

formed at the left side of the abdomen, which has never since entirely disappeared, but is subject to slight variations in size, becoming smaller when he lies down, and is sometimes the seat of gurgling sensations.

At five o'clock this morning he felt very unwell, but nevertheless came as usual with his fish-cart from Knottingley to Leeds, a distance of sixteen miles. During his journey he gradually became worse, suffering from severe pains in the abdomen, and vomiting frequently. On arriving at Leeds, he applied to a chemist, who gave him some tincture of rhubarb. His sufferings continuing to increase, he applied for admission into the hospital. He is now much exhausted, moaning incessantly, and vomiting frequently large quantities of black fluid, like coffee-grounds; the skin is profusely bathed with perspiration, and is rather below its natural temperature; pulse 118, intermittent, and of moderate power; the abdomen, throughout its whole extent, is tender on pressure, more especially in the left iliac region, where a flattened oval tumor, about three inches in length, is perceptible to the touch, although it can scarcely be recognised by the sight. By pinching up the thick mass of fat covering this part, it is evident that the tumor is situated beneath the aponeurosis of the external oblique, which forms a tense and smooth covering of the tumor. The portion of the abdominal walls occupied by the tumor is extremely painful on pressure, and is readily distinguished from the surrounding parts by its hard, unyielding character. It is situated in the left iliac region, to the iliac side of the linea semilunaris, but does not appear to encroach upon that line. The bowels have not acted since yesterday. A dose of calomel and colocynth to be given immediately, and castor oil in an hour afterwards. A large clyster to be injected.

Eleven, p.m. The injection has brought away a small quantity of fecal matter; the vomiting and pain in the abdomen continue; the tumor is hard, unyielding, and extremely painful on pressure.

Under these circumstances, Mr. Teale, with the approval of his colleague, Mr. Smith, proceeded to operate. An incision, two and a half inches in length, was made over the tumor, in the direction of its long axis, which corresponded with the course of the fibres of the external oblique. By this incision, the aponeurosis of the external oblique was exposed, tightly extended over the tumor. The aponeurosis being next divided, the hernial sac, covered by a rather thick layer of tissue, presented itself. On opening the sac, a coil of large intestine, of a high degree of vascularity, and a small portion of omentum were exposed. The fore-finger being now passed deep into the sac, the protruded parts were found to be constricted by an opening in the internal oblique and transversalis muscles, which presented a sharp, tendinous edge at its mesial border, where it was contiguous to the linea semilunaris. A deep grooved director was passed into the abdomen, and the opening dilated by the hernia-knife at its upper border; after which, the intestine was emptied of its contents, and then replaced within the abdomen; the omentum appearing healthy, but being extensively adherent, was allowed to remain in the sac. The wound was closed by suture and adhesive straps.

In half an hour after the operation the patient had a copious fecal evacuation, and the abdomen became rather softer, but his sufferings were not at all mitigated. Pulse 120, and very feeble. He was ordered to take forty drops of tincture of opium.

2, Eight, a.m. He has passed the night in great pain, and constant jactitations, frequently vomiting dark-colored liquid. Pulse scarcely perceptible; cold perspiration.—One, p.m.: Dead.

Body Examined Seven Hours after Death.—A small portion of the sigmoid flexure of the colon had again descended into the sac, and was united by its posterior surface, where uncovered by peritoneum, to the neck of the sac by common cellular adhesions, which, however, were so lax as to allow of the intestine being pushed to and from the sac with great facility. The aperture was situated in the internal, oblique, and transversalis muscles, immediately to the iliac side of the linea transversalis, but without encroaching upon this line. The mucous membrane of the whole of the large intestine, from the cæcum to the protruded portion of the sigmoid flexure, was of a uniform black color and soft consistency; on detaching the mucous membrane, the submucous tissue was more intensely black; the interior of the cæcum and colon contained black fluid, similar to that which had been vomited; the portion of the sigmoid flexure which was lying in the sac was considerably injected, but its mucous membrane did not exhibit the high degree of discoloration observed in the intestine above; below this part the remaining portion of the sigmoid flexure, and of the rectum, appeared perfectly healthy; the small intestines exhibited no unnatural appearance; there was not any effusion in the peritoneal cavity, nor deposition of lymph on the serous surface; the vessels of the subserous tissue, near the site of hernia, were slightly injected.

ON THE CONVERSION OF BENZOIC ACID INTO HIPPURIC ACID.*

By WILHELM KELLER.

(From the *Annalen der Chemie und Pharmacie*.)

So early as in the edition of Berzelius's "*Lehrbuch der Chemie*," published in 1831, Professor Wöhler had expressed the opinion, that benzoic acid, during digestion, was probably converted into hippuric acid. This opinion was founded on an experiment which he had made on the passage of benzoic acid into the urine. He found in the urine of a dog which had eaten half a drachm of benzoic acid with his food, an acid crystallising in needle-shaped prisms, which had the general properties of benzoic acid, and which he then took for benzoic acid. (*Tiedemann's Zeitschrift für Physiologie*, i. 142). These crystals were obviously hippuric acid, as plainly appears from the statements, that they had the aspect of nitre, and, when

* We reprint this paper from Liebig's "*Animal Chemistry*," by Dr. Gregory, just published. Mr. Ure seems to have concluded that the uric acid was converted into hippuric, under the influence of benzoic acid; but, from the experiments of Keller, it would appear that it is the benzoic acid, and not the uric, which undergoes transformation. This is an important point which we trust further researches of Mr Ure may enable him to clear up.—Eus.

sublimed, left a residue of carbon. But at that time hippuric acid was not yet discovered; and it is well known that, till 1829, when these acids were first distinguished from each other by Liebig, it was uniformly confounded with benzoic acid.

The recently published statement of A. Urc, that he actually found hippuric acid in the urine of a patient who had taken benzoic acid, recalled this relation, so remarkable in a physiological point of view, and induced me to undertake the following experiments, which, at the suggestion of Professor Wöhler, I made on myself. The supposed conversion of benzoic acid into hippuric acid has, by these experiments, been unequivocally established.

I took, in the evening before bed-time, about thirty-two grains of pure benzoic acid in syrup. During the night I perspired strongly, which was probably an effect of the acid, as in general I am with great difficulty made to transpire profusely. I could perceive no other effect, even when, next day, I took the same dose three times; indeed, even the perspiration did not again occur.

The urine passed in the morning had an uncommonly strong acid reaction, even after it had been evaporated, and had stood for twelve hours. It deposited only the usual sediment of earthy salts. But when it was mixed with muriatic acid, and allowed to stand, there were formed in it long prismatic, brownish crystals, in great quantity, which, even in this state, could not be taken for benzoic acid. Another portion, evaporated to the consistence of syrup, formed, when mixed with muriatic acid, a magma of crystalline scales. The crystalline mass was pressed, dissolved in hot water, treated with animal charcoal, and recrystallised. By this means the acid was obtained in colourless prisms, an inch in length.

These crystals were pure hippuric acid. When heated, they melted easily; and when exposed to a still stronger heat, the mass was carbonised, with a smell of oil of bitter almonds, while benzoic acid sublimed. To remove all doubts, I determined the proportion of carbon in the crystals, which I found to be 60·4 per cent. Crystallised hippuric acid, according to the formula $C_{18}H_8NO_5 + HO$, contains 60·67 per cent. of carbon; crystallised benzoic acid, on the other hand, contains 69·10 per cent. of carbon.

As long as I continued to take benzoic acid, I was able easily to obtain hippuric acid in large quantity from the urine; and since the benzoic acid seems so devoid of any injurious effect on the health, it would be easy in this way to supply one's self with large quantities of hippuric acid. It would only be necessary to engage a person to continue for some weeks this new species of manufacture.

It was of importance to examine the urine which contained hippuric acid, in reference to the two normal chief constituents, urea and uric acid. Both were contained in it, and apparently in the same proportion as in the normal urine.

The inspissated urine, after the hippuric acid had been separated by muriatic acid, yielded, on the addition of nitric acid, a large quantity of nitrate of urea. It had previously deposited a powder, the solution of which in nitric acid gave, when evaporated to dryness, the well known purple colour characteristic of uric acid. This observation is opposed to the statement

of Urc; and he is certainly too hasty in recommending benzoic acid as a remedy for the gouty and calculous concretions of uric acid. He seems to suppose that the uric acid has been employed in the conversion of benzoic acid into hippuric acid; but as his observations were made on a gouty patient, it may be supposed that the urine, even without the internal use of benzoic acid, would have been found to contain no uric acid. Finally, it is clear that the hippuric acid existed in the urine in combination with a base, because it only separated after the addition of an acid.

STATE OF THE BLOOD IN HYDROPHOBIA.

The last number of the Austrian *Fahrbücher* contains an interesting case of hydrophobia, with an account of some experiments performed by Professor Berres on the patient's blood.

The blood was dark red in colour, and of an oily feel; with the exception of the portion contained in the heart, it furnished very little fibrin and did not coagulate. When examined under the microscope, the globules appeared as perfectly round corpuscles of a dull white colour, without any nucleus, and with a few dentated red rays along the edges.

The bicarbonate of potash developed the red coloured rays on the corpuscles; the same effect was produced more evidently by a concentrated solution of sulphate of copper, and the nuclei now appeared.

On washing the corpuscles with water, they became of a dull white colour, and seemed to pass gradually into a gelatinous, granular mass of molecules.

Concentrated acetic acid turned the corpuscles into molecules. At first, each globule changed into a cluster of small granules, which soon separated, thus showing the difference between them and the globules of healthy blood.

Under a solution of chlorine the globules remained transparent, but soon changed into a granular mass. When concentrated muriatic acid was mixed with a few drops of the blood, a considerable quantity of gas was disengaged, and the corpuscles were converted as before into molecules, with a few opaque, contracted globules mixed amongst them.

Treated with concentrated nitric acid the globules became small, round, and opaque; some few were oblong; some pointed at both ends.

Sulphuric ether, iodine, and corrosive sublimate were also employed with analogous effects. The action of water, chlorine, acetic and muriatic acids, was altogether different from that produced on healthy blood; the three first substances rapidly changing the corpuscles into molecules, and the latter disengaging a remarkable quantity of gas. The peculiarities then observed in the blood in this case may be stated to be—dull white globules, without nuclei; no appearance of the crenated margin; a very quick transition of the corpuscles into molecules, and a tendency to lose their individual character.

HONORARY DISTINCTIONS.

The King of Prussia, having instituted a civil section in the Order of Merit, has nominated Mr. Robert Brown, Mr. Faraday, Sir John Herschel, and Mr. Thomas Moore, knights of the order.