anaemia prevents healing from taking place. The pain caused by the unhealed mucous membrane sets up a reflex spasm of the sphincter, and a vicious circle is thus produced.

Chronic Cases.

The late results of all these conditions are not uncommonly seen. Fissures and ulcers have healed over by scar tissue, resulting in fibrous bands and contractions. The lumen of the canal is partially occluded, rendering defaecation painful and difficult. Constipation is induced, and the attempt to pass a normal stool produces a fresh tear. In such cases one frequently finds on rectal examination areas of old scarring and contracture in one segment and a recent tear in another, attended with persistent spasm of the sphincter. If the fibrosis exceeds the ulceration the stools are malformed. The attention of the patient is often concentrated upon these disabilities, and a definite state of hypochondriasis may be set up. If the ulceration exceeds the fibrosis, pain and spasm predominate.

Technique.

The patient lies on his side in the Sims position. We use as the indifferent electrode the metal abdominal belt described by Cumberbatch⁴ and Robinson in the treatment of cervicitis. All towels and instruments should be sterilized, and complete asepsis observed.

Electrodes used in acute cases. | Electrodes used in chronic cases.

In very acute cases it may be found necessary to begin the first treatment by applying a pad to the anal orifice, as recommended by Bensaude and Meyer, with the object of reducing the spasm, but we have never met a case in which it has not been possible to insert a fine electrode before the completion of the treatment. All electrodes should be warmed to a temperature of thermal indifference with the skin, and well lubricated with sterile vaseline before insertion. The very greatest care should be exercised in introducing the electrode. We begin with a metal rod of 3 mm. diameter and of uniform bore. The sphincter closes tightly upon it. The current is turned on and very gradually increased until a sensation of warmth is appreciated by the patient, but it should never exceed 300 milliamperes with this electrode, because in very acute cases the patient is sometimes unable to distinguish the sensation of heat from that of pain. (Normally this transition takes place at about 115° F.) In a few minutes the spasm begins to relax, and the patient often volunteers the remark that the instrument appears to be falling out. The electrode should be held *in situ* for ten minutes. During this period a painful reflex spasm of the anus may occur from time to time, but this will gradually decrease and finally disappear. It will now be possible to move the electrode up and down quite freely without producing further spasm. It is then removed very carefully, and another of slightly wider bore inserted and retained for a further ten minutes. Treatment in the early stages should be continued daily or even twice daily. At each treatment the initial electrode should be of slightly smaller bore than that selected at the end of the previous treatment. In this way it is usually found possible to increase on each successive application, until

full dilatation is obtained. The relaxation of the sphincter induced by the diathermy current remains for a considerable time after treatment, and defaecation is rendered less painful. Regeneration of the mucous membrane is promoted over the ulcerated surface by the increase in blood supply, and the passive dilatation of the canal prevents the occurrence of fibrosis.

In chronic cases in which stenosis of the canal has taken place as the result of fibrous contraction, and which are often the late result of operations for the removal of haemorrhoids or of old ulceration in this area, active ulceration is not usually present, although attempts to pass a stool of normal consistency may produce recurrent tears in the adjacent mucous membrane. The patient is driven to the use of every kind of purgative, the passage of a stool of normal size and consistency in some cases being mechanically impossible.

In these cases it is usually found possible to insert a fine blunt electrode without difficulty. The method we adopted was suggested to us by Dr. A. F. Hurst, who had previously treated cases with success. It consists in the use of a much more intensive application of diathermy, with the object of rendering the whole area flaccid and malleable. The anal canal is then dilated manually. Recourse is had to the conical electrode of Doumer. These we had made of varying gradients according to the type of case to be treated, the position of the stricture, and the degree of dilatation required. In no case should the electrode exceed four inches in total length, in order to ensure that its tip should not impinge upon the roof of the pelvi-rectal flexure. It is graduated at intervals of 1/2 cm. in order to check the progress made at successive treatments. The electrode is pushed forward until slight pain or discomfort is experienced, and is left in this position for a few minutes, and then further inserted. This process is repeated at each operation. The amperemeter is not a good guide as to current, because the surface contact varies in individual cases, and this increases as further dilatation is obtained. More than 1,400 milliamperes can be given. At the end of each treatment, which lasts from twenty to thirty minutes, the forefinger is inserted, and later both forefingers, and the canal is gently but firmly stretched. It will be found that a much greater degree of dilatation can be produced after diathermy than is possible without such application, and the tendency to spasm is very considerably reduced. The dilatation produced has in most cases been permanent, and there has been no recurrence of fibrosis.

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PROTEIN THERAPY IN INSANITY.

BY

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DURING a recent outbreak of dysentery it was observed that the blood of patients who eventually died of the disease showed the highest estimation in agglutinative properties. Although these patients had a considerable amount of specific antibody, it would appear that for some unknown reason they were unable to utilize it against the infection. Since complement is considered necessary in a reaction of this nature, it might be reasonably assumed that the amount present had been insufficient, or at least not in proper proportion to the amount of antibody and antigen.

It has been demonstrated in our laboratory that in order to produce complete fixation of specific antigen and antibody in known quantity, the amount of complement required had to be, within limits, in proportion to the amount of antigen and antibody. The complete fixation did not take place if the quantity of complement was too great or too small. Whether this applies to reactions in

vivo it is difficult to say. Should this be the case, however, then it would seem that in order to get complete fixation of antigen in the body, complement will require to be present, within limits, in proportion to the quantity of antigen and antibody. In a given case of illness it is almost impossible to estimate the quantity of antigen, consequently the estimation of total complement presents obvious difficulties. As complement in the body is partly free and partly combined, estimates can only indicate the amount of free complement.

In "toxic confusional insanity" some cases after a short illness end fatally, while others presenting an almost similar clinical picture make a rapid recovery. Many clear up after months of confusion, while the more unfortunate victims develop permanent secondary organic changes in the brain. The duration and prognosis of the illness are in a great many cases a matter of speculation. Little or nothing is known of the toxins, their origin, or their antibodies, and consequently treatment tends to become non-specific. If the patient makes a rapid recovery it is reasonable to assume that he produced the necessary antibodies and complement to destroy the toxins. When he remains confused and physically exhausted for months, making no progress, it is possible that, as in the dysentery cases above mentioned, he is producing antibody but cannot make the balance in complement. The fact that confused and stuporose patients sometimes become clear mentally during an intercurrent illness may be due to the upsetting of the relative proportions of complement to antigen and antibody, thereby giving the antibody a temporary control over the antigen.

McIntosh¹ found that, apart from producing a slight diminution, the injection of vaccines had little influence on complement. McCully at this hospital, however, in some cases produced a fall, followed by a rise in free complement, by administering T.A.B. intravenously. Three asylum patients with very severe acne of several years' standing, resistive to all forms of treatment including vaccines, recovered only when they showed a rise in free complement.

Increase of Free Complement.

The following method appears to produce an increase of free complement in a considerable number of cases. Human serum when withdrawn and allowed to stand for a few days is alleged to become "anticomplemental," at least its presence in some way inhibits the action of the complement in fresh serum. On this hypothesis the "anti-complemental" serum is injected into the patient in the hope that any free complement in his blood will be absorbed, thereby stimulating a physiological increase of fresh complement—an analogy being the administration

Graph indicating complement based on figures from the table in cases which recovered from confusional insanity.

of an alkali to stimulate the production of HCl in the stomach. One cannot be dogmatic about the explanation of the reaction, but I find that the procedure can bring about an alteration in the value of free complement with beneficial results, especially in confusional states without secondary dementia. After injections of the serum, complement estimates indicated an initial fall followed by a rise, the leucocytic cell count following the same curve. These results are shown in the accompanying graph. Injections given on alternate days produced better results than those given on consecutive days.

Technique of Treatment.

The technique is simple. About 90 c.cm. of blood are drawn into a test tube from the cubital vein. The test tube is rotated to prevent the clot from sticking to the side of the tube. The blood is put on ice; in twenty-four hours the serum is separated and centrifugalized; 2 c.cm. are retained for complement estimation and the remainder is put up in a sterilized serum bottle with a rubber cap. This is left on the ice for five days, 0.04 c.cm. of carbolic acid per 100 c.cm. of serum being added on the fourth day.

First Day of Treatment.—Two c.cm. of serum are given subcutaneously (abdominal wall), followed in one hour by 6 c.cm. The patient may complain of headache and slight shivering. He may become more restless and confused, and in about six hours the temperature usually drops to about 96.5°, the pulse rising to 100. A few hours later the pulse and temperature are again normal.

Third Day.—12 c.cm. of serum are administered subcutaneously. The patient is usually quieter, tends to sleep, and is more easily managed.

Fifth Day.—25 c.cm. of serum are administered.

Sixth Day.—Blood is withdrawn for a second course of injections. Complement should be estimated in twenty-four hours.

Three or four courses of injections may be necessary before obtaining a rise in free complement. It is advisable to estimate complement before and after each course of injections.

The figures given in the accompanying table indicate the smallest amount of patient's serum which allows five doses of immune body completely to haemolyze 1 c.cm. of a 3 per cent. suspension of sheep's washed red blood corpuscles in a water-bath at 37° C. for an hour.

Results of Treatment.

After the first injections the condition of the skin and mouth becomes much cleaner, and the patient looks healthier. Although confusion persists, mental improvement is first noted in the fact that the patient is less restless, sleeps better, takes more food, and tends to be cleaner in his habits. Eventually the patient has short lucid intervals which gradually become longer. The improvement, which appears to have some relation to the increase in free complement, should take place in the course of a few weeks. I consider that by improving the patient's physical condition the treatment gives him a better chance of recovering from his confusion. A number of confused patients were treated in this way, the results being indicated in the table. It is possible that the "toxic" cases would have recovered if left alone, but they had all been in the observation wards before certification, and after admission to this hospital they continued to deteriorate both physically and mentally and to become dirty in their habits.

Other Methods of Producing Protein Shock.

Probably the treatment is a mild form of protein shock, the biochemistry of which is still obscure. My experience so far, however, has been that "toxic states" appear to improve with a rise in free complement.

In general paralysis, malaria inoculation, a dangerous and violent form of protein shock, is now past the experimental stage. It is generally accepted that varying degrees of remission can follow inoculation, but the underlying syphilis is unaffected to any great extent. Combination with antisyphilitic drugs is therefore imperative.² Bunker states that out of 2,460 cases treated with malaria 27 per cent. remitted, while in 542 cases treated with trypanamide 35 per cent. remitted.³ Fribourg-Blanc claims that with malaria alone 46 per cent. remitted, of whom 22 per cent. died later, while with malaria *plus* antisyphilitic drugs 66 per cent. remitted with a subsequent mortality of 6.7 per cent. The mortality in the first two months of malaria therapy is given by Meagher⁴ as 40 per cent. McCully and I believe that any beneficial effects which follow malaria therapy are in part due to the auto-protein shock resulting from the enormous destruction of blood corpuscles which act as foreign protein. There are phases in the course of general paralysis during which it is almost impossible to tell whether the signs and symptoms are organic or toxic in origin. When remissions have been procured with protein shock the condition of the patient,

Case No.	Diagnosis.	Age.	Family History.	Duration of Illness before Treatment.	Complement before Treatment.	Complement after Treatment.	Result.
1	Confusional insanity, lactational	37	Insane	2 months	0.07	0.04 0.07 0.05	Became clear in a few days, but remained apathetic.
2	Confusional excitement, dementia praecox	25	?	5 years	0.08	0.05 0.03 0.07	Became quiet after years of excitement. Chronic acne cured.
3	Confusional insanity, puerperal	25	Insane	1 year	0.09	0.01 0.07	Recovered.
4	Confusional insanity, exhaustion	32	Insane	3 months	0.07	0.07 0.03 0.07 0.06 0.06	Recovered.
5	Confusional insanity, puerperal	30	?	4 months	0.07	0.12 0.09 0.07 0.05	Recovered.
6	Confusional insanity, lactational	27	Insane	5 months	0.07	0.09 0.07 0.06 0.06 0.06	Recovered.
7	Confusional insanity, exhaustion	17	Alcoholic	7 months	0.18	0.18 0.34 0.14 0.1	Recovered.
8	Confusional insanity, puerperal	21	Insane	4 months	0.22	0.12 0.14 0.12 0.12 0.09	Recovered.
9	Confusional insanity, exhaustion	21	Alcoholic	6 months	0.08	0.05 0.03 0.03	Recovered.
10	Confusional excitement, post-influenzal	21	? Insane	3 months	0.08	0.05	Recovered.
11	Confusional excitement, exhaustion	19	Negative	3 months	0.09	0.09 0.07	Recovered.
12	Mental defective, congenital syphilitic	24	Alcoholic	24 years	0.05	0.1 0.05 0.07	No change.
13	G.P.I., excitement, confusion	49	Insane and alcoholic	2 years	0.07	0.07 0.05 0.06	Became quieter.
14	Organic brain disease	52	Unknown	? years	0.08	0.08 0.06 0.07 0.35 0.05	No change.
15	G.P.I., excitement	57	Negative	? years	0.4	0.4 0.24 0.4	Became quieter, slept better.*
16	Epileptic, chronic	39	?	37 years	0.09	0.11 0.09 0.06 0.05	No change in fits. Acne cured.

* A persistent blood Wassermann reaction 16+ was reduced to 12+, but reverted to 16+ with fall in complement.

I consider, has been more toxic than organic. The use of relapsing fever (*Spirochaeta duttoni*) is even more dangerous, as its action cannot be controlled. It may set up violent inflammatory processes in the meninges, with coagula in the cerebro-spinal fluid, recovery from which is questionable. Antityphoid or T.A.B. vaccines intravenously give results which are almost as satisfactory as those of malaria. The shock can be controlled, and institutional treatment is not absolutely necessary. The shock influences the leucocytic cell count and the complement estimate. But again, as in all protein therapy in general paralysis, antisyphilitic drugs must be used.

The effects of protein therapy in encephalitis lethargica are only transient. In epilepsy injections of proteins have given varying results. The pathogenesis of the disease is so obscure that it is difficult in many cases to determine whether the condition is psychical, toxic, or organic. Results so far, however, seem to indicate that states of stupor, confusion, and excitement may be ameliorated, but the disease as a whole is uninfluenced.

The same difficulties arise in dementia praecox. In the early untreated cases remissions from stupor and confusion take place, indicating that the psychosis at this stage is probably more toxic than organic. Blume treated 33 schizoid women with neosaprovitin B, a preparation containing living air bacilli, cocci, sarcinae, and dead *coli* vaccine. Of this, 0.001 to 0.003 c.cm. is administered intravenously every two to three days, gradually increasing to 1.5 c.cm. in a course of twelve to fifteen injections. The cases were treated on an average for three and a half months after the onset of the disease, with the following results: cured or improved 57 per cent., temporarily improved 7 per cent., and unaffected 36 per cent. Of 25 untreated cases, 40 per cent. were improved, 44 per cent. were unaffected, and 16 per cent. died.

Videla,⁵ after using many forms of protein, considered that Witte's peptone gave the best results. A 5 per cent. solution is made in sterilized and filtered physiological salt solution. He discovered that the mode of administration gave varying results.

Intramuscular: Doses of 5 c.cm., 10 c.cm., 15 c.cm., and 20 c.cm. can be given into the gluteal muscles at intervals of 72 to 96 hours. The doses are modified according to the severity of the case.

Intravenous: Doses of 1 to 5 c.cm. give uncertain results.

Subcutaneous (abdominal wall): Used mostly in melancholia in doses not exceeding 5 c.cm.; 10 to 15 injections may be given. Anxiety was diminished in some cases.

Intradermal: This method was discontinued owing to the risk of sloughing and ulceration.

Within a short time of treatment the patient tends to become restless. There is some shivering, arterial hypoten-

sion, and rise in temperature. This is usually followed by sweating, bradycardia, and polyuria. The general reaction is over in twenty-four hours, leaving the patient feeling weak and with the desire to lie in bed. Contraindications are cardiac and hepatic diseases.

Over a period of five years Videla claims that out of 218 cases of insanity treated in this way 16 relapsed, 5 eventually recovering with further treatment; 44 are still undergoing treatment, 13 of whom are improving. The remainder were discharged "recovered." He considers that as a non-specific treatment peptone injections have given satisfactory results. He believes that the shock "modifies the colloidal equilibrium of the blood plasma."

Current literature gives little information about the influence of protein shock on complement, but I consider that it is a field which should be explored as the information obtained may be useful as a guide to the patient's reaction when undergoing this form of treatment.

I offer my thanks to Dr. A. M. Dryden, physician superintendent, for his courtesy in giving me permission to carry out the investigation discussed in the first part of this article, and also to Mr. Winkworth, our laboratory assistant.

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DAMAGE TO THE SCIATIC NERVE FROM INTRAMUSCULAR ADMINISTRATION OF QUININE.

BY

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A FEW cases have been reported in which nerve lesions have resulted from the injection of quinine in the vicinity of nerve trunks. The following case, in which the lesion affected the sciatic nerve, illustrates the necessity of avoiding important nerve trunks in administering quinine intramuscularly.

The patient, a male aged 30 years, attended at the out-patient department complaining of pain and weakness in the right leg.

History.

He stated that about three months previously he had attacks of shivering and fever on alternate days, and a doctor, diagnosing