day of the disease, bronchial breathing and bronchophony were more distinct. Pulse, 116; respirations, 28. He was treated with small doses of antimonial wine, and was put upon milk diet and beef-tea. Turpentine stupes were applied to the chest. He progressed favourably, was convalescent within three weeks after the commencement of the attack, and was discharged well in little more than four weeks.

13. *Fourth day of the disease.* Urine high coloured; acid; specific gravity, 1017; contained a little albumen.

14. *Fifth day.* Acid; specific gravity, 1013; natural colour.

15. *Sixth day.* Acid; specific gravity, 1016; pale; still contained a trace of albumen.

16. *Tenth day.* Acid; specific gravity, 1022; no albumen.

17. *Twenty-second day.* Acid specific gravity, 1016; pale; no albumen.

	Analysis.		
	13	14	15
Water	956.60	957.40	954.00
Solid matter	43.40	42.60	46.00
Organic matter	40.28	92.82	44.64
Fixed salts	3.12	7.18	1.36
Chloride of sodium	0	traces	0
		16	17
Water	955.00		968.40
Solid matter	45.00	100.00	31.60
Organic matter	42.12	93.64	23.26
Fixed salts	2.88	6.4	8.34
Chloride of sodium	0		4.56

The decrease of the fixed salts generally, during the stage of hepatisation is remarkable. The last analysis of the urine, when the patient was well, shows the healthy proportion. In vol. xxxv of the *Medico-Chirurgical Transactions* will be found several other cases showing similar results. In some of the cases, it was shown that, although there was not a trace of chloride in the urine, and the blood contained less than its normal proportion, the sputa were very rich in chloride of sodium. In one case, it amounted to upwards of 18 grains in 100 of the solid matter of the sputum. In a fatal case, much chloride was found in the products effused into the air-cells of the lung. In most exudations, and in growing tissues, there is a considerable amount of chloride of sodium. In acute inflammations generally, the proportion of chloride in the urine gradually diminishes until the disease is at its height. When resolution occurs, the chloride reappears, and gradually increases as convalescence advances, until it attains its normal standard. The amount of chloride in the urine is much influenced by the nature of the food, and by the quantity of fluid taken, as remarked when considering the chloride in healthy urine; but the results above described cannot be explained in this manner; for, although patients take less food when they are ill, and therefore less salt, the same results are observed if salt be given to them. Moreover, the disappearance is gradual, and the reappearance is marked by a change in the symptoms of the disease, although the food has remained the same during the whole period of the illness. I have expressed the opinion that, in all probability, the chloride is attracted from the blood in undue proportion to the point where the inflammatory changes are taking place; and that, instead of passing through the organism as it does in health, it accumulates at this point until a certain stage of the morbid process is passed, when it is reabsorbed into the blood, and excreted by the ordinary channel. The precise office which the salt plays in these processes is not understood; but certainly, in all the specimens of inflammatory lymph that I have examined, I have always found common salt present in large quantity. In many cases of bronchitis, acute rheumatism, pleurisy, in some cases of skin-disease, and in some other instances in which its absence would appear to be merely an accidental circumstance, no salt can be detected in the urine. We cannot, therefore, regard this diminished proportion or absence of chloride in the urine as a point of any value in the diagnosis of pneumonia, although it must be looked upon as a fact of great interest with reference to the morbid changes which are taking place at the time. The conclusions to which I arrived, after examining the urine, blood, sputum, and inflammatory products, in several cases of pneumonia, are as follows:

1. That in pneumonia there is a total absence of chloride of sodium from the urine at or about the period of hepatisation of the lung.

2. That, soon after resolution of the inflammation, the chloride is again present in the urine, and often in considerable quantity.

3. That, at this period (resolution), the serum of the blood is found to contain a greater amount of chloride than in health.

4. That the presence of chloride of sodium in the urine may be taken as evidence of the existence of a greater quantity of the salt in the blood than is required for the wants of the system generally, or, at least, of an amount sufficient for that purpose; and that the absence of the salt from the urine indicates that the circulating fluid contains less than the normal quantity.

5. That the sputa in pneumonia contain a greater quantity of fixed chloride than healthy pulmonary mucus, if there be not much less than a normal amount in the blood, although there be a complete absence of the salt from the urine. In all cases, however, there is found in the sputa a quantity many times greater than exists in an equal amount of blood at the same period of the disease. The absolute amount present is subject to variation at different periods of the disease, and in different cases.

6. That, in one case which was fatal, the proportion of chloride present in the sputum underwent a decrease, while the amount of solid matter, and especially the extractive matters, increased in quantity. At the same time, the sputum became acid; and in the matters expectorated within the last few hours of the patient's life, a large quantity of grape-sugar was found; but, in that obtained on the day previous to his death, none could be detected.

7. The absence of chloride of sodium from the urine during the stage of hepatisation seems to depend upon a determination of this salt to the inflamed lung; and, when resolution occurs, this force of attraction ceases, and whatever salt has been retained in the lung is reabsorbed, and appears in the urine as usual.

Analysis 18 represents the composition of the urine in an extreme case of *elephantiasis Græcorum*, occurring in a boy about twelve years of age, who was in the hospital some years ago, under Dr. Todd. The emaciation was extreme, and there were a great number of large ulcerated tubercles all over the body, which discharged freely. The absence of the chloride may perhaps be accounted for by the presence of exudation and cell development at the bases of these numerous ulcers. The urine was acid; specific gravity 1020.

Analysis 18.

Water	.	.	960.0	
Solid matter	.	.	40.0	100.00
Fixed salts	.	.	4.51	11.27

The ash consisted of sulphates and phosphates, with a mere trace of chloride.

Analysis 19.

Another specimen about two months after the last. Specific gravity, 1014; acid.

Water	.	.	965.1	
Solid matter	.	.	34.9	100.00
Urea	.	.	13.97	40.02
Extractives	.	.	16.06	46.01
Uric acid	.	.	.31	.88
Alkaline salts	.	.	4.07	11.66
Earthy salts	.	.	.49	1.40
Sulphuric acid	.	.	.422	1.20
Phosphoric acid	.	.	1.389	3.98
Chloride of sodium	.	.	not a trace.	

It is difficult to account for the absence of the chloride in the following analysis. The urine was obtained from a woman aged 31, suffering from hysterical coma. About eleven ounces were drawn off by a catheter. The patient was quiet; skin cool; tongue covered with a thick white fur; pulse 135; respiration 18; sensation very much impaired. The patient did not notice a very severe pinch with the nails.

Analysis 20.

Water	.	.	921.41	
Solid matter	.	.	78.59	100.00
Uric acid	.	.	.57	.72
Urea extractives, etc.	.	.	67.70	86.15
Fixed salts	.	.	10.32	13.13

The salts contained sulphates and phosphates, but not a trace of chloride was present.

Sulphates. I have already observed that the proportion of sulphates usually varies according to the urea; and it follows that, in diseases characterised by a considerable disintegration of muscular tissue, we shall find an unusual amount of sulphate in the urine. In *chorea*, the increase of the sulphate and urea is often very considerable; but there are conditions in which the increase of the sulphates does not appear to be associated with the formation of urea to a correspondingly large amount. An increase in the quantity of sulphate in the urine, in cases of *rheumatic fever*, is noticed in some of Dr. Bence Jones's analyses. In one case, on the fifth day, the urine had a specific gravity of 1026, and yielded 11.89 grains of sulphate of baryta. Dr. Parkes has shown, by some very careful experiments on four cases, that in rheumatic fever the sulphuric acid is greatly increased. In one case, 52½ grains of sulphuric acid and 5½ grains of unoxidised sulphur were excreted in twenty-four hours. The urea was not increased in the same degree. This increase of sulphate is not observed in typhoid fever and scarlatina. It does not, therefore, depend merely on increase of temperature. Dr. Parkes suggests that in the blood, in acute rheumatism, there may exist a material richer in sulphur than albumen. Potash increases the tendency of this substance to disintegrate; and hence, whenever liquor potassæ is given, the proportion of sulphates in the urine is augmented.

Urinary constituents.	Condition in rheumatic fever.	Effect produced by liquor potassæ in large doses.
Solids	Increased	Still more increased
Water	Greatly diminished	Slightly increased
Uric acid	Increased	Slightly increased
Sulphur	In considerable quantity	Probably increased
Chlorine	Diminished	Unaffected
Sulphuric acid	Greatly increased	Still more increased*

In many cases of skin-disease, I have found the relative proportion of the sulphates to be considerably augmented. This is well illustrated in Analysis 5, which gives the composition of the urine of a boy suffering from eczema.

[To be continued.]

Transactions of Branches.

SOUTH-MIDLAND BRANCH.

ŒDEMA OF THE GLOTTIS, FOLLOWING THE ACCIDENTAL DRINKING OF SULPHURIC ACID; TRACHEOTOMY; WITH REMARKS ON THE OPERATION.

By E. LAWFORD, M.D., Leighton Buzzard.

[Read October 6th, 1859.]

I WILL, with your permission, call the attention of the members to a case which occurred in my practice, in which inflammation and œdema of the glottis followed the accidental swallowing of sulphuric acid, and in which the operation of tracheotomy was resorted to, in order to relieve the symptoms of impending suffocation. I will then make a few remarks on the danger and difficulty attending this operation; on the surgical appliances which have been introduced for the purpose of simplifying it; and I will lastly call your attention to an instrument made for me by Mr. Coxeter of London, calculated to steady the windpipe at the moment of its division, to prevent the injurious effects of pressure, and to act at the same time as a director for the knife.

In the month of July 1852, I received a hasty summons to attend on a young person of about fourteen years of age, who was reported to have taken poison. On arriving at the house, I found her labouring for breath; the respiration was noisy and croup-like; and, on examining the mouth, I found the lips excoriated, and the lining membrane of the mouth and fauces of a white or ash colour. There was intense pain in the region of the windpipe, and, in fact, every symptom of poisoning by a corrosive irritant.

On inquiry, I found that the patient had arrived home fatigued from a long walk; and, seeing a ginger-beer bottle on the table, she had taken for granted that it contained ginger-beer,

* The influence of liquor potassæ on the urine in rheumatic fever. (*Med.-Chir. Review*, vol. xiii, page 248.)