the cold applications could not be exclusively due to mere refrigeration, to simple abstraction of heat from the body by *force majeure*. Naunyn had insisted on this point, and had furnished good reasons, clinical and experimental, in its support. The most efficient method of keeping down the temperature in typhoid was the continuous tepid bath of Riess, in which patients were kept in water at 88° F. or so, for ten to twenty hours at a time. In this way the temperature might oscillate about the normal throughout the greater part of the illness; yet Riess's rate of mortality was not of the lowest. Including all cases, it was, on the average, 22 per cent. The same observer had previously forcibly suppressed pyrexia in his patients by the continuous use of sufficient doses of salicylic acid, but, notwithstanding, he lost 24 per cent. of his cases. Other cases were given in illustration, and the conclusion drawn that we must seek for an explanation of the wholesome effects of cold bathing in its influence on the nervous system, transmitted in the first instance through the sensory nerves.

The effects on the several factors of the thermolytic system were then considered in detail. The primary contraction, followed by reactive dilatation of the cutaneous vessels, was compared with the vaso-inhibitory action of antipyrin. The radiation from the skin was increased after tepid baths immediately, after cold baths it was at first diminished until the skin-temperature rose to a certain height, when it again increased. Diuresis was a usual result of the bath, and might be credited, among other most important and valuable results, with a certain thermolytic effect. The changes in the respiration, the increased depth and slowness of the breathing, were described and evaluated from the same point of view. Incidentally it was remarked that the fear some physicians entertained lest cold bathing might bring about pulmonary congestion was not justified by experience, or, indeed, by physiology. On the contrary, the pulmonary tissue was more fully opened up, bronchial and vascular obstructions were removed, and the signs of partial lobular collapse and engorgement usually done away.

As to the effect of cold bathing on thermogenesis there was still a great deal to learn. Direct calorimetric experiments which would be at all decisive on the subject were very difficult to devise, and the lecturer had not been able to suggest any satisfactory contrivance. A number of observations had, however, been made on the changes in metabolism that accompanied the baths, but in most the method used was open to physiological objections which made it difficult to draw conclusions from them as to thermogenesis. In few had the temperature been effectively kept down for any sufficient length of time. Riess, whose experiments on antipyrin would be remembered, had applied a precisely similar procedure to determine the effect on nitrogenous excretion of his continuous tepid bath, and his results were therefore useful for comparative purposes. Three days of the continuous bath were interpolated between two periods, each of three days, during which the fever was left unchecked. Cerebral disturbances were absent, and no difficulty was found in making exact estimations of the excreted nitrogen. In four cases the increase of nitrogen during the bath days over the fever days was respectively 13.1, 12.4, 2.7, 37.0 per cent. In the last case it was possible that defervescence had set in before the close of the observations; but even if the last period of fever, when the temperature was never high, were excluded, and the bath days compared only with the preceding fever days, the percentage of increase was still 25.8. The effect on excretion appeared to be exactly the opposite of that produced under antipyrin; and it pointed most suggestively to the conclusion that the *modus operandi* of the two antipyretic methods was different. During the bath days it was moreover to be observed that the urine excreted was greater than on the fever days by 3,310, 2,450, 2,650, 2,750 cc. respectively. There was thus no direct evidence of diminished thermogenic metabolism under the continuous bath. Was it possible that in unchecked typhoid fever the nitrogenous excretion, though in excess of that of health, was yet inadequate to eliminate all the waste that was produced? If so, the baths might be supposed to lead not to increased metabolism, but merely to increased discharge of the accumulated nitrogen. Dr. Murchison's suggestion that the cerebral and other symptoms in typhoid were "uræmic" in character was recalled, and correlated with this hypothesis of retained nitrogenous waste, and with the ascertained effects of bathing on the renal functions.

One inference that might be deduced from this apparently fundamental difference in two methods of treatment, both potent to

lower the temperature, was that they should be regarded as in a sense complementary, each effecting what the other did not. A combined treatment in which, for example, a cool bath in the evening procured a favourable night, while antipyrin kept the fever and its attendant discomfort within limits during the day, was an eminently rational one. It was certainly more practicable than the frequent cold bath, at least in private cases. In the present state of our knowledge it ought not to be held as objection to the bath treatment that it led to an increased discharge of nitrogen, but it certainly was in favour of antipyrin that it diminished, not merely the discharge, but the production of nitrogenous waste. As Riess had suggested, in the case of wasted, feeble, or aged patients, it would be an advantage to use an antipyretic which which was proved capable of checking excessive metabolism, such as antipyrin; while in the case of robust and previously healthy patients the fact that cold bathing appeared to increase metabolism would not deter us from resorting to a mode of treatment which in typhoid had been abundantly proved to be beneficial.

FURTHER REMARKS ON ALBUMINURIA RESULTING FROM SEWAGE POISONS.

By GEORGE JOHNSON, M.D., F.R.S.,

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IN a paper on the above subject, which was published in the JOURNAL of March 3rd, I gave the history of four cases of albuminuric renal disease, the exciting cause of which was believed to be defective drainage, and consequent sewage poisoning.

The further history of the third case, which was then recorded, and the remarkable improvement in the patient's condition since the defective drainage was discovered and repaired, afford confirmatory evidence that sewage poisoning was the sole cause of the malady.

It will be remembered, or seen by referring to Case III, that a previously healthy and temperate man had been ill for two years since dwelling in a new house in which a bad smell had been noticed. The first symptoms were disorder of the stomach and bowels, with almost constant diarrhoea, which on two occasions ceased entirely while he was away from home for three weeks, but recurred soon after his return home. At length general dropsy appeared, and then the urine, which had not before been tested, was found to contain a very large amount of albumen, with numerous hyaline and oily casts and cells. At the time of my visit in December I was led to suspect that sewage poisoning had been the cause of the patient's illness. Acting upon my advice, the patient went from home while the defective drain was sought for, discovered, and repaired. The diarrhoea, which had continued until he left home, ceased almost immediately afterwards, and since he returned home, after an absence of five weeks, it has not recurred. In other respects, the improvement has been most remarkable. The albumen has decreased from 15 grammes per litre (by Esbach's exact method) to 3.5 grammes per litre. No tube casts or oily cells have been visible for some weeks past; the dropsy has disappeared. The man has a healthy look, declares that he feels quite well, and for the last six weeks he has been actively pursuing his business as agent for a large brewery. No one who has watched the progress of this case could doubt that the very great improvement which has taken place, although it has been aided by medicinal and dietetic treatment, has been mainly due to the discovery and removal of the exciting cause of the malady—an unsuspected exciting cause, to which the patient had been almost constantly exposed for a period of two years.

Since the publication of the cases before referred to I have met with another example of fatal degeneration of the kidneys, consequent on sewage poisoning.

CASE V.—On February 23rd I saw, in consultation with Dr. Kellock and Mr. Percy Reynolds, Mr. W., aged 47, a town surveyor, who had been ill for several months, and treated for disorder of the liver, but his urine had not been examined until a fortnight before, when he had come under the care of Mr. Percy Reynolds, who had immediately found the urine albuminous. I said to the patient, "How did your illness begin?" He replied, "I have not been well since I got blood poisoning eighteen months ago." I inquired, "How did you get blood-poisoning?" He said, "I was superintending the opening and repair of a blocked drain, and

the smell was so bad that I came home, and vomited many times. The next day I went again to the open drain, and the smell immediately made me vomit. I have been ill ever since."

The chief symptoms at the commencement were those of disordered digestion, with headache and vomiting, which at first occurred at intervals of some weeks, but much more frequently of late. He had lost three stone weight since Christmas, and those who knew him were much struck by his greatly altered appearance. His illness had compelled him to resign his appointment as surveyor. There had been no oedema, and the urine had never been observed to be high-coloured. During the last few weeks micturition had been frequent and copious. The urine now was of light colour, specific gravity 1012, and contained four grammes per litre of albumen. It deposited a dense but scanty whitish sediment, containing large granular and large hyaline casts, a few epithelial casts, and a few oily cells, appearances indicating a large white kidney, now undergoing contraction.

The heart's impulse was excessive, with doubling of the first sound and accentuation of the aortic second sound. All the superficial arteries, in particular the radials and the temporals, were tortuous and very tense. There was severe headache, with restlessness and frequent vomiting. The evidence of advanced and incurable degeneration of the kidneys was complete.

On March 12th, when I had another consultation with the gentlemen before mentioned, the urine was slightly blood-tinged. During the last few days the sight had become very dim, no doubt the result of albuminuric retinitis, but he was too ill and restless to bear an ophthalmoscopic examination, and I had to abandon the attempt to make one. I heard from my friend Mr. Percy Reynolds that, except an attack of nose-bleeding of some hours' duration, no fresh symptoms occurred until, after a few hours of coma without convulsions, the patient died on March 20th.

That the renal disease in this case was a direct result of the sewer poison to which the patient had been exposed about eighteen months before his death can scarcely be doubted. Up to that time he had been in good health, he was of strictly temperate habits, and he had not been exposed to cold, or to any other known cause of renal disease; and, on the other hand, he emphatically stated he had never been well since the sudden onset of the toxæmic symptoms.

It is noteworthy that none of the men engaged in repairing the drain, the emanations from which caused the fatal disease in our patient, were made ill in the performance of their disagreeable work, although they must have been much longer exposed to the foul air. This affords an illustration of the common observation that a virus which is sufficiently potent to excite fatal disease in one man may have no appreciable ill effect upon others who have been equally or even more exposed to its influence.

The most rapidly fatal case of poisoning by sewage virus that I have seen came under my care many years ago when I was physician to the Public Dispensary. I regret that I cannot find my notes of the case, but the main facts are that a man having been engaged for an hour or more in unstopping a blocked drain by stirring with a stick was speedily seized with vomiting, and the urine became scanty and deeply blood-tinged. There was rapidly increasing cerebral oppression, and death within forty-eight hours after exposure to the sewer poison. The kidneys were found much enlarged and of a deep chocolate colour, presenting exactly the appearance which is admirably represented in Dr. Bright's Plate 5 (*Medical Reports*, vol. i). On microscopic examination every uriniferous tube was found injected with extravasated blood.

METHYLENE AS AN ANÆSTHETIC.

By WILLIAM H. DAY, M.D.,

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ATTENTION is just now being drawn to the action of methylene, and its claim to certain advantages over other anæsthetics. Having had with Sir Spencer Wells some considerable experience in the administration of methylene, and its subsequent effects during the period of convalescence, I am tempted to offer a few practical notes.

It is a mystery to me that an anæsthetic so safe and effectual as methylene should not have been more generally employed by the profession. A few deaths have been imputed to it, it is true, and occasional deaths will occur from any anæsthetic, however

carefully administered, but notwithstanding, I think, methylene occupies in point of safety a first class position. Some years ago the late Mr. Peter Squire asked me whether I considered methylene possessed any advantages over chloroform, and I replied in the following words, which will be found in his *Companion to the British Pharmacopæia*:

"It is less likely to cause vomiting, it is more agreeable to inhale, and there is less excitement preparatory to the stage of anæsthesia; rarely more than three or four drachms are required for an operation lasting half an hour, and consciousness returns in a few seconds after inhalation is discontinued."

My conviction of these merits remains unshaken. We should always bear in mind that all patients do not behave alike under an anæsthetic, whether it be ether, chloroform, or methylene. The young bear anæsthetics better than the middle-aged. The strong and the vigorous, and those of sanguine temperament, resist the action more than those who are nervous and phlegmatic; they are longer in getting under the influence of it, and it sometimes requires much patience and tact before complete muscular relaxation and tranquil sleep are established. If such patients have been intemperate the difficulty is all the greater, and I have felt on these occasions some anxiety, though I have never yet failed to narcotise them. Men do not take anæsthetics so well as women. If young and healthy there is more struggling and resistance, and after the middle period of life fatty infiltration of the heart is more common in the former, and they indulge to a greater extent in alcoholic stimulants. Children are quickly narcotised, and danger is scarcely ever present. In patients who lead temperate lives, and whose heart and lungs are healthy, almost any anæsthetic may be safely administered; it is when these organs are damaged that death from asphyxia or syncope sometimes ensues. In abdominal tumours of long standing, with a large quantity of peritoneal fluid, the diaphragm is pressed upwards, and the lower lobes of the lungs are so compressed that very little breathing space is left, and hence the danger of suffocation if the anæsthetic is not given sparingly and slowly. Slow administration is in itself a safeguard. In such cases the shoulders of the patient require to be well elevated, and the mask of the apparatus not brought so near the mouth as to exclude the free admission of atmospheric air into the lungs. In these cases of pulmonary oppression the patient may become livid after a few inhalations, and be seized with a convulsive, choking cough, which embarrasses the operator, but as the ascitic fluid escapes, and the tumour is removed, freer respiration is established, and then the remedy can be pushed to full narcotism, more particularly when the abdominal distension is of recent date. It is in disregard of this warning that fatal consequences may result.

When the abdomen is distended with fifteen or sixteen quarts of fluid, and contains a multilocular cyst, weighing eight or nine pounds in addition, the umbilicus may reach a higher level than the nose of the patient as she lies on the operating table. In such a case slow and cautious administration is demanded, and as I have before said some of the fluid must be withdrawn before the patient can take a full inspiration. At this stage we cannot push the methylene beyond partial anæsthesia.

When mucus accumulates in the mouth, I am in the habit of twisting one end of a pocket-handkerchief round the forefinger of the right hand, and wiping it away. This simple practice prevents the mucus from collecting at the back of the pharynx, whilst it facilitates respiration, and prevents the choking cough.

When the pulmonary organs have been long pressed upon, or the heart displaced, bronchial irritation sometimes comes on a few days after operation, as the lungs undergo expansion, and the pressure is removed. This is all the more likely if a considerable quantity of the anæsthetic has been administered. Such complications are rare in recent abdominal distension, but in old standing cases where the lower ribs are bulged outwards like a fan this risk is frequent, and ought to be calculated upon. In these cases the heart becomes weak; it is often displaced upwards, and prone to take on degenerative change.

As to the existence of a cardiac murmur, undue importance may be attached to it. It is not always easy to diagnose a functional from an organic murmur, but where the pulmonary circulation is free, I never hesitate to recommend methylene as an anæsthetic. The pressure resulting from a large abdominal tumour may give rise to a soft cardiac murmur, which means nothing at all, if the muscular structure of the heart is vigorous enough to overcome any distension of its cavities, but we must not overlook the fact that long-standing upward pressure tends to invite feebleness of