half a grain of opium per head per annum, Italy 1 grain, France 3 grains, and America 36 grains; Dr. Copeland, M.O.H. for New York City, puts this figure at 40 grains.

To some extent fashion or opportunity determines the type of drug used: in New York heroine is used almost entirely; in Chicago morphine is the common narcotic, and in cities with a large coloured population cocaine is in vogue.

The vast majority of cases of opium smoking, heroine and cocaine sniffing are acquired socially, though it is agreed in America that the largest single factor in the production of the morphine addict is professional medication.

Treatments for morphinism I am not considering, but it is generally agreed by those best fitted to give an opinion that the proper treatment, besides custodial care, consists in (1) the gradual withdrawal of the drug, in about ten days; (2) intensive purgation; (3) the administration of atropine or hyoscine. By this treatment the patient may be discharged in six weeks in good physical condition, and apparently a normal man without craving.

But can we cure a character, convert weakness into strength, so that temptation disappears? Perhaps proper education of the higher faculties of mind, like self-control, may do much, but simply to control conduct so that choice cannot be exerted is to court disaster. True temperance is dependent on self-control, not on control by others. Perhaps if children were taught something of the realities of the life into which they must presently enter, and received more vocational guidance, they would be in a better position to combat the difficulties and temptations to which they must presently be subjected, certainly in a better position than by a system of education apparently devised to fit a life of cultured leisure.

ALCOHOL.

It would hardly be fitting to conclude without a brief word on *alcohol*. Fermented beverages, and more especially beer, have formed from time immemorial the national drink of Great Britain. The introduction of the caffeine beverages did not oust them, and, although their popularity has not waned, the amount consumed is steadily diminishing before legislative restrictions and the attacks of the abstainers. England was once a drunken nation, and Mr. Lecky tells us that in 1688, 90 gallons of beer a head were consumed per annum: at the beginning of this century this had diminished to 30 gallons. Now it must be very much less and the percentage of contained alcohol smaller.

It has been clearly shown that as the difficulties of obtaining alcoholic beverages have become greater the consumption of drugs and truly noxious substances has become greater also. It is almost inconceivable to what lengths men will go to obtain something as a substitute for alcoholic beverages, and very few drugs or chemical substances—especially volatile chemicals—have not been used. This evil effect of prohibition has necessarily been more evident in America, where in past times most of the States have at some time, though generally only for a short period, adopted the principle of prohibition. Wood spirit (methyl alcohol) is one such evil substance; as little as a teaspoonful may cause blindness and an ounce death; several cases of poisoning have recently been reported from America. Methyl alcohol is oxidized in the body to formic aldehyde and formic acid, and it is to the production of these substances that the poisonous action is due.

Ethyl alcohol must be regarded as an addiction drug, though true addiction, in the same sense as morphinism, must be extremely rare. It is interesting to note that many authorities believe that habitual inebriety is not acquired, in the strict sense of the term, but that the inebriate starts life handicapped by imperfect brain development. That is to say, he takes alcohol in excess, just as he does everything else which is foolish and wrong.

It is notorious that morphine addicts rarely turn to alcohol; if they do, it seldom gives them what they seek, and they almost invariably return to narcotics. De Quincey says: "I do not readily believe that any man having once tasted the divine luxuries of opium will afterwards descend to the gross and mortal enjoyments of alcohol." Nobody questions the evils produced by alcohol in the intemperate, but for the vast majority moderation in alcoholic beverages produces pleasure and benefit. Ought we then to advocate prohibition? Would the benefits so accruing outweigh the disadvantages? Prohibition in other countries has led to

other and worse addictions and to industrial unrest, evils which appear to counterbalance the benefits. It is an axiom with lawyers that legislation for hard cases makes bad law; the plethora of these which we have experienced in recent times should make us chary in advocating yet another. Apart from this, prohibition is at present impracticable, as it would mean a loss to the revenue of over one hundred millions annually.

Plato says: "No one desires drink simply but good drink; nor food simply but good food." To the average man these add a little more joy and beauty to life. The position is perhaps summed up by Matthew Arnold, who says: "Wine used in moderation adds to the agreeableness of life."

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PYROGENIC THERAPY.

("PROTEIN SHOCK.")

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(A Further Contribution.)

THE paper published in this JOURNAL, vol. i, 1918, p. 195, described a severe febrile reaction which I obtained in 1916-17 with certain colloidal metals used intravenously; a reaction identical with that which certain American investigators had been producing at the same time by the intravenous use of suspensions of killed typhoid and coli bacilli (vaccines), and termed by them "protein shock." I found, however, that the full reactions following these particular metallic colloids could be produced by the protein used as the protective or coating to the metallic particles and in the same dosage. In an inert medium, such as gum water, the metallic suspensions were destitute of any fever-producing properties. In a recent examination of various well known metallic colloids the characteristic protein reactions were very marked, and so the clinical results would be questionable. When the metallic particles were suspended in an inert watery medium and injected in considerable quantity, the slight rise of temperature which sometimes followed was found to be quite capable of production by the water of the continuous phase.

"Protein shock" being rather an unfortunate expression,* I suggested "pyrogenic therapy" instead, chiefly in view of the fact that the reaction was produced by substances called "pyrogens" by Burdon-Sanderson. Moreover, the fever so induced is essential, as no benefit accrues without it. The view is, indeed, gaining ground that the high temperature, which is ushered in by a rigor more or less severe, is the crucial factor. Further reference to this will be made. In any case it is evident that some such distinguishing appellation is now needed, as "protein therapy" is a generic term applicable to uses of protein which are entirely different and distinct.

The cases in which the reactions were produced by the protein-protected colloidal metals were chiefly those of delayed resolution in pneumonias and pleurisies, with rises of temperatures to 100° and 101° F. for some considerable time. Recovery seemed complete at the end of the reaction; the temperature remained normal and the local lesions gradually cleared up. Some cases of acute pneumonia were then tried, but the results were by no means favourable. Certainly a fall of temperature soon occurred; but this proved to be a negative phase effect, as it always rose again to about the original level. These trials indicated that with a high temperature the defences

* In the first place there is no shock in the true sense, and, secondly, the reaction can be produced by certain non-protein substances.

of the body are already fully engaged, and the introduction of a pyrogenic substance is illogical, and merely adds to an already heavy burden. This treatment is therefore indicated in subacute or chronic conditions, wherein the defensive reserves are quiescent or only partially called out.

Cases of arthritis of various kinds have mainly been treated, with on the whole very favourable results; but skin affections and many infective disorders have also been laid under contribution. Where the response is good no other treatment gives such rapid or complete relief. I wish now to record briefly some results obtained in certain functional neuroses presenting pain or paraesthesia or both, and probably of toxic origin. Though not serious, these disorders are very persistent and often entail intolerable discomfort, being more or less refractory to ordinary methods of treatment.

Case 1.—A woman, aged 58, had for several months very severe cramp in the feet and legs during the night which obliged her to get up and endeavour to obtain sleep in a chair. Many remedies were tried. She had rheumatic fever at 21; she was not alcoholic. Her teeth were very defective; she was otherwise healthy. Pyrogenesis was induced with alfalfa seed proteose with immediate relief (temperature 102.8° F.). A second reaction was induced in a week, followed by permanent relief. [Two other cases somewhat similar have been successful.]

Case 2.—A woman, aged 47, suffered pain with paraesthesia (neurotic) for weeks over the left shoulder and back, especially troublesome at night. Only temporary relief was obtained from medicine and topical applications. She was otherwise healthy; the menses had ceased some time ago. Two reactions were induced (102° F. and 103.4° F.), using caseose as the pyrogen, with permanent cessation of the symptoms.

Case 3.—A woman, aged 48, had got acroparaesthesia for three months—numbness and tingling ("pins and needles")—in both hands, with pains radiating up the forearms. She was rheumatic, but otherwise in good health. She had tried electrical treatment without relief. A very active lecitho-protein was used which gave a good reaction (103° F.). The temperature went down slowly, being 100° F. after twenty-four hours; afterwards it became subnormal. Complete relief ensued, and there was very little further inconvenience. [Another case gave a similar result.]

Case 4.—A woman, aged 48, strong and healthy, had for two months been subject to most distressing noises in the head, which she thought "would drive her mad," and likened to "a traction engine in the brain." There was no apparent cause, no deafness or ear disease. The noises were continuous night and day. A maximal reaction was induced with lecitho-protein (temperature 104.4° F.). The temperature fell slowly, being 101° on the third day. By this time the noises had totally disappeared, and up till now, after ten months, there has not been the slightest return, and the patient enjoys excellent health. [Prolonged elevation of temperature as in the above case is not usual, though pyrexia lasting twelve days has been noted. More commonly the temperature falls to subnormal within eighteen to twenty-four hours.]

The only other case of tinnitus I have treated was that of a male, aged 39; I saw him in consultation with Dr. Hartigan of North Kensington, but in this instance there was deafness in one ear and a long history of Ménière's disease. The case had resisted every treatment, and pyrogenic therapy was tried as a *dernier ressort*. The patient was tolerant to moderate pyrogenic doses, but gave a maximal reaction to 500 million of recent *B. typhosus*, in which a second rigor occurred a few hours after the first. The symptoms remained quiescent for a week or so and then returned.

This treatment is not to be lightly undertaken. Careful consideration must be given beforehand to the condition of the patient, the pyrogen to be used, and the dosage. The patient should have a good reserve of strength, an efficient heart muscle, distensible arteries, and a safe blood pressure. Elderly feeble subjects are unsuitable; also those more or less exhausted by long illness or whose defensive resources have already been largely used up by prolonged fever. In suitable cases the full pyrogenic reaction may be necessary for a successful result—namely, a good rigor, high pyrexia, body pains, profuse sweating, and usually sickness and diarrhoea. If two such reactions (at a week's interval) fail, it is little use trying more. But some cases, considered unfit to stand the maximal reaction, may derive great benefit from submaximal doses more frequently repeated, and in yet others the condition may be such as to render the maximal reaction unnecessary. A temperature of 102.2° F. should be aimed at, however. As regards the pyrogen to be used, that depends largely on the experience of the operator, but for those not specially acquainted with the various substances, typhoid vaccine, or caseose (2 c.cm. and upwards of a 2 per cent. solution), may be employed. Personally, I have

the caseose prepared by gentle hydrolysis. Owing to its content in albumoses, Witte's peptone in large doses is sometimes used, but it is dangerous, as it may induce during or immediately after the injection, even in non-sensitized persons, symptoms of asphyxiation and collapse, with possibly serious consequences. As regards the bacterial suspensions, it is important to ascertain beforehand the degree of subculture to which they have been subjected. *B. typhosus*, for instance, subcultured for a long time, possibly years, has been largely detoxicated, and gives a feeble reaction in comparison with a recent culture. Mistakes have been made in this way in regard to the relative susceptibilities of patients. Usual doses are 50 to 200 million of a fresh culture and 100 to 500 million and upwards of an old one. Before giving the full dose it is necessary to find out how the patient is going to react to the pyrogen selected, as great variations are encountered. The only satisfactory way of doing this is by giving a small trial dose. If the reaction it produces is considered excessive, it may be best to select another pyrogen and test it in the same way. In either case, the full dose is based on the result. The particular pyrogen used is immaterial, so far as the characteristic effects are concerned, and in the case of infections there is no added advantage in using the particular organism, the reaction is entirely non-specific. Typhoid-immune animals show the same degree of hyperleucocytosis when injected with *B. coli* as with *B. typhosus* (McWilliams). Culver¹ treated thirteen cases of gonococcal arthritis with non-specific proteose, and nine cases with killed gonococci (three to five injections spread over three weeks). The opsonin content was determined by the extinction method (Klein) and the bactericidal substance in the serum by the dilution method. The results were indistinguishable in the two sets. Others have verified these results.

The best time to give the injection is the early part of the day; a cup of tea or coffee with a little bread-and-butter may be allowed a few hours previously, and the bowels should be emptied. The patient must be in bed; warmth is grateful during the chill, and if the pains are severe aspirin will give relief. It is well to have adrenalin at hand in case of any contretemps, but up to the present I have not had occasion to use it.

That temperature is a natural means of defence is, of course, too well recognized to require more than mention. But in infection there is an optimal temperature which no doubt varies according to the infecting organism on the one hand and the condition and constitution of the patient on the other. When the temperature is over the optimum—Nature having overshot the mark, so to speak—although combustion of metabolic products may be energetic, yet the factors conducing to recovery, the cellular products of defence and attack, suffer injury, and in time become exhausted. A similar state of exhaustion may occur in cases of long-continued fever. For most infectious fevers the optimal temperatures lie between 102° and 105° F. The object of pyrogenic therapy is to induce a temperature within these limits, in those infective or toxic conditions wherein a sufficient stimulus for the induction of pyrexia is naturally lacking or else is weakened, though capable of producing a ready response if artificially roused. By so doing we draw on the accumulated stores in various parts of the body, secure the production and mobilization of new weapons of attack, and direct them to the seat of disturbance.

Let us consider briefly the effects of this induced pyrexia. They are roughly divisible into the physico-chemical and the "vital." The former consist mainly in a greatly increased transformation of energy: increase in the velocity coefficient of chemical systems, with alteration of the equilibrium constant, and greater activity of the catalyst. Enzyme action may be doubled or trebled. The rate of adsorption is increased with diminution in the amount adsorbed—that is, the dissociation of adsorption compounds is increased. Hence increased dissociation of oxyhaemoglobin with supply of more oxygen to the tissues. Energy is also liberated by the lowering of surface tension, which at a critical temperature may disappear, possessing as it does a negative temperature coefficient. The hydration of ions is diminished, and so their velocity increased from reduced friction. The viscosity of the blood is reduced and its flow rendered easier, while the dilatation of the blood vessels makes them more permeable to the serum.

What may be termed the "vital" changes in the pyrogenic reaction, so far as known, are chiefly expressions of a powerful stimulation of certain productive capacities of the cells and tissues, more especially those that are extra-ordinary, and the rapid mobilization of these products. After an initial leucopenia there is a leucocytosis in which a striking blood picture has been described and figured, that by Cowie and Calhoun² showing in some cases many young and atypical cells, myelocytes, mast cells, nucleated reds, and increased size and development of the platelets. Changes in the white cells, the blood pressure, and pulse frequency have been described (with illustrative charts) by Gow.³ Miller and Perry⁴ record the curious phenomenon of phagocytosis of erythrocytes in the peripheral blood by the large mononuclear cells. Others have obtained evidence of increase in circulating antibodies, at first by detachment from their mooring stations and later (two or three days) by new production.

Now, changes very similar have been described as the effect of artificial heat. Thus, J. B. Murphy and Sturm,⁵ in a series of experiments, found that mice subjected to dry heat of 55° to 65° C. for five minutes showed an initial leucopenia, followed by leucocytosis, which continued for two to three weeks, the increase amounting to a gain of over 200 to 300 per cent. above the normal for the animal. Mice so treated developed a high degree of immunity to cancer grafts as compared with the controls. Precisely similar results were obtained with bovine tubercle bacilli, the resistance in the heated mice being increased from two to three-fold. In regard to phagocytosis, Ledingham⁶ found that when leucocytes were put in contact with fresh serum and staphylococci and incubated together at different temperatures for the same period of time (varying from 15 to 45 minutes) phagocytosis was considerably increased at temperatures over 37° C., up to 43° C. McCallum⁷ states that the influence of temperature has not hitherto been sufficiently recognized, and quotes a number of experiments showing that animals kept at a high temperature in a thermostat room, in whom small doses of bacteria or toxins had been injected at intervals, developed a much more effective defence than those left at ordinary temperatures, in that "agglutinins and bacteriolytic substances were produced far more quickly and in much greater amounts than in the controls."

We find, as a matter of fact, that the conditions amenable to pyrogen therapy are chiefly those which are benefited by thermal baths (water or air), such as arthritis (various), neuritis and neuralgia or myalgia, certain skin affections, and subacute or chronic inflammatory exudations; and, further, the results are so far comparable in view of the more intense and prolonged pyrexia produced by the pyrogen and the collateral effects of its autogeneration.

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ILIO-TIBIAL BAND GRAFTS FOR THE RADICAL CURE OF LARGE INGUINAL HERNIAE.

BY

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THE difficulty of securing a satisfactory radical cure in cases of large inguinal herniae is so well known that it need not be enlarged upon, but if evidence is needed it is furnished by the number of operations which have been described for the purpose. It is also obvious that the results obtained are not always entirely successful, and there is, therefore, some excuse for this description of yet another method of dealing with the condition.

Fortunately, herniae which cannot be treated by Bassini's operation, or some modification of it, are not common, but in the three cases to be described the base of the sac was very wide, and the lower fibres of the internal oblique—those arising from Poupart's ligament—were so weak that it was impossible to bring down any part of the muscle to the deep surface of the ligament; therefore, after closing the base of the sac by interlocking ligatures, or by

a continuous suture, there remained nothing to strengthen the abdominal wall over the hernial site except the external oblique, which was greatly stretched and weakened in each case, the superficial fascia and the skin. Recurrence was practically certain if the operation had been completed, leaving the abdominal wall in such a weak condition, and I thought it would be worth while to try a graft of the ilio-tibial band to take the place of the internal oblique.

The usual incision for the radical cure of hernia was made, and, after ligaturing bleeding points, the external oblique was divided over the whole length of the cord. The remains of the internal oblique were raised from the underlying structures by blunt dissection, and the sac found and separated in the usual way. The sac was opened and the contents replaced in the abdomen, and, with a finger in the sac to prevent the exit of these contents, interlocking sutures were placed and tied, and the sac was removed about a quarter of an inch beyond the ligatures. The cut edges were also brought together by a continuous silk suture. Two strips of gauze were passed beneath the cord, so that it might be lifted out of the way while the graft was being sewn into position beneath.

I then made a semilunar incision, with its base anterior on the outer side of the patient's thigh, raised the flap of skin and subcutaneous tissue, and removed a piece of ilio-tibial band of such a size and shape that, when folded diagonally, it would fill the triangular space between Poupart's ligament, the outer border of the rectus sheath, and the exit of the cord through the fascia transversalis.

Diagram to show ilio-tibial band graft in position. Dotted lines indicate deep or buried structures or stitches. The external oblique is not shown except in relation to Poupart's ligament. The internal oblique external to the exit of the cord should be brought down to Poupart's ligament if necessary.

The folded edge representing the diagonal of the piece of band removed was stitched by a continuous suture of silk to the deep edge of Poupart's ligament from the attachment of the conjoined tendon to the pubic spine to a point a little external to the exit of the cord, and the inner edge was also stitched with silk to the outer border of the rectus sheath (conjoined tendon). The upper and outer edge was passed beneath the fibres of the internal oblique and transversalis muscles, and anchored to the deep surface of these by two or more mattress sutures of chromicized catgut, so that when contraction occurred during some effort requiring the use of the muscles of the abdominal wall, the graft should be drawn tight, and so offer the greatest possible resistance to the exit of any of the abdominal contents. These deep sutures should, of course, not be drawn so tight as to cause strangulation of the muscle fibres included by them. If any part of the internal oblique could be brought down to the deep surface of Poupart's ligament over the graft, this was done. The cord was replaced on the graft, and the external oblique and superficial structures were closed over it in the usual manner.

Three cases were operated on in this way, and the following is a brief account of them:

CASE I.

Pte. T.: left inguinal hernia. Operation on December 3rd, 1915. The hernia was very large, and the base of the sac would allow three fingers to be passed into the abdomen. The external oblique was very much stretched, and its oblique fibres were widely separated; the intercolumnar fibres were very weak, and the whole structure could not have given any support to the abdominal wall in the hernial region. The part of the internal oblique arising from Poupart's ligament was very weak also, and would not have offered any effective resistance if it had been brought down to the ligament. After ligature and