are not uncommon. It is by a variation in the sensitiveness of the local recipient that we have an explanation of the endless variety to be found in the relative development of racial and individual features.

Regulation of Muscular Effort.

Some ten years after Starling had formulated the theory of hormones Professor W. B. Cannon, of Harvard University, piecing together the results of researches by Dr. T. R. Elliott and by himself on the action of the suprarenal glands, brought to light a very wonderful hormone mechanism—one which helps us in interpreting the action of growth-regulating hormones. When we are about to make a severe bodily effort it is necessary to flood our muscles with blood, so that they may have at their disposal the materials necessary for work—oxygen and blood-sugar—the fuel of muscular engines.

At the beginning of a muscular effort the suprarenal glands are set going by messages passing to them from the central nervous system; they throw a hormone—adrenalin—into the circulating blood, which has a double effect; adrenalin acts on the flood-gates of the circulation, so that the major supply of blood passes to the muscles. At the same time it so acts on the liver that the blood circulating through that great organ becomes laden with blood-sugar.

We here obtain a glimpse of the neat and effective manner in which hormones are utilised in the economy of the living body. From that glimpse we seem to obtain a clue to that remarkable disorder of growth in the human body known as acromegaly. It is a pathological manifestation of an adaptational mechanism with which we are all familiar. Nothing is better known to us than that our bodies respond to the burden they are made to bear. Our muscles increase in size and strength the more we use them; increase in the size of our muscles would be useless unless our bones also were strengthened to a corresponding degree. A greater blood-supply is required to feed them, and hence the power of the heart has to be augmented; more oxygen is needed for their consumption, and hence the lung capacity has to be increased; more fuel is required—hence the whole digestive and assimilative systems have to undergo a hypertrophy, including the apparatus of mastication.

Such a power of coördinated response on the part of all of the organs of the body to meet the needs of athletic training, presupposes a coördinating mechanism. We have always regarded such a power of response as an inherent property of the living body, but in the light of our growing knowledge it is clear that we are here dealing with a hormonal mechanism, one in which the pituitary gland is primarily concerned.

Production of Acromegaly.

When we study the structural changes which take place in the first phase of acromegaly,⁶ we find that not only are the bones enlarged and overgrown in a peculiar way, but so are the muscles, the heart, the lungs, the organs of digestion, particularly the jaws; hence the marked changes in the face, for the form of the face is determined by the development of the upper and lower jaws. The rational interpretation of acromegaly is that it is a pathological disorder of the mechanism of adaptational response; in the healthy body the pituitary is throwing into the circulation just a sufficiency of a growth-regulating substance to sensitise muscles, bones, and other structures to give a normal response to the burden thrown on the body. But in acromegaly the body is so flooded with this substance that its tissues become hypersensitive and respond by overgrowth to efforts and movements of the slightest degree. It is not too much to expect, when we see how the body and features become transformed at the onset of acromegaly, that a fuller knowledge of these growth mechanisms will give us a clue to the principles of race differentiation.

THE PATH OF FUTURE INQUIRY.

There must be many other mechanisms regulated by hormones with which we are as yet totally unacquainted. I will cite only one instance—that concerned in regulating the temperature of the body. We know that the thyroid and also the suprarenal glands are concerned in this mechanism; they have also to do with the deposition and absorption of pigment in the skin, which must be part of the heat-regulating mechanism. It is along such a path of inquiry that we expect to discover a clue to the question of race colour.

This is not the first occasion in which the doctrine of hormones has been applied to biological problems of the British Association. In his Presidential address to the Zoological Section at Sheffield in 1910 Professor G. C. Bourne applied the theory to the problems of evolution: its bearing was examined in more detail in an address to the same section by Professor Arthur Dendy during the meeting at Portsmouth in 1911. At the meeting of the Association at Newcastle in 1916 Professor MacBride devoted part of his address to the morphogenetic bearings of hormones. Very soon after Starling formulated the hormone theory, Dr. J. T. Cunningham applied it to explain the phenomena of heredity.⁷ Nay, rightly conceived, Darwin's theory of Pan-genesis is very much of the same character as the modern theory of hormones.

"HETEROSEROTHERAPY" IN PULMONARY TUBERCULOSIS.

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AN attack of acute pleurisy with serous effusion occurring in the course of chronic pulmonary tuberculosis, with subsequent spontaneous absorption of the effused fluid, is followed not infrequently by a prolonged period of improved health and a marked amelioration of pre-existing symptoms. This improvement has been ascribed to the mechanical action of the effusion in compressing and immobilising the subjacent lung, an action comparable to that of gas artificially introduced into the pleural cavity for this purpose or to that of the accumulated serous fluid in a case of hydro-pneumothorax. This explanation seems doubtful in view of the fact that the duration of an intercurrent attack of pleurisy with effusion is usually limited to a period of three weeks, sometimes less. It entirely fails to explain the improvement witnessed in those cases where the effusion has occurred on the side of the sounder or (in instances of unilateral disease) the apparently sound lung.

Of late years the treatment of tuberculous serous pleural effusion has become more conservative and paracentesis is reserved by many for those cases where the accumulated fluid is dangerous in virtue of its bulk or where natural absorption is unduly delayed. In fact, it is becoming recognised that the patient gains "something" from his effusion; it is difficult to be more explicit.

One of us (W. O. M.)¹ has pointed out elsewhere that the amount of specific antibody (as estimated by means of the "complement-fixation reaction") in the blood-serum of a consumptive individual may show marked fluctuations during an intercurrent attack of acute pleurisy with effusion. R. C. Paterson,² whose work throws fresh light on the subject of the tuberculous serous effusion, concludes that "clinical pleural effusions are caused by the infection of an allergic pleura." V. Gilbert³ of Geneva, in 1896, published details of the treatment of sero-fibrinous pleurisy by "autoserotherapy." He advocated the withdrawal of a small amount of fluid from the pleural cavity and the inoculation of 2 c.cm. into the patient's own subcutaneous tissue. He stated that this procedure was followed by (a) a reaction evidenced by a transient rise of temperature of 1°-2°, (b) increased diuresis with a fall of temperature, and (c) rapid absorption of the effusion in from six to ten days. A. Jousset,⁴ in 1912, while not admitting the value of "autoserotherapy," suggested the employment of "heteroserotherapy" in the treatment of chronic tuberculous pleurisy, stating that tuberculous pleural effusion fluid may be protective to guinea-pigs. He recommended that the fluid withdrawn from cases of acute serofibrinous pleurisy should be allowed to clot and the serum be pipetted off and sterilised by heating to 55° C. on three successive days. This sterile serum was to be employed in doses of from 20-50 g., by subcutaneous inoculation, in the treatment of other patients suffering from chronic tuberculous pleurisy.

⁶ See Keith, THE LANCET, 1911, ii., 993; 1913, i., 305.

⁷ Dr. J. T. Cunningham, Proc. Zoo. Soc., London, 1908, p. 434.

Details of Treatment.

In 1917-18 we employed the method of "heteroserotherapy" in the treatment of a few cases of pulmonary tuberculosis. The following is a brief account of our experience:—

Source of the tuberculous effusion fluid employed.—Fluid from five cases of pleurisy was used: (a) Two cases of "primary" tuberculous pleurisy with effusion, from the wards of St. Thomas's Hospital, diagnosed on clinical grounds and on cytological examination of the aspirated fluid. (b) Three cases of acute pleurisy with effusion complicating "open" pulmonary tuberculosis in patients at the Frimley Sanatorium.

Collection and preparation of the fluid.—The effused fluid was withdrawn from the "donors' " chests by the usual method, with aseptic precautions, into flasks containing a 2 per cent. solution of sodium citrate in normal saline, the final proportion of pleural fluid to citrated saline being roughly as 3 to 1. The fluid was examined cytologically, and in some instances a rough estimation of the number of lymphocytes to the cubic centimetre was made. Sterilisation was effected by adding to the fluid one-tenth its volume of a 5 per cent. solution of carbolic acid, the addition being made gradually with constant stirring. Even so, some coagulum forms, but it is small in amount and, if the fluid is shaken before use, the slight flocculent deposit is insufficient to block a moderately stout hypodermic needle. Finally, the fluid was stored in the cold in convenient hermetically sealed vessels. From the above it will be seen that all the constituents of an unheated effusion were employed for inoculation.

Dosage.—The fluid was administered by inoculation into the subcutaneous tissues. For obvious reasons the initial dose was small (1-2 c.cm.). The amount was increased gradually up to 10, 15, or even 25 c.cm. At the commencement of a course of injections they were given twice or three times weekly; when the larger doses were reached, as a rule at weekly intervals. The injections never caused any disturbing symptoms. Occasionally a transient small rise was noted in the evening temperature on the day of administration. This occurred with some regularity in Case C alone of the eight cases treated. In another instance, where the temperature had fallen to normal during treatment, a dose was sometimes followed by an evening temperature of 99° F. In no instance was a sudden marked rise of temperature, comparable to that produced by an overdose of tuberculin, witnessed. Where improvement in the patient's condition coincided with the administration of the pleural fluid, it was most marked when a dose of about 10 c.cm. had been reached.

Selection of cases for treatment.—As will be seen from the subjoined clinical abstracts, all the cases treated, with the exception of D, had extensive active disease of the lungs, and in all, with the same exception, the outlook seemed very grave. The patients, C, G, and H appeared to us to be moribund at the time treatment was commenced. All, except Case C, were undergoing sanatorium treatment at the Frimley Sanatorium and had been there for some months previous to the administration of the pleural fluid. In every instance tubercle bacilli were present in the patient's sputum.

Details of Cases Treated.

(A) Male, 39, eight years' history. Admitted June 6th, 1917. Extensive active bilateral disease and extensive laryngeal ulceration. Evening temperature 100°-101° F. Very distressing laryngeal symptoms. Rest in bed for two months effected no improvement, and his condition steadily deteriorated. On August 13th injections of pleural fluid were commenced with a dose of 1 c.cm. gradually increased up to 15 c.cm. by the end of September and continued until Oct. 16th, when they were omitted. During this period the temperature fell gradually and remained about normal, the laryngeal symptoms disappeared in a remarkable manner, the patient gained some weight and was well enough to be up and about. His condition remained satisfactory until Nov. 22nd, when the temperature again rose to 100° F. Injections of 10 c.cm. of pleural fluid were recommenced and continued until the patient was discharged on May 8th, 1918. During the second course of injections the temperature fell rapidly and remained satisfactory, not reaching 100° F. again, and only twice exceeding 99° F. He returned to light work at his home and reported in August, 1919, that he had been constantly at work with continued improvement in his health.

(B) Male, 21, 12 months' history. Signs of active disease throughout the right lung, with infiltration of the upper lobe of the left lung. Admitted May 2nd, 1917. Evening temperature about 100° F. After 10 weeks' rest in bed the general condition showed no improvement and the temperature was higher. On July 19th a right-sided artificial pneumothorax was induced, and compression of the lung kept up until August 24th. The lung collapsed readily, and the pneumothorax was apparently complete. (No X ray examination.) This having no effect upon the pyrexia or other symptoms, injections of pleural fluid (1 c.cm.) were commenced on August 13th. The amount was increased gradually up to 25 c.cm. on Nov. 5th, on which date the injections were discontinued. The temperature began to fall when a dose of 7 c.cm. was reached, and after a few doses of 10 c.cm. rapidly assumed a more favourable type, being practically normal by Sept. 27th, and from this date until Nov. 20th rarely exceeded 99° F. and was never higher than 99.4° F. During this period the patient gained 12 lb. in weight, was able to get up for most of the day, and the symptoms and general condition were improved. On Nov. 20th, 21st, and 22nd the evening temperature was 99° or 99.2° F., and injections of 10 c.cm. of pleural fluid were recommenced and continued until Feb. 8th, 1918. During this time the temperature remained satisfactory, weight was maintained, and the patient was well enough to be up all day and to take exercise. He relapsed subsequent to discharge, and in June, 1919, was reported to be going downhill.

(C) Male, 16, two months' history. Seen Feb. 12th, 1918. Acute caseous tuberculosis of both lungs. Tuberculous laryngitis. Pyrexia (temperature up to 103° F.). After two months' rest in bed the temperature improved (ranging up to 100° or 101° F.), he had gained a few pounds in weight, and the general condition, while still grave, showed slight improvement. Between April 7th and June 12th he had 23 doses of pleural fluid from 2 to 10 c.cm. During this period the temperature fell further, the general condition improved, he gained 10 lb. in weight, and became well enough to go to a sanatorium. Subsequently the laryngeal disease increased, and he died about Christmas, 1918. In this case the administration of the earlier doses of pleural fluid was followed frequently by a slight elevation of temperature with a subsequent fall.

(D) Male, 48. Admitted Dec. 28th, 1916. Seven years' history. Chronic tuberculosis of right lung. Recent activity. Slight pyrexia and constant hæmoptysis of small amount. In March, 1917, acute bilateral tubercular epididymitis developed. One testicle was removed in April and the second in June. This was followed by a prolonged period of slight pyrexia, with occasional rises of temperature to 100° or 101° F., and persistent slight hæmoptysis. From Dec. 24th, 1917, to May 3rd, 1918, he had 35 injections of pleural fluid in doses of from 2 to 10 c.cm. (346 c.cm. in all). By February the temperature had fallen to 98.4° F. or below, and thereafter remained stable. The hæmoptysis ceased at the end of this month and did not recur. The pulmonary symptoms were reduced to a minimum, and in May he was well enough to resume active work and has remained well ever since.

(E) Male, 24. Admitted May 16th, 1917. A few weeks' history.—Acute bilateral disease. Continuous pyrexia and frequent hæmoptysis. By November the general condition had improved slightly, the evening temperature ranging up to 101° F. From Nov. 13th, 1917, to March 1st, 1918, he had 35 inoculations of pleural fluid (300 c.cm. in all). During the administration the temperature fell and remained much more stable, though he did not become actually afebrile. (Average evening temperature 99° F.) The improvement in general health was marked. In April, 1918, a prolonged period of fever set in and the temperature remains unstable at the time of writing, though the improvement in general condition has been maintained.

(F) Male, 23. Admitted Sept. 26th, 1917. Nine months' history. Extensive disease of the right lung and ulceration of the larynx. Slight pyrexia with irregular rises of temperature up to 102° F. From Nov. 21st, 1917, to Jan. 15th, 1918, had 18 injections of pleural fluid (1 c.cm. to 10 c.cm.). There was no apparent effect on temperature or general condition. He subsequently improved and reported in June, 1919, that he had returned to America and was in better health.

(G) Male, 47. Admitted Nov. 14th, 1917. Eighteen months' history. Extensive bilateral disease with advanced laryngeal and pharyngeal tuberculosis. Apparently moribund. From Jan. 18th, to Feb. 28th, 1918, had 14 doses of pleural fluid (3 c.cm. to 10 c.cm.). They had no effect, and the patient died in April.

(H) Female, 21. Admitted Nov. 30th, 1917. Eighteen months' history. Extensive bilateral disease. Pyrexia. In February, 1918, there was evidence of marked extension of disease, and the general condition deteriorated. From May 1st to July 5th 12 doses of pleural fluid were given (110 c.cm. in all) with no effect. The patient continued to go rapidly downhill, and died in the winter.

Summary.

In three (F, G, and H) of the above eight cases the administration of the pleural fluid was without any apparent effect upon the symptoms or course of the disease. In two (C and E), where improvement coincided with treatment, it must be admitted that these two patients had shown signs of improvement before it was commenced. Two (A and B) were going steadily downhill in spite of other measures of treatment; in both the use of pleural fluid was followed by rapid and marked improvement, in both the cessation of the injections was followed by a tendency to relapse, and in both renewed improvement followed their resumption. Both these patients received injections of the same pleural fluid (from a case of "primary" tuberculous pleurisy) used within a few weeks of its preparation.

In the remaining case (D), though the patient's general condition was good throughout, troublesome symptoms which had persisted for months disappeared within a few weeks of the administration of the pleural fluid.

While well aware of the difficulty of correlating cause and effect in a case of tuberculosis of the lungs, we are of opinion that the use of "heteroserotherapy" in this disease is worthy of further investigation, and that the results obtained in Cases A, B, and D may be ascribed fairly to the effect of the inoculated pleural fluid.

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THE EARLY TREATMENT OF MENTAL DISORDERS.

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AT the present time, when articles are constantly being published with regard to the extraordinary good results obtained in the treatment of the psychoneuroses in special neurological hospitals, I think it will not be out of place to record the results obtained amongst the psychoses.

The Material Examined.

I am taking my figures from the admissions to the Mental Division of the Lord Derby War Hospital for the first two years. There were during this period 4695 admissions, all of whom were soldiers in a state of acute mental disorder, and by far the majority came from the Expeditionary Forces overseas.

Amongst this vast number of cases of acute mental breakdown all types were met with. Speaking generally, there was nothing very noticeable in the way of symptoms presented to differentiate them from those seen in pre-war experience. I have already recorded the individual types of psychoses met with in a paper published in the *Journal of Mental Science* of July, 1918, and will therefore not enter into the discussion of individual cases in this article.

A survey of the numbers of admissions and discharges at the end of two years' work discloses the fact that the recovery rate stands at 56 per cent., and I think this is sufficiently encouraging to call attention to, seeing that the percentage of recoveries amongst male admissions to county and borough asylums in England for the 10 years 1902 to 1911 inclusive was only 32 per cent.¹ A statistical record of the admissions from the French Expeditionary Force will be found in Table III.

Of the 1000 cases in hospital at the end of two years' admissions only 200 had been resident six months or over, and during this period the deaths totalled only 40, or 0.8 per cent.

Over 330 cases who had developed a mild psychosis under exceptionally trying conditions were considered sufficiently recovered to justify their return to military duty under the proviso that they were kept on home service for 12 months.

This step was so far justified that a great number of these ultimately again went to the front, the wisdom of which, however, is a question for speculation.

Review of Treatment Adopted: 1. Early Observation.

I propose, therefore, to review the treatment adopted in dealing with this vast number of cases of acute mental disorder.

In the first place, I think an important point is that all were brought under observation at the earliest possible period of their trouble and placed under medical officers with special experience of such conditions. At the same time, this segregation was as far as possible relieved of any stigma. No patient was under any certificate, and no legal formalities had to be gone through before he was placed under the special treatment. As soon as possible, after his condition improved sufficiently, he was allowed parole and all the privileges of a case in the surgical or medical wards of the hospital. The Lord Derby War Hospital was, in fact, a general hospital with medical, surgical, and mental divisions, of which the latter comprised 1000 beds. Apart from the fact, therefore, that his mental condition prevented it, just as a case in the surgical or medical wards might be similarly prevented by his disability, a patient was as soon as possible allowed to mix freely with patients from other parts of the hospital. Any distinction was avoided.

The bringing of these cases under early observation was helped considerably by the facilities in detecting premonitory symptoms. If a soldier in the army, who has been previously up to the average standard, is noticed to be unable to stand properly to attention on parade, or does not form fours properly, or in any other way does not seem up to his usual standard, it is almost certain that this will be reported by his N.C.O. to a superior officer, who will ultimately send him to be examined by the medical officer. Even off duty, when in billets or barracks, he is more or less under observation, and by night more especially so. It is therefore likely that any strange action will be noticed and reported. In civil cases, on the other hand, this early detection of symptoms is much more difficult, and patients are much more likely to be able to conceal their symptoms. This point has been brought out by my colleague, Captain O. P. N. Pearn, R.A.M.C., in his article on the Psychosis in the Expeditionary Forces, recently published in the *Journal of Mental Science*.² I feel sure that the patient, as a civilian under present conditions, knows that by disclosing his feelings he will be brought before a medical man, who will probably call in the assistance of a magistrate, that he will deprive him of his freedom, and at the same time subject him to the stigma of certification and all its necessary legal accompaniments. Under such conditions symptoms are concealed as long as possible, and in the early stages, as a rule, the patient does not find much difficulty in "pulling himself together" sufficiently to pass muster in his office as a clerk, or whatever occupation he may perform. In a city he probably does not return home to his midday meal or tea, but has these at a restaurant, where it is no one's business in particular if he does anything strange. He probably returns home late at night, and spends little time in the company of his friends or relations. This sort of thing often goes on for months or even years undetected, until he ultimately commits some act against the conventions of society by which he gets into the hands of the police. In the soldier, on the other hand, as treated during the war, no stigma was attached to the fact that he became insane. He was, as far as practicable, treated as any other casualty, and if he reported his symptoms voluntarily, was taken to a hospital in the same way as if he were suffering from any other illness.

2. Adequate Medical Staff.

Another point is the importance of having an adequate medical staff in dealing with cases at this stage. A glance at Table I., which shows the monthly admission and discharge rate during the two years under consideration, will indicate the necessity for a large medical staff to deal with such numbers alone. At the opening of this special psychiatric section it was strongly urged that the relative strength of medical officers should be no less than 1 to every 100 patients.

Apart from the question of dealing with large numbers it must be remembered that if patients are to have adequate treatment in the early stages of mental disorder, the relative