fear causes loss of voluntary attention to the world around and its diversion to the personality of the individual. The result of this is a disorder of the involuntary automatic functions of the body—a disordered coenesthesia. Such organs as the heart, the lungs, the stomach, and the intestines, which under normal conditions function automatically with phasic or periodic regularity and without the intervention of attention, now, owing to the effects of introspection and contemplative fear, are disordered in function, and consequently obtrude themselves in consciousness. This causes hypochondriasis and various forms of neurosis.

A local colour of deranged organs gives rise to various types of neurasthenia, and obsessional psychasthenia with phobias. But besides these bodily disorders of the vital functions contemplative fear and anxiety upset the delicate poise of the internal secretions of the reproductive and endocrine glands, the functions of which we are only vaguely conscious of by the bodily effects produced.

An intelligent understanding of the influence of mind on body and body on mind—mental hygiene—and its practical application by the doctor, would avoid recourse of the public to faith healing, Christian Science, the Coué cult, and other forms of treatment by suggestion, which now receive so much popular attention and acclamation.

REFERENCES.

¹ *Bristol Med.-Chir. Journ.*, March and June, 1922. ² *Analytic Psychology*. ³ The Identity of the Neuroses and Psychoses, *Journ. of Mental Science*, 1920.

THE OUTLOOK OF NEPHRITIS IN CHILDREN.*

BY

HUGH T. ASHBY, B.A., M.D.CAMB., M.R.C.P.LOND.,
PHYSICIAN TO THE MANCHESTER CHILDREN'S HOSPITAL, ETC.

As a general rule cases of nephritis in children do better than in adults; one reason, no doubt, being that the cardiovascular system is in good order, and any rise of blood pressure which may take place has less effect.

The examination of urine in infants is often neglected because of the difficulty in obtaining a specimen. The best way to do this is to put the infant on a mackintosh so arranged that the urine runs into a small pool at the end of the bed. Another way is to hold the infant out after a long sleep.

A simple method of estimating how much urine a child (over 4 years of age) should pass in the twenty-four hours is as follows. The age of the child in years multiplied by two and a half gives the amount in ounces. Thus a child of 6 years will pass about 15 oz. ($6 \times 2\frac{1}{2} = 15$); a child of 12 will pass 30 oz. ($12 \times 2\frac{1}{2} = 30$).

Acute inflammation of the kidneys occurs more often as a secondary than as a primary disease in childhood. Scarlet fever is by far the commonest cause, the nephritis coming on at any time from about the fourteenth to the twenty-sixth day of the disease; it is often impossible to determine the exact date of the commencement of the nephritis, and many cases are the result of mild attacks of scarlet fever not recognized at the time. The severity of the attack of scarlet fever plays no part in the occurrence of nephritis, which may come on after severe and mild attacks alike; often, indeed, the most fatal are those which come on after an attack only recognized by the peeling. It is likely that the patient has not been looked after during the convalescence and has been exposed to cold, etc. In any child under 10 years of age who develops nephritis, scarlet fever should be borne in mind and desquamation looked for very carefully.

The occurrence of nephritis after scarlet fever varies in different epidemics, but it may be roughly estimated at about 10 per cent. The outlook is usually good, and it is rare for the nephritis to become chronic. The amount of albumin in the urine does not seem to alter the outlook, for a case with a large amount may get quite well while one with only a small amount may do badly. The worst cases are those which have remained untreated for some days and in those where there is suppression of urine, as uraemia is liable to occur. The preventive treatment consists in the greatest care being taken during the two and three weeks after the acute onset of scarlet fever, especially as regards catching cold.

Acute nephritis does, however, occur as a primary disease, or at any rate as far as we know. Thus a schoolboy, who had apparently been in good health, was noticed by his parents to be puffy in the face one morning, and on examination a large quantity of albumin was found in the urine.

Unlike the post-scarlatinal nephritis, the outlook is mostly bad in these insidious cases. They run a course of perhaps three months to two years, but complete restoration to health does not often occur. The child may get fairly well, but he is liable to further attacks, which damage the kidneys still more, till he grows waterlogged and dies. Towards the end very little urine is passed, and dyspnoea becomes a very marked feature, so that the patient has to be propped up in bed. Uraemic convulsions are also common.

It is, however, often difficult to give a prognosis, which is what the relatives want to know. The prognosis depends on (1) the general condition of the patient; (2) whether the nephritis is post-scarlatinal or idiopathic; (3) the results of the renal function tests, etc., the chief being for the ordinary man the urea concentration test.

Recently the renal efficiency test has been elaborated by Maclean and de Wesselow, of St. Thomas's Hospital. It is simple, needs no clinical laboratory, and from my own experience gives reliable information as to the state and efficiency of the kidneys. Until lately the condition of the kidneys of patients suffering from nephritis was judged solely by the amount of albumin and by the presence of casts. Now, a large amount of albumin does not necessarily mean that the outlook is bad; nor is the converse true, for a patient with a small amount of albumin may do badly.

This is where the urea concentration test or renal efficiency test is useful. It depends upon the fact that when a large dose of urea is administered to a patient with defective kidneys he is incapable of excreting urine with a high urea concentration. The Ministry of Pensions has used this test to assist in assessing patients for pensions. The details of the test are as follows:

Renal Efficiency Test.

Starting at a convenient time, say 8 a.m., the child empties his bladder and immediately afterwards takes 10 grams of urea (15 grams for an adult) dissolved in about 3 oz. of water, flavoured with tincture of orange. The urea solution is not unpleasant to take, and there is seldom any difficulty.

At 9 a.m., or an hour later, he passes urine.

At 10 a.m., or two hours later, he passes urine again, and this specimen is kept for the estimation of urea.

The test is easily carried out, the urea being estimated by the hypobromite method and an apparatus which gives the volume of gas evolved. The apparatus can be bought complete, or it can be arranged by oneself. The percentage of urea equivalent to the amount of gas evolved may be ascertained from a table.

If the percentage of urea after the test exceeds 2 the kidneys are fairly efficient, but if below 2 their condition is unsatisfactory. The test can be carried out each week during an illness, and we can see how the kidneys improve or otherwise. The general reliability of the test and its ease of application (it takes about three minutes) should make it of great assistance in clinical medicine, and also in certain surgical conditions, such as prostate and kidney cases.

Again, if it is suggested that a patient with chronic nephritis should undergo an operation, we can, after performing the test, say whether the nephritis precludes it. There is also the test where the blood urea is estimated, but the test is beyond the scope of anyone who is not a trained pathologist.

Little need be said of the general treatment of nephritis until we come to the question of diet. It is clear that in the past we have restricted the diet too much, especially in the amount of protein allowed. Everyone needs a certain amount of protein to keep in good health. If very little or no protein is given in the food the body itself will supply waste products, so that we cannot eliminate altogether the work of the kidneys. There is no retention of nitrogenous products in a case passing albumin in the urine, and therefore there is no need to restrict the diet. Again, there is a large loss of protein each day, and all the more reason for giving a liberal supply in the food to make good this loss. When protein is given in the diet the amount of albumin in the urine is not increased and often diminishes.

A high protein diet is the best means we have of relieving a patient who has much dropsy from nephritis, and helps to make him more comfortable. This is most probably to be explained on the ground that the protein diet raises the urea percentage in the blood and so causes a diuresis, for urea is

* A paper read to the Lancashire and Cheshire Branch of the British Medical Association, January, 1923.

one of the best diuretics we have. A dose of urea, 10 to 15 grams each morning, will often get rid of obstinate oedema.

It should be noted that there is no excess of urea in the blood during uraemia; if there were there would be a good diuresis and no uraemic convulsions.

To sum up, I would advise that a patient with nephritis should have a slop diet for about ten days, and that the diet should gradually be increased to include fish, eggs, and meat, although there is still albuminuria. Also do not keep a nephritic patient in bed too long. A certain amount of exercise in a warm room helps to lessen the oedema, besides giving the child a happier time.

IONIC MEDICATION.

BY

DAVID CAMPBELL, M.C., M.A., B.Sc., M.B.,

FOLLOK LECTURER IN MATERIA MEDICA AND PHARMACOLOGY, UNIVERSITY OF GLASGOW; PHYSICIAN TO OUT-PATIENTS, WESTERN INFIRMARY, GLASGOW.

THAT particular branch of therapeutics known as ionic medication or ionization is one about which very little information can be obtained in any recognized textbook of pharmacology and therapeutics. Yet the subject is not a new one. Lewis Jones states that Leduc, in one of his publications, gives references to a great many papers on the subject, and mentions one published in 1833.¹ Turrell goes even farther back and declares that the theory of ionic medication was enunciated by Verratti in 1747.² The general application of this theory as a practical question in therapeutics appears, however, to date from the publication of a series of papers by Leduc in 1900. In spite of this most textbooks ignore the subject. A few mention that there is such a method of treatment, but offer little or no criticism of its efficacy.

The reason for this reticence on the part of authors is fairly obvious. The majority of those who practise this method of treatment acclaim with enthusiasm the wonderful results which follow. Those who criticize it exhibit an almost equal degree of vehemence in their condemnation. It is difficult for the therapist, who may have little or no practical experience of the method, to know where the truth lies. It seemed to me, therefore, that it might serve a useful purpose to undertake a critical examination of the whole subject, basing my views on a considerable number of experiments and clinical observations.

The first difficulty which arises is in the definition of the term "ionic medication." According to those who speak with authority on the subject the term embraces (1) the introduction of drugs into the body through the skin or a mucous surface by means of an electric current, and (2) the modification of the chemical composition of parts of the body by the setting up of chemical changes throughout the tissues.³ If the second part of the definition means that the chemical composition of the tissues is modified by the drugs introduced, then it is understandable. If, however, as is generally held, it means that this modification is the result of the passage of a current through the body, without any reference to the drug introduced, it is very difficult to see how this process can be termed "medication." It is obvious, in any case, that the two parts of the definition involve quite different conceptions, and will require to be considered separately.

The first question therefore which has to be considered is: Can drugs be introduced through the skin by means of an electric current? The answer to that question is undoubtedly in the affirmative. In animals Leduc showed that it was possible to introduce strychnine ions through the skin of a rabbit in this way.⁴ Finzi proved that the ferri-cyanide ion could be carried through the skin of a monkey.⁵ Inchley repeated these experiments on cats, rabbits, and guinea-pigs, and showed further that it was possible to introduce a number of other alkaloids, some metals, and certain negative ions.⁶ In man exact records of experiments are few, though numerous writers have mentioned that it is possible to prove the penetration of the iodine ion. In my experiments I have been able to confirm this, and I have further been able to demonstrate quite conclusively the presence in the body of another anion, the salicylic ion, and of two cations, pilocarpine and atropine, after they have been carried through the human skin by a current of electricity.

The next question is: Has the ion thus introduced into the body any special pharmacological action in virtue of its being

so introduced? If we are to believe the ionic theory of the action of drugs—namely, that soluble salts exist in the body mainly as ions, and that each ion possesses an independent pharmacological action—then we must believe that the method of administration will make no difference to its intrinsic action. That this is so has been shown by the experiments of Leduc and Inchley on animals. The strychnine ion introduced electrically exhibited its ordinary action on the spinal cord and caused convulsions, while the atropine ion exhibited its ordinary action by producing paralysis of the cranial autonomic nerves. In man it can be shown quite easily by using a solution of pilocarpine nitrate underneath the positive pole. After the current has passed for some time the individual exhibits salivation, sweating, and disturbance of vision—in other words, the ordinary signs of the action of the pilocarpine ion. It may seem that I elaborate this point rather unnecessarily, but the suggestion has frequently been made, or at any rate implied, that by introducing an ion through the skin by means of an electric current you thereby endow it with some peculiar properties. That this is not so is obvious. The essential pharmacological action of any particular ion is the same whether it be passed through the skin into the body by inunction, a hypodermic needle, or an electric current.

If that be so the critic will very naturally ask: Wherein lies the particular merit of this method of introducing drugs into the body? The technique is expensive, complicated, and wasteful of valuable drugs, compared at any rate with the hypodermic needle or inunction. What advantages does it possess to compensate for these very obvious drawbacks? The answer is given that "in treatment by ionization a cloud of ions is introduced into the place where the disease exists";⁷ that the ions are limited to the diseased region, and that therefore the local concentration is high. As a result the action is more intense, and the effect consequently greater.

If we examine these statements we must inquire: (a) What quantity of drug can be passed through the human skin by means of the currents used for therapeutic purposes? (b) What evidence is there of a local concentration of the drug? (c) How deeply can the drug be made to penetrate in this way?

I have investigated the first question with special reference to the iodine and salicylic ions, which are the two remedies most extensively employed in the treatment of medical conditions in this way. The method adopted was to "ionize" a number of patients, using a 2 per cent. solution of potassium iodide or sodium salicylate under the negative electrode. The process was continued for a period of thirty to forty minutes, and the urine was collected for analysis during the twenty-four hours following the experiment. The method described by Kendall⁸ was employed to estimate the amount of iodine present in the urine, and the amount of salicylic bodies was estimated by Hanzlik's method.⁹ The following table gives the results when potassium iodide was used.

Current in milliampères	25	50	100	200
Milligrams of iodine in 24 hours' urine	30	55	98	146

It must be pointed out, of course, that it is not possible to raise the current all at once to the amperage indicated. For the comfort of the patient that has to be done gradually, and accordingly the currents mentioned were not acting during the whole period of the experiment. The rapidity with which the current could be raised varied with different individuals, but the quantities of iodine noted in the table were the maximum found for each particular current. In the case of the current of 200 ma. the duration of the experiment was forty minutes, the current being raised from 100 to 200 ma. during the last thirty minutes of the period. The duration in the other cases was thirty minutes.

It is known that from 60 to 80 per cent. of the amount of iodide taken into the body by any channel is excreted in the urine in twenty-four hours. From the figures given it is possible therefore to estimate approximately the amount of the iodine ion which has entered the body. Taking even the lowest percentage, the maximum amount of iodine which was introduced into the body by each current was 50, 92, 160, and 243 mg. respectively. In other words, it will be seen that, with the ordinary currents used in therapeutics, and for the ordinary duration of treatment, the total amount of iodine introduced was not greater than 0.77 grain, 1.4 grains, and