Luciani first called attention to the fact others have confirmed his observation that the muscles are in a hypotonic condition, while asthenia results in diminished force of contraction. My own results of destructive lesions of the organ are in accord with Nothnagel's view that lesions of the vermis result in much more severe symptoms than do those of the hemispheres, for while my results do not accord with those who have maintained that no disturbance of function results from ablation of the lateral lobe, the increase in the severity of the symptoms which resulted when part of the middle lobe was removed, as opposed to the lateral lobe alone, was out of proportion to the extra amount of cerebellar tissue that was thus put out of action. My results are also in accord with those who, like Marrassini, find that lesions of the median portion of the cerebellum caused disturbances of equilibrium, in which forward or backward oscillations occurred, whereas lesions of the lateral portions result in lateral oscillations to the right or left, as the case may be.

EFFECTS OF LESIONS OF THE LABYRINTH.

What has been said of the important connexions which exist between the labyrinth and cerebellum prepares us for the fact that destructive lesions of the labyrinth result in disorders of equilibrium which are similar to those the outcome of lesions of the cerebellum. Thus it is that lesions of the semicircular canals or section of the vestibular nerve result in disorders of equilibration, in which the animal rotates to the side of the lesion and its homolateral limbs are extended and abducted, as if in the attempt to prevent the rotation, while its contralateral limbs are flexed and adducted. Moreover, the connexions which the vestibular nerve forms with the ocular nuclei prepare us for evidences of disordered innervation of the eye muscles of a similar kind to those which follow lesions of the cerebellum, including abnormal position of the eyes and nystagmus. The similarity between the effects of lesions of the cerebellum and labyrinth is further evidenced by the conclusions of J. R. Ewald and others that the labyrinth exerts a tonic influence on many muscles, while Sherrington points to the fact that the "knock-out" blow, in which the concussion is conveyed by the lower jaw to the labyrinth, reduces "a vigorous athlete to an unstrung bulk of flesh."

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THE annual report for 1909 of the Library Committee of the College of Physicians of Philadelphia states that the number of bound volumes is 81,018, and of unbound reports, transactions, theses, and dissertations is 31,913. There are in addition over 70,000 unbound pamphlets. The cost of transferring the whole collection from the old to the new building amounted to about £165 for boxes, vans, and labour.

THE fifth annual dinner of the Sheffield Edinburgh University Club was held at the Royal Victoria Station Hotel on February 5th, Dr. W. S. Kay, President of the club, in the chair. A company of 108 members and guests assembled to meet Sir Thomas Fraser, the guest of the evening. Dr. Gordon proposed the Alma Mater, and Sir Thomas Fraser replied in characteristic fashion. Amongst the guests were Drs. Sinclair White, Burgess, Dyson, Favell, and Mr. Pye-Smith. A very enjoyable evening was spent

Remarks

ON THE

EFFECT OF BACTERIAL VACCINES ON NUTRITION.

BY LEWIS CAMPBELL BRUCE, M.D.,

MEDICAL SUPERINTENDENT, PERTH DISTRICT ASYLUM.

IF I were asked what is the most common bodily disorder to be noticed in patients suffering from nervous diseases of the type of neurasthenia and the insanities, I would reply, failure of nutrition. There are exceptions to this statement, but it may be taken as a fact that 90 per cent. of the sufferers from functional nervous disorders are thin and poorly nourished. Some of these cases actually die of starvation in the midst of plenty, while others linger on from year to year obstinately resistant to all forms of dietetic treatment. The subject of nutrition, therefore, is an important one for the physician, and any observations which may throw light upon this question are of interest.

In physiological nutrition there appears to be a definite ratio between the nitrogen ingested in the food and the nitrogen excreted in the urine and faeces. When the daily average of nitrogen in the food is reduced, the nitrogen in the excreta also falls, and the body weight is reduced; eventually, however, the body accommodates itself to the altered food supply, a new nitrogen balance is struck, and the weight remains constant.

In acute diseases, notably those associated with fever, the nitrogen balance is upset, the excretion far exceeds the ingestion, and as a consequence there is loss of body weight. When recovery takes place, this condition of affairs is reversed, nitrogen is conserved, more is ingested as the appetite returns, and at the same time the body weight increases, and when recovery is complete a condition of nitrogen balance is again resumed.

In many of the acute insanities, notably maniacal states, the relation of the nitrogen excreted and the urea-nitrogen value of the food ingested conforms to that noticed in acute febrile diseases.

In neurasthenics and cases of chronic insanity, however, there is an entirely different state of affairs. As a rule, the excretion of urea nitrogen is much less than the urea-nitrogen value of the food ingested. If a chart of the nitrogen excreted and the nitrogen ingested in a case of chronic insanity with malnutrition be compared with a

Chart I.—Represents the weekly average of the urea nitrogen excreted, the urea-nitrogen value of the food ingested, and the body weight in a case of acute mania. During the first three weeks, when the patient was acutely maniacal, the excretion exceeded ingestion, and body weight was lost. The latter part of the chart shows the excretion and ingestion during the period of convalescence and recovery, during which period weight was gained.

similar chart of a patient recovering from acute mania (Chart I), they at first sight appear somewhat similar, but a comparison of the body weights at once denotes a

* Delivered at the annual meeting of the Perthshire Branch of the British Medical Association.

difference. While the patient recovering from mania ingests more nitrogen than he excretes in his urine, and gains weight, the chronic case also ingests more nitrogen than he excretes, but either loses weight or does not gain weight. In the one case the nitrogen is being used to form new tissue, in the other the nitrogen is not being

Chart II.—Shows the weekly average of the urea nitrogen excreted, the urea-nitrogen value of the food ingested, and the body weight in a case of chronic insanity with marked malnutrition. Throughout the observation, although excretion was less than ingestion, the patient lost weight and finally died of inanition.

while to try vaccine treatment in such cases if no improvement followed the usual methods of treatment. As the streptococci isolated from different cases differed slightly from one another in their sugar reducing reactions, I made a polyvalent vaccine from seven different varieties of streptococci and treated 11 cases of mania with injections of from 7 to 10 million cocci given at intervals of a fortnight. Of these patients 8 had been ill for over a year, and of the remaining 3, 1 was a recent admission, while the other 2 had been resident for more than three months without showing signs of improvement. Of the 8 chronic cases 2 recovered, and of the 3 more recent cases 2 also recovered. The fact, however, which most impressed me was that the injections of vaccine apparently stimulated nutrition, as 8 out of these 11 cases markedly increased in

Chart III.—Shows the increase in weight in a case of chronic mania which occurred while the patient was undergoing a course of vaccine treatment. The first injection was given on August 13th and the last on December 1st. The stimulation of nutrition was only temporary in character. Three months after the injections were discontinued the weight fell rapidly.

weight. This point is illustrated by Chart III, that of a case of chronic mania. The weight began to increase after the first injection and continued to increase for a considerable time after the doses of vaccine had been dis-

continued; after their stimulating effect had passed off weight was again lost.

Chart IV shows the increase of weight in one of the chronic cases which recovered. It will be noticed that from May, 1907, to December, 1907, the nutrition did not alter, but almost immediately after the first injection the

Chart IV.—Shows the increase in weight in a case of chronic mania which occurred while the patient was undergoing a course of vaccine treatment. The chart shows the body weight for a period of six months prior to the commencement of treatment. The first injection of 7,000,000 streptococci was given on December 1st. The body weight immediately began to increase; the patient made what was apparently a good recovery, and was discharged on July 1st, 1909.

weight began to increase, and the further increase of weight was steady and continuous.

In a series of 11 cases it can hardly be a coincidence that 8 gained weight under vaccine treatment, and to explain the action one must examine the changes which occur in the human body following upon the injection of dead bacterial cultures.

When a bacterial vaccine is injected, Nature produces a specific bacteriolysin, and, if toxins are also included in the injection, a specific antitoxin. There is also a specific substance formed, which enables the leucocytes to ingest the bacteria. This substance, first described by Wright, was called by him an "opsonin."

In addition to all these, however, there is a further action, which is not specific in character and which is always associated with an increase in the polymorpho-nuclear leucocytosis. This action consists in a raising of the general resistive power of the body to any bacterial infection. This factor has been taken advantage of by surgeons, who, by injecting various leucocyte stimulating substances, raise the resistive powers of their patients in preparation for operative procedure.

When my colleague, Dr. C. J. Shaw, and I were working at opsonic indices, we found that in healthy persons it was possible to raise or depress the index to the tubercle bacillus by injecting staphylococci vaccine. A small dose of staphylococci vaccine raised the tuberculous index, and an excessive dose lowered it. The same results were obtained when testing the streptococcal indices of maniacal patients. These findings appear to be contrary to the teachings of Wright, who maintains that there are specific opsonins for all forms of bacteria, and that the quantity of any one opsonin is not affected by the injection of any other organisms to which that one opsonin is not specific. This statement of Wright has been proved to be correct, and my explanation of the variations in the opsonic indices of the patients mentioned above is that a small dose of staphylococci vaccine raised as a whole the resistive powers of the body, and an excessive dose temporarily depressed it. The staphylococci vaccine, in other words, did not actually increase or diminish the quantity of the opsonic bodies normally present in the serum, but only relatively increased or diminished their efficiency for the time being. I mention these facts because it is by no means proved that the vaccines I used in the treatment of my cases of mania were made from organisms causing the disease. I personally believe that maniacal states are always due to a condition of streptococcal toxæmia, but I must admit that the most careful examination of the serums of maniacal patients, even when treated for long

periods with streptococcal vaccines, never contained the slightest trace of bacteriolytic substance when tested *in vitro*.

To explain the stimulation of nutrition, therefore, it is necessary to look for some action more general than a specific action. According to Ehrlich's theory of cell nutrition, there exists in the protoplasm of an active cell a nucleus with which the special functions of the cell are associated. This nucleus has attached to it a number of atomic groups or side-chains which play an important part in the work performed by the cell. These side-chains readily enter into combination with suitable group atoms presented to them, and it is in this way that the nutrition of the cell is maintained. When toxin molecules are introduced they also can enter into combination with the side-chains and for the time being exhaust the supply. As side-chain molecules are, however, in some way necessary for the life of the cell, the cell is stimulated to further production until finally the side-chains are produced in excess. As has already been stated, these side-chain molecules are there not merely for the purpose of combining with toxin molecules, and so forming antitoxins, they are there for some definite purpose in the cell's nutrition, and therefore, if present in excess, they will combine with other suitable group atoms.

This theory, I believe, explains the improvement in nutrition which in some cases follows upon the use of bacterial vaccines. We may take it that in cases of persistent malnutrition the cells are unable of themselves to produce a supply of side-chain molecules to carry on healthy nutrition. When toxin molecules in the form of vaccines are introduced in suitable quantities the cells are stimulated to produce an excess of side-chains which not only combine with the toxin molecules but also combine with suitable food atoms presented to them by the blood plasma.

That vaccine injections do alter the nitrogen balance can be readily demonstrated by observing the amount of urea nitrogen excreted and comparing it with the urea-nitrogen value of the food ingested. In the cases of five patients who each received $\frac{5}{16}$ mg. T.R. there was a marked increase in the urea nitrogen output in four of them during the week which followed the injection.

Since making these observations on the patients labouring under mania I have had several opportunities of noting the effects of various vaccines on the body weight of the patients under treatment, and I am satisfied that in some cases of obstinate malnutrition vaccine injections do improve the general nutrition. To obtain the best results, the dose of vaccine must not produce a constitutional reaction. When a constitutional reaction is produced there is a loss of body weight. The dose should therefore be too small rather than too large. Secondly, the injections must be sufficiently spaced. In my observations I found that fortnightly injections gave the best results.

MR. JOHN D. ROCKEFELLER, having learnt of the distinguished services to medical science which have been and are being rendered by the researches of Professor Paul Ehrlich of Frankfurt, Germany, has presented to the Board of Directors of the Rockefeller Institute for Medical Research the sum of ten thousand dollars, to be placed at the disposal of Professor Ehrlich for furthering his investigations into the chemical therapy of the protozoan diseases.

THE annual report of the Trained Nurses' Annuity Fund for the year 1909 tells a simple but eloquent story. During the year, the total amount received in the form of subscriptions and donations exceeded that which had been collected in any previous twelve months; but the council is anxious with regard to the future on account of the loss by death of several generous helpers, including the Earl of Hardwicke, the late chairman. In 1901 the number of applicants was so large that it was found that the fund would have to be "closed" until all these claims had been dealt with. It is now reported that these claims have been satisfied, the last three annuities having been granted during 1909 in highly deserving cases. There are nineteen nurses receiving support, and the sum of £219 6s. 3d. was distributed between them during the year. The fund is administered in a most economical manner, no salaried officers being employed, the only expenses being those of printing, postage, transfer, and audit fees. The Honorary Secretary of the fund is Dr. Ogier Ward, 73, Cheapside, E.C.

Introductory Address

ON

SOME OF THE USES OF X RAYS IN DIAGNOSIS AND TREATMENT.

DELIVERED BEFORE THE BRADFORD DIVISION OF THE BRITISH MEDICAL ASSOCIATION,

By JAMES METCALFE, M.D.,

CHAIRMAN OF THE DIVISION; HONORARY SURGEON TO ST. CATHERINE'S HOME FOR CANCER AND INCURABLES, BRADFORD.

I HAVE taken as my text some reflections on the present position of the x rays in diagnosis and treatment. For the past six years I have devoted a great deal of my time to this subject. Considering that Roentgen only discovered the peculiar physical qualities of the x rays at the end of the year 1895, and that it was only during the next two or three years that it was suspected that they had any therapeutic qualities whatever, it is really astounding to think of the elaborate technique evolved during the short period since that time. The diagnostic value of the rays is not now a question of argument—the scope of their use is becoming greater year by year. The therapeutic value of the rays is more open to discussion. They have been tried in almost every conceivable disease, and while it is necessary for the practitioner in this speciality not to allow his imagination to outrun his discretion, yet for certain conditions their application is of indubitable advantage. In some diseases the benefit derived is most unexpected. It seems to me that the results are often astonishing in what I may call the medical derelicts. I mean by that term those unfortunate individuals who have been subjected to every possible and impossible form of medical treatment.

DIAGNOSTIC USES.

To consider, first, some of the diagnostic advantages of the rays, I suppose every one will agree that in fractures and dislocations they are of incalculable value; they do not, however, necessarily make one happier in looking at the results of the treatment of fractures. This is a danger if radiograms fall into the hands of the lay public. They are misread. Only those with a medical education can comprehend the actual position of the parts shown in the radiogram and allow for the distortion produced by the method. But we can see the nature of our fracture, its extent, and the best position to retain it in. Near joints where there is either a dislocation or a fracture, or both, the rays are especially useful.

In all examinations by x rays we can use two methods—the fluorescent screen, in which the picture is shown instantly, or a photograph, which is a permanent record. It is obvious that there are advantages in both methods. Where the parts are very dense, as at the hip-joint, and for the examination of renal calculi, screen examinations are of somewhat limited utility. Radiograms are procurable of almost every part of the body. It is simply a question of the form and quality of the Crookes's tube and the amount of current put into it. Most dislocations can be seen on the screen, and their reduction is assisted if performed at the time of examination. It is a great consolation to be able to see at once that the joint is in its correct position. The examination of bones for inflammatory swellings and new growths is very easy, and a good deal of information in regard to the nature of these conditions can be obtained from a satisfactory x -ray picture. In the examination of spinal malformations, the nasal sinuses, the antrum of Highmore, the pharynx, larynx, and trachea, the x rays can give a great deal of information. Bony abnormalities, foreign bodies, pus, and other things, can often be diagnosed. Abnormalities in the bony parts behind the eye and foreign bodies in that organ can be seen and localized. Foreign bodies can, of course, be seen in any of the soft tissues of the body. The diagnostic value of x rays in many diseases of the thorax is now well known.

In the examination of the chest the fluorescent screen is of the greatest utility. The tube can be placed behind the chest and the screen to the front, or vice versa, for anterior and posterior examinations respectively; but