recover aural health spontaneously. It is the recognition of those who do not thus recover aural health which is important, for a proportion of them will drift on to deafness, which is as preventable in its early stages as it is irremediable in the stage in which we generally see it.

The conditions which tend to cause the maintenance of the state of inflammation should be kept in mind. I will not deal with them, for, except for the occasional occurrence of a sinusitis, or a tonsillitis, they are the province of the physicians, who tell us that anaemias, liver deficiencies, constipation, acidosis, and the presence of a toxic focus are the common causes of the failure of establishment of immunity from an infection.

THE USES AND MISUSES OF VACCINES*

BY

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With the introduction of vaccine therapy as a general therapeutic remedy by Wright and his school we witnessed what so often occurs when a good remedy has bad or indifferent advocates. Many of those who in the early days of vaccine therapy "used vaccines" had little or no knowledge of the remedy they proposed to use, nor did they attempt to study the principles of an antigen-forming antibody as exemplified by the injection of an antigen (or vaccine) into their patient. They merely administered the vaccine by rule of thumb at stated intervals, and hoped for the best. It never seemed to occur to those who thus misused vaccines that they were not even prepared to allow to a foreign protein (such as a vaccine undoubtedly is) the same vagaries as they would to a drug such as digitalis—namely, personal idiosyncrasies. It is therefore not to be wondered at that vaccine therapy, after a certain period of great popularity, fell under a cloud and was looked at askance. From being a "cure-all" it became a "no-good-at-all" in the eyes and teaching of many, and only of recent years has a more sane and reasonable view been adopted as to the place of vaccines in the therapeutic armamentarium. Even nowadays one has recently seen correspondence on such a subject as "Why do not pathologists adopt a standard initial dose?" Why does the *Pharmacopoeia* lay down the dose of iodides within the region of 5 to 20 grains according to the salt used; and have those practitioners who want a standard dose ever heard of iodism?

Generally speaking, vaccines can be used where time is not of great urgency, and where an active immunity lasting for some time can be aimed at. Antiserums, on the other hand, are remedies for urgency, and the production of passive, and usually very temporary, immunity only. Thus vaccine therapy is of the greatest use in prophylaxis, and it is probable that the public will never realize the debt it owes to T.A.B. prophylactic inoculation during the late war.

While it is obvious that for prophylactic inoculation stock vaccines must be used, I am strongly of opinion that where there is a chronic bacterial infection, the organism of which is known and can be obtained from the lesion, then an autogenous vaccine is the best. I have come across certain cases that have failed on an autogenous vaccine, and then have cleared up on a stock vaccine of that particular organism; but such cases are in my experience rare.

Detoxicated vaccines are in my opinion useless as specific remedies, and whatever good may be obtained

from their exhibition is merely the result of foreign protein shock. In fact, one has obtained as good results in certain gonococcal cases from giving detoxicated T.A.B. as from giving detoxicated gonococcal vaccines.

TYPE OF CASE SUITABLE FOR VACCINES

As regards the type of case suitable for vaccines, I think success is more likely with young people than with old, and the nearer one gets to the age of 50 the less likely one is to have success. After 50 I am always chary of advising a vaccine, and in my opinion the lack of success with colon bacilluria in elderly women is due to "anno Domini." Even in this type of case one sometimes seems to get remarkable results, for some women after the menopause seem to take a new lease of life, and once more I would emphasize the advisability of autogenous *coli* over stock vaccines.

In many types of infection I really think the pathologist or bacteriologist should see the case it is proposed to treat. It may be argued that this involves an additional fee and expense, and that a bacteriologist is no clinician. While these things may be true in theory, in practice a bacteriologist who is accustomed to treat cases with vaccines is apt to know more about the chances of success with any given case. While I am no advocate of retrograde medicine, there is much to be said in practice for our forebears' ideas of "types" and "diatheses," and this applies equally in vaccine therapy.

Patients with a high temperature are unsuitable for vaccine therapy; and in acute infections it is unwise to give vaccines. Here again one comes across notable exceptions; for I well remember one of my laboratory clerks, desperately ill with a streptococcal arm, who seemed to pick up (and finally recovered) from the first administration of an autogenous vaccine. Anyway, should you decide to give an acute infection a vaccine, start with almost incredibly small doses, and increase them by doubled amounts daily until a reaction is obtained.

Patients with conditions of great chronicity, such as chronic sinuses, particularly if there is any cause for the chronic sinus, such as a buried stitch, a piece of dead bone, etc., are quite hopeless until the cause has been removed, then healing perchance may be accelerated by the administration of a suitable vaccine. During the war there were some types of mind that insisted on requesting the bacteriologist to prepare a vaccine for chronic sinuses at the bottom of which were huge sequestra caused by comminuted fracture from shrapnel. The only legitimate reason for putting such a case on a vaccine is to increase its bacterial resistance pending an amputation or removal of sequestrum, and this may be done with benefit in such cases. In the war, I am afraid, it was sometimes asked for under the peculiar impression that the vaccine would unaided heal the sinus and remove the sequestrum. Very chronic colon bacillurias, again, are quite unsatisfactory cases, for the time to put a patient on a *coli* vaccine is in the acute stage, as soon as or, in some cases where the fever is not severe, before the temperature falls. So often I think one is inclined to give the urinary antiseptics first and the vaccines as a last resource. This I believe to be wrong, for I hold that all the "shots in the locker" should be brought to bear on the enemy, and that both vaccine and urinary antiseptics should be given. Do not let us regard a vaccine as a thing apart from ordinary therapy, but as a part of ordinary therapy—another weapon to be used in suitable cases along with drugs and surgical operations.

DOSAGE

And now we come to dosage. I have made a few observations on those who desire a standard initial dose and so forth. I believe from the nature of a vaccine such a thing to be impossible. I would go further and say that

* An abstract of a lecture to the Post-Graduate Section of the Watford and West Herts Medical Society.

every case you attempt to treat with a vaccine is in the nature of a personal experiment on your particular patient. When I am asked to treat a case, or advise on a case, I always try to insist that the patient be made to understand that one is about to try and see whether or not he will form curative bodies as the result of the injections. The patient, as a rule, readily appreciates the idea, and co-operates in such details as letting you know about any feelings of malaise, local soreness, etc., after an injection. Explain before the start that you may fail because his tissues may possibly fail. He readily appreciates from common knowledge of drugs in general that drugs occasionally are not successful in producing the desired effect, and so he is not disgruntled to the same degree at a failure of a vaccine to stimulate his tissues to cure him.

I am often asked how to judge the interval between doses. As one of the first principles of vaccine therapy, I may say there is no such thing as a rule-of-thumb interval. While a general rule is that as you increase the dose you increase the interval, it is most important to recognize from the beginning that each case must be treated strictly on its merits.

In prophylaxis one gives one to four doses at more or less fixed intervals, but even here one sometimes finds undue susceptibility to the first or subsequent doses, and it is most harmful to proceed to inject the case again at the prescribed rule-of-thumb interval. Wait until the reaction has passed off and then proceed.

In therapy there are two main schools: one recommends a large dose at fairly long intervals, the other small doses at frequent intervals. I myself prefer to give small doses at frequent intervals in the early stages, gradually lengthening the intervals and increasing the doses as tolerance appears to increase.

There are certain advantages in this latter method, in that one never should get an unduly severe reaction. How does one tell when a patient gets a reaction? Apart from general malaise, etc., which one aims at avoiding as far as possible, it is the site of injection that tells this. At the site of subcutaneous injection there will almost invariably be a red mark. This follows any injection of foreign protein, but if in addition there is local induration, this is a reaction. The amount of the induration is a measure of the reaction.

Therefore, whatever vaccine is being administered, start with a low dose and look for this induration. If it is absent, I repeat with a larger dose next day, and so on daily until a reaction appears. When a reaction appears, wait until the induration has almost gone, and repeat the same dose that produced the original reaction. If this dose produces a trivial or no reaction a further increase may be essayed in the dosage, again watching for the reaction. Should reaction occur, observe the same rules as have been formerly laid down, and do not yet increase the dose. *Only increase the dose when you are sure that little or no induration has occurred.*

You will find that individual cases vary enormously. In *B. coli* or staphylococcal cases, starting as I do with 25 to 50 millions, it may be found that the first reaction occurs with 250 millions or even more, whereas in some cases one cannot go higher than 50 to 100 millions. I am convinced that many of the failures of vaccine therapy have been due to the lack of appreciation of this extreme variability in the sensitiveness of the individual to his vaccine.

VACCINE THERAPY

Tuberculosis.—As regards tuberculosis, I only use old tuberculin (both bovine and human strains) and similar preparations of bacillary emulsion (B.E.): I prefer the old tuberculin for treatment, though this is not in accord with all authorities. As an initial dose, in both preparations, I use a dilution of 0.002 gram per c.cm., which works

out to about 0.0001 per minim (taking 1 c.cm. as 20 minims). I start with 1 minim and increase the dose by 1 minim a day until a reaction occurs, and then proceed according to the lines previously mentioned. As the doses get larger (and you may get up to even 1/2 to 1 c.cm. of the undiluted tuberculin) so, of course, you will find the intervals have to be much increased. I regard phthisis, even apyrexial cases, as quite unsuitable for tuberculin treatment, at any rate outside a sanatorium, and I think the bacillary emulsion (either bovine, human, or a mixture) the preparation to be used for this type of case. Most of the cases of renal and vesical tuberculosis that one encounters are too advanced or quite unsuitable for vaccine therapy, though early tuberculosis of the testicle may afford some hope of success. I have seen quite remarkable results in tuberculous pleurisy and in peritonitis of the non-adhesive type. Certain eye and skin conditions and early tuberculous joints give a percentage of success, but the best cases to deal with in my opinion are tuberculous glands. In treating these tuberculous conditions do not hesitate to employ or have employed any other beneficial remedy known to give relief—thus, for example, see that an early tuberculous joint is kept at rest.

Gonorrhoea.—In gonococcal infections I have never been in the least impressed with the results of vaccines in the acute stages, even though on many occasions I have used an autogenous vaccine. In the chronic stages of prostatitis I have used stock vaccines without great success, but I think a mixture of stock vaccine plus those organisms of secondary infection which always occur and which can be obtained in the secretion after careful prostatic massage, are often very helpful. It is these organisms of secondary infections that keep up the trouble, and not the gonococcus. In women I do not give vaccines, because, candidly, I am afraid of possibly producing a violent reaction, with spread to the tubes and peritoneum. I have seen it occur more than once, and I do not think it worth the risk for the problematical benefit that may accrue.

Chronic Catarrh.—In the chronic catarrhal states, including bronchitis and asthma of bacterial origin, one is up against many difficulties. For instance, if there is any nasal or sinus condition present, that must be treated by suitable means. It is useless to treat a condition of chronic nasal catarrh associated with a badly deflected septum or nasal polypi with a vaccine, but I have been invited to do so more than once. Hence, have such conditions carefully excluded by a competent specialist. Similarly, in an aged patient with emphysema and purulent bronchitis of considerable chronicity, the real trouble is that his lungs and bronchioles have lost their elasticity, and purulent secretion collects in the dilated bronchioles. A vaccine will not restore his elasticity nor close his dilated bronchioles, and I regard a vaccine as useless in this type of case. In patients who suffer from recurrent colds, particularly the seasonal ones of autumn and spring, much can be done by autogenous vaccines in the former and stock vaccines given prophylactically in the latter case. Again I would remind you not to neglect auxiliary methods of treatment, and I always advise that cases of chronic nasal catarrh should use a glass nasal douche (never a syringe) with some mild antiseptic lotion (such as glycerin thymol co. B.P.C.) night and morning, combined with the injections of vaccine. After all, one is dealing with a susceptible and damaged mucosa, and if it is to recover it is as well to remove the products of inflammation and catarrh as often as possible. One never quibbles about washing away the products of inflammation from wounds, so why avoid the obvious? I have never seen Eustachian tube trouble follow from douching, provided a syringe is not used.

VACCINES IN DENTAL PRACTICE

I suppose you have wondered why I have not mentioned the question of vaccines in dental practice, and the pros and cons of vaccines in pyorrhoea and apical infections. The subject is too difficult, and to a certain extent too controversial, to deal with in a brief lecture, but I maintain that, given co-operation between the bacteriologist and a dental surgeon, who is also an expert in interpreting x-rays of the teeth, a great deal of most valuable salvage work can be done. Some teeth have to come out, others may be salvaged, and it is the expert dentist, accustomed to working with a bacteriologist, who, in my opinion, can do such useful work.

INTRAVENOUS METHOD OF GIVING VACCINES

All my remarks so far have referred to subcutaneous administration of vaccines, but to conclude my lecture I would mention one method of giving vaccines which may or may not be a method of producing a non-specific protein shock. I refer to the intravenous method of giving vaccines, and I hold that in many cases one is certainly giving a specific protein. One knows that large doses of T.A.B. have been given intravenously in cases of general paralysis of the insane, asthma, etc., also peptone solutions, and this, of course, is non-specific protein therapy. I have, however, had many cases of arthritis, in particular where there seemed to be definite foci of infection (either dental, intestinal, etc.), that have responded in a most striking manner to autogenous intravenous treatment when the subcutaneous method had failed. It is necessary to add a few words of caution about the intravenous adminis-

tration of vaccines. The initial dose must be small, at least half the dose that I should commence with in subcutaneous injection. The patient must be warned that he or she may feel quite uncomfortable about an hour or so after the injection, the symptoms being headache, shivering, and pains all over. Aspirin, bed, and hot bottles usually quickly ameliorate these symptoms, and after a fairly profuse sweating the patient recovers in a few hours, and feels none the worse, though possibly a little limp. Occasionally these symptoms may be very severe, but I assure you that, however severe, there is no cause for alarm. In extreme cases the reaction may last two to three days, and, although your patient may reproach you for causing such inconvenience, it is in these cases that I have seen the best results.

I had one patient with arthritis who, after each injection, had the most violent reaction; yet so impressed was she by the obvious improvement that followed each bout that she continued the treatment till a free movement of her joints was obtained, and all that remained was the existing bony and joint changes prior to treatment. I may add that she is now playing a very useful game of golf, and, while regarding me as her benefactor, does not properly apportion the credit due to herself for sticking it out.

Though one may get these violent reactions in susceptible cases, there is fortunately no cause for alarm, and the symptoms need only be treated. Once you have adjusted the dose you will find that on increasing your dosage the subsequent reactions tend to be of a trivial nature, and that the case I have just quoted is the exception rather than the rule.

THE ORGANIZATION OF TREATMENT
FOR INFANTILE PARALYSIS*

BY

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The organization of treatment for infantile paralysis may be divided under two distinct headings, the first dealing with the acute attack, the second with the after-effects of the attack. The object of this paper is to explain that the scope and variety of the special technique involved in each case are so wide that organization becomes a necessity.

Treatment of the acute attack is of importance because it may greatly influence the subsequent degree of disability. This is a point on which emphasis should be laid, as it is too little realized. Unfortunately, owing to the infrequency of its occurrence and the unexpected way in which single cases or epidemics occur in out-of-the-way places, the acute attack often goes undiagnosed until after its subsidence; the signs of paralysis follow what was thought to be a case of influenza or something of that sort, and are not discovered until the patient is allowed to get up.

In the orthopaedic scheme of the East Sussex County Council, we have complete preparations for acting promptly at the onset of the disease, but we are, of course, dependent upon the alertness and co-operation of the general practitioners in every case.

With regard to early diagnosis I would emphasize the importance of examination for muscular tenderness in all

cases of acute pyrexia without obvious cause. A rapid passage of the hands over the four limbs and squeezing of the various muscle groups can be carried out in a couple of minutes. If acute tenderness is noted and for this and other reasons suspicion is aroused as to the diagnosis of acute anterior poliomyelitis, prompt investigation of any case rising in East Sussex may be secured by telephoning to the county M.O.H., Dr. Ashleigh Glegg at Lewes. If it is considered desirable, Dr. Glegg will then ring me up and I will proceed to the spot to meet the practitioner in consultation, with all dispatch.

By arrangement with the Lister Institute I have a supply of the new anterior poliomyelitis antitoxin always in readiness and, if we make the diagnosis, can administer it at once. This is considered to be the best procedure, but in case I might be unavailable with sufficient dispatch, I have in cold storage a supply at the Girls' Heritage School, Chailey, so that the R.M.O. can administer it without waiting for me. It should be given partly intrathecally and partly intravenously. For a favourable prognosis, the serum should be given, at any rate, in the first few hours of the attack, but in view of the pathological picture, it appears to me worth while to administer it at any time during the persistence of the pyrexia. Apart from this antitoxic treatment, special orthopaedic measures are important.

The correct posturing of the affected parts at the very outset of the disease is of paramount importance, and this should be secured without pressure from bandages, which tends to increase the atrophy of the affected muscles. The lumbar puncture carried out in the administration of the antitoxin affords an opportunity for withdrawing cerebrospinal fluid to relieve pressure, if desirable. The posturing of the limbs by the method of slinging, which I will shortly describe, should be carried out without delay as soon as the muscular pain has departed. There is no need to wait until tenderness to pressure has gone.

* Read in opening a discussion in the Section of Public Health at the Annual Meeting of the British Medical Association, Eastbourne, 1931.