EXPERIMENTS
ON
CHYLOUS OR CHYLO-SEROUS URINE.

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WITH
A HISTORY OF THE PATIENT.

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THE experiments to be detailed were made at the request of Dr. Pearse, Garrison-Surgeon of Bangalore, who was desirous of ascertaining the real nature of the matters that imparted to the urine, passed by one of his female patients, the peculiar characters which have received the titles given in the heading.

For the attainment of the object in view, it will at once be seen, that no extended analysis of the whole constituents of the urine was required, nor were any quantitative determinations needed.

The absence or presence of caseine, in any recognisable form, was the first point to be ascertained. The secondary points to be attended to were the absence or presence of pus and phosphates, these being the only known bodies which, when diffused through healthy urine, were likely to

cause it to be mistaken for urine, such as that about to be described.

The specimen of urine, brought for examination, appeared of a dirty milk colour, resembling gum ammoniac mixture; its consistence somewhat thicker than milk, and its smell very faint; indeed the urinous odour was scarcely perceptible: the sp. gr. was about 1.013.

Experiments.	Results.	Deductions.
No. 1. Portion of the urine placed on a filter of common bibulous paper.	Passed through, milky and unaltered, nothing perceptible being retained on the filter.	Absent, pus and mucus.
No. 2. Litmus paper immersed in the urine. Turmeric paper immersed.	Became faintly red- dened. Remained unaltered.	Absent, any strong alkali. The fear that albumen, if present, might, when the urine was heated, be held in solution by alkalies, was thus removed. Present, albumen, with some other matter, to be further investigated.
No. 3. Boiled, per se, in a flask, the contents then placed on a filter.	Remained on the filter a copious white precipitate, on the surface of which there was some matter resembling fat.	Present, albumen, with some other matter, to be further investigated.
No. 4. Filtrate from No. 3, which now appeared perfectly clear, like ordinary urine, having been collected in another flask, treated with strong acetic acid guttatim.	No clouding, no precipitate, nor perceptible change of any kind.	Absent, probably caseine.
No. 5. Flask containing the filtrate from No. 3, plus acetic acid, exposed again to boiling temperature for some minutes.	No opacity, nor appearance of anything like curd.	Absent, caseine.
No. 6. Two parts of the urine and one of æther were placed in a stoppered phial, which, after being closed, was briskly agitated two or three times for about half a minute.	The contents of the phial now became clear, dividing into three portions; two of which were fluid, the third semi-solid, this portion occupied a space in the phial between the two fluid portions; the upper fluid was distinguished, not only by its position but by the smell, as æther; its colour, however, was somewhat altered, it had now a faint yellow tint. The semi-solid portion was a tremulous	Present, some fatty matter, previously combined with the semi-solid portion, but which was separated from it by the superior affinity of æther for such substances. Present, in the form of the semi-solid, jelly-like coagulum, either albumen or fibrine. This substance, when combined with the matter held in solution by the æther, forms the milk-like matter, that so disguises the urine.

Experiments.	Results.	Deductions.
After standing three weeks, the phial and contents were again examined.	jelly-like coagulum. The third portion, which occupied the lowest part of the phial, was urine as it usually appears. No perceptible change had taken place, except that the upper or the ætherial portion of the contents of the phial had deposited a semi-crystalline matter, much resembling stearine, on that part of the internal surface of the phial with which it was in contact.	The deposition of the fatty matter arose from the partial evaporation of the æther, the phial being but very loosely stoppered.
No. 7. A small slip of blotting-paper was rubbed against the internal surface of the phial, so as to become smeared with some of the matter deposited there.	The smeared paper, when rubbed between the fingers, became partly transparent, as happens with paper substances.	Deductions from No. 6 confirmed.
No. 8. Portion of the urine treated with nitric acid in a test-tube.	Copious deposition of a white flocculent precipitate.	Absent, phosphates. Presence of albumen confirmed.
No. 9. Portion of the urine placed in a stoppered phial, with some strips of lead, and well agitated.	No deposition of coagulum or filaments on the lead.	Absent, fibrine.

After an interval of three weeks, a second specimen of chylous urine, from the same individual, of precisely similar appearance, was obtained; the experiments made with the first were repeated, with the same results. The details are, therefore, not given: they are mentioned merely as offering confirmation of those recorded.

The general deductions from all the experiments made, are:—first, the absence of caseine; second, the absence of pus and phosphates; third, the presence of albumen; fourth, the presence of animal fat, which confers on the urine its milky appearance.

To test to the utmost (as far as the time and means at my disposal would permit) not only the truth of the above general deductions, but the delicacy of the direct method, an indirect mode of proof was employed; it consisted in treating

artificial mixtures of milk and urine by the method used in the examination of the chylous urine. In this case, if the previous deductions be correct, the results will be reversed. The first series of experiments was made with cow's milk and healthy human urine. The second series with human milk and healthy human urine. These artificial mixtures were made to resemble, as much as possible, in appearance the chylous urine. The difference of the sp. gr. between the chylous urine and such mixtures was not determined.

Experiments.	Results.	Deductions.
No. 1. Two parts of milk and one of æther were agitated in a phial.	No clearing, as in the case of the chylous urine; no effect, but that of being somewhat less white, looking as if diluted with water.	Absent, the matter that the æther takes up from the chylous urine.
No. 2. A mixture of cow's milk and healthy human urine, made as described, agitated with a little æther in a phial.	No clearing whatever; escape of some gas, with effervescence, the nature of which I had not time to examine.	Absent, the matter which æther takes up from chylous urine.
No. 3. A fresh portion of healthy human urine and cow's milk, mixed as before, amounting to about $\frac{3}{4}$ iv, boiled for some time, probably ten minutes, after cooling filtered.	No precipitate nor deposit of any kind in the flask. Slight pellicle on the surface formed while boiling.	Absent, any matter coagulable by heat, except the pellicle, which is a well-known form of caseine.
No. 4. Filtrate from No. 3, treated with acetic acid, a few drops.	Copious and immediate precipitate of white curdy matter.	Present, caseine.
No. 5. A mixture, as before, of cow's milk and healthy human urine, tested by litmus paper.	Scarcely any perceptible action; if any, slightly acid.	Absent, any free alkali that could hold albumen in solution, had it been present.

From these experiments it follows:—

1st. That æther, by simple agitation, does not take up those parts of milk which give it the well-known white appearance.

2d. That when urine and milk are mixed and agitated with æther, although a well-marked action takes place, no clearing whatever ensues, the æther being in these circumstances equally incapable of taking up the particles that give to the mixture its peculiar appearance.

3d. That an artificial mixture of cow's milk and healthy human urine will afford, by boiling, no trace of albumen, contrasting with the behaviour of chylous urine, under similar treatment, in a most striking manner.

4th. That although no trace of albumen could be detected by continued boiling (no uncombined alkali being present in the mixture), an immediate precipitate of caseine follows on adding acetic acid to the boiled artificial mixture, and again boiling,—this being exactly the reverse of what takes place when chylous urine is similarly treated, showing in the one case the total absence of caseine, and in the other the simplicity of its detection when present.

Previous to following out the plan of proof which I had laid down for myself, I was desirous (never having previously experimented with human milk) of gaining such information as I could, relative to this kind of milk, and its behaviour with reagents: with this object, I consulted all the chemical works in my possession. In by far the greater number, nothing is said of peculiar kinds of milk—cow's milk being taken as the type of all; however, in Professor Brande's 'Manual of Chemistry,' these passages occur:—"Its albumen or caseine (meaning that of human milk) is said to furnish soluble compounds with acids, so that it is not coagulated by them. Of fifteen samples, only three were coagulated by acetic and hydrochloric acids," &c. (see p. 1361, vol. ii, of the fifth edition); and in Dr. Thomson's 'System of Chemistry,' (p. 502, vol. iv, sixth edition,) are the following words:—"None of the methods by which cow's milk is coagulated succeed in producing the coagulation of woman's milk," &c. Dr. Thomson quotes from Clarke, 'Irish Transactions,' vol. ii, p. 175. Dr. Gregory says:—"If carefully neutralised by an acid, milk is not coagulated, but it is then coagulated by boiling." ('Outlines of Chemistry,' p. 535.) Dr. Turner, in the eighth edition of his 'Elements of Chemistry,' though published two years later than Dr. Gregory's 'Outlines,' says not a word regarding the behaviour of milk in the circumstances under consideration.

After perusing these conflicting passages, I little doubted

that it would be necessary to seek for some new mode of proof; but being unwilling at once to abandon the method I had first proposed, and so far pursued with the most satisfactory results, I obtained specimens of milk from three women, which I numbered 1, 2, and 3. A small portion from each of these was treated with acetic acid, only the portion from No. 2 gave a precipitate; the quantity of acid was increased gradually with the two other portions, but without effect.

Another portion from each specimen was treated with half its bulk of strong acetic acid, still only No. 2 gave a precipitate. Fresh portions of each were boiled, and then small quantities of acetic acid were added to each, the effect being as before. Again, fresh portions from each were taken; acetic acid in small quantities added; all three were boiled; all three gave a precipitate, which remained in each case at the surface of the fluid. This slight difference in the mode of proceeding appeared to promise all that I wished; but before proceeding further, I obtained two new specimens of human milk, neither of which gave a precipitate by the simple addition of acetic acid, but both readily did so after boiling. Not to take up more time by further details, it will suffice to state, that I treated eleven specimens of human milk, obtained from different females, in the manner above stated; of these, four gave a precipitate by the simple addition of acetic acid—seven refused to do so,—all readily afforded a copious precipitate by boiling, the acid having been first added. Sixteen specimens of human milk, obtained from different females, having now shown the same behaviour, I had sufficient confidence in the method; but before trying its efficacy in the presence of urine, I was anxious to ascertain its delicacy; half a drachm of human milk was therefore diluted with 8 ounces of water, and 20 drops of dilute acetic acid added; the whole boiled. The reaction not being sufficiently distinct, I added 24 or 25 minims of the same milk, and half a drachm of dilute acid, and boiled again; a copious precipitate, white and flocculent as usual, occurred. In an imperial pint of water at 62° there are 8750 grains; and in

half a pint (the quantity of water used to dilute the milk) 4375 grains; and in 1 drachm of human milk, the sp. gr. of which does not vary much from that of water, there will be about 55 grains. Now the mean of three analyses quoted by Professor Brande, gives in 100 parts of human milk, two of caseine (or 2·25): from these data, it is evident that 55 parts will contain 1·23 grains of caseine,—and if, as the experiment proves, we find 1·23 grains of caseine in 4375 water + 55 milk + 55 acid = 4485 grains of fluid, the reaction is sufficiently delicate for all practical purposes, being in whole numbers 1 grain discernible in 3646. Having thus removed an apparent obstacle to the intended method of investigation, I proceeded to make the following experiments:—

Experiments.	Results.	Deductions.
No. 1. Two parts of human milk, with one of æther, agitated in a phial.	No clearing whatever, the action being precisely similar to that with cow's milk.	Absent, that matter which the æther takes up from chylous urine.
No. 2. An artificial mixture of human milk and human urine, made as before, agitated with æther.	The action, in this case, is exactly similar to that with cow's milk.	Absent, that matter which æther takes up from chylous urine.
No. 3. An artificial mixture of human milk and human urine, made as before, boiled and filtered.	No precipitate; slight pellicle on the surface of the fluid, separated by the filter, the fluid passing through unchanged.	Absent, all traces of albumen; the pellicle being, as before observed, a form of caseine.
No. 4. The filtrate from No. 3, treated with acetic acid, and again boiled.	A copious white, curdy, flocculent precipitate.	Present, caseine.
No. 5. A mixture, as before, of human milk and human urine, treated by litmus paper.	No perceptible action.	Absent, any uncombined alkalies that could hold albumen in solution, had it been present.
No. 6. A mixture of healthy human urine $\frac{3}{j}$, white of egg $\frac{5}{j}$, mixed with $\frac{3}{ss}$ of water and $\frac{5}{ij}$ of human milk, boiled, and then filtered.	Opaque white precipitate, which, after the filtrate had passed through nearly clear, was kept on the filter.	Present, albumen.
No. 7. To the filtrate from No. 6 added $\frac{3}{ss}$ of dilute acetic acid, the whole boiled and afterwards filtered.	White candy precipitate after boiling some time; precipitate left upon the filter.	Present, caseine.

Experiments 6 and 7 were repeated, with the serum

of blood, instead of white of egg, with precisely similar results. Before their bearing on this subject is noticed, the results of this series, as far as No. 5, when compared with those of the second series, show that they are identical; confirmation stronger could not be desired. Both series show, that caseine, in either of the forms taken, is, in the presence of urine, easily detectable; consequently it would have been discerned had it been present in any of the specimens of chylous urine examined. Experiments 6 and 7 show, that although there may be present also albumen in quantity, the caseine is still to be detected, while its presence in no way interferes with the detection of albumen; hence, it is evident we can always be sure of detecting either of these bodies, or all, when present in urine. The detection of fibrine is less insisted on than that of the other two bodies, as the spontaneous coagulability of the fibrine at once announces the presence of this substance; but the facility of detecting fibrine, albumen, and caseine, all or singly, is not the only result of these experiments; henceforward, no fraudulent mixture of milk with urine can pass without being detected. The negative action of æther on such mixtures, the absence of a precipitate by boiling, and a precipitate obtained by boiling after adding acetic acid, will immediately point out the deception.

STATEMENT OF A CASE OF CHYLOUS OR CHYLO-SEROUS URINE.

BY

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ABOUT the end of March, 1850, I was requested to visit Mrs. Catherine R —, an Indo - Briton, ætat. 22 years, married, and the mother of three healthy children, the youngest of whom, ten months old, is a particularly strong and healthy infant. She has been nursing up to the present time, although, of late, with a very scanty supply of milk. She is a tall young woman, very thin, but of a healthy appearance, and, according to her own account, her general health is very good. When nursing her two eldest children, which she continued to do until they were fourteen or fifteen months old, she states, that she observed, for some time previous to weaning them, that her urine had become white like milk, which peculiar appearance it lost soon after she discontinued nursing.

Towards the end of November last, her infant being then about five months old, her attention was again attracted to the peculiar white appearance the urine had assumed, when she applied for medical advice, and the following is the account of her condition, given by the medical officer by whom she was then attended.

“Appeared pale and weak, and complained of general debility and loss of tone in the system. She had been confined some months before, and was then nursing a very large vigorous infant. The urine, for some time previous to her application for treatment, had particularly attracted her attention; when seen then by me, it was of a pale milky appearance, and, on cooling, became gelatinous, and frequently was of more than usual quantity. This appearance

of the urine had been noticed after former confinements while nursing, and had disappeared shortly after her children were weaned. I was of opinion that a nurse should be procured for the child, when, as on former occasions, it was to be hoped, the drain on the system being removed, the kidneys and other organs of the system generally would take on a more vigorous action: the patient being unwilling however, for many reasons, to give up nursing, with the view of giving tone to the system, and, if possible, putting a stop to this unhealthy secretion from the kidneys, various tonics were used, as Columba and Quinine. An occasional laxative of Rhubarb and Magnesia being, at the same time, used when necessary.

"During this course of tonics, the patient had an attack of simple continued fever, which was treated in the usual way. Quinine and the Muriated Tincture of Iron were again used; the Infusion of Gentian with Quinine, the Decoction of Cinchona, and the Mineral Acids, with a few alterative doses of blue pill occasionally, and a warm plaster to the loins, were also latterly ordered. Port-wine and a generous diet being, at the same time, the regimen adopted.

"As no effect, however, was produced on the appearance and character of the urine by the above treatment up to the end of January, 1850, although the general health did not seem more impaired than at first, a change of air to Bangalore was advised."

Mrs. R— having resolved to come to this place, a distance of about sixty miles, for further advice, states that, on the journey, which occupied nine days, she suffered from a slight attack of fever, lasting one or two days, but says she is now in her usual good health. The bowels are said to be regular, and appetite pretty good, but it is always very moderate and small; tongue clean; pulse 90; no unusual thirst; has no feeling of uneasiness in the region of the kidneys or epigastrium; no night sweats, and sleeps well. The first specimen of the urine seen by me, was passed early in the morning, and was nearly as white as pure milk, and in moderate quantity. This was accidentally spilled. The

next specimen obtained, passed also before breakfast, formed a thick, but not firm jelly, in the glass in which it was contained, and was of the same whitish appearance as the first; the only test applied to it was a few drops of diluted nitric acid, which caused it to separate into a serum, having a firm coagulum in its centre. The patient was at once made to wean her child, and a course of tonic treatment recommended, the following mixture being given :—

R Ferri sulphatis, grs. xij;
Aqua, ℥viiij;
Quinæ sulphatis, grs. xviiij;
Acid. sulph. dilut., ℥xx;
Mft. mist.;

the bowels being kept regular by occasional small doses of her usual aperient (Castor Oil), and she was advised to be as much in the open air as possible, morning and evening. About the middle of April an opportunity offered of having the urine carefully analysed; but the specimen then obtained, though still retaining the milky appearance, had a reddish-brown tinge, evidently from containing a large admixture of healthy urine; it did not coagulate as before, though the patient herself declares that it always does form a jelly when allowed to stand for some time without being agitated. Her answers to questions regarding her health are still the same, viz., that it is very good, and that there is nothing particular the matter with her beyond the condition of the urine. She, however, appears to me to have lost flesh, but neither she nor her friends, her father being an intelligent European sergeant, perceive any change in that respect, and she is anxious to be allowed to rejoin her family at Hoonsoor.