My conclusions are:

1. Exposure to high explosives may produce rupture of the membrana tympani. This rupture may occur at any part of the membrane. It varies in size, and two perforations are occasionally seen. Small perforations are most frequent, but there may be a large perforation, and in one of these the malleus was driven back.
2. The rupture in the membrana tympani tends in most cases to spontaneous closure. Its non-closure is usually due to its large size, or middle-ear suppuration following the rupture. Appropriate treatment hastens healing and diminishes the risk of suppuration. Adhesion of the malleus to the internal wall of the middle ear is frequent.
3. Concussion of the internal ear with nerve deafness and equilibrium disturbances occurs with or without rupture. In many cases the concussion passes off with slight damages to hearing, though equilibrium disturbances may persist for a considerable period.
4. The concussion may pass off, leaving an injured nerve mechanism demonstrable by (a) nerve deafness of a varying degree; (b) defect of equilibrium. The subsequent history of these will be referred to in the report of the cases observed at the West Cliff Hospital.
5. The treatment of recent perforated membrane which gives most satisfactory results aims at leaving the blood clot over the perforation intact. The following has been found satisfactory: A plug of cotton is placed in the meatus, and the lobe of the ear is cleaned and dried. The plug is removed, and then the outer part of the external meatus is cleaned by pledgets of cotton dipped in hydrogen peroxide. The meatus is then dried, and washed with pledgets dipped in alcohol and again dried. A piece of sterile cotton is then placed in the ear.
6. All the cases ought to be kept in bed for at least ten days to allow effects of the concussion to subside.
7. High explosives may cause a definite injury to the ear and its central connexions. The diagnosis requires considerable experience. A considerable proportion of the cases seen with deafness following exposure to high explosives had no sure definite trauma demonstrable, and the deafness present was accounted for by some other cause. Speedy recognition of those so injured by high explosives, with treatment, means more rapid recovery of hearing, diminution of the subjective symptoms of vertigo, so apt to persist, and subsequent usefulness. In view of these facts, an otologist of experience ought to be available at appropriate centres.
8. Apart from such injuries there were frequently seen cases of deafness or ear disease in which removal to the base was unnecessary—for example, wax in the ear, furunculosis in the canal, or slight serous discharge from old perforations; and cases where delay in treatment involved in transportation to the bases has aggravated the disease and delayed the recovery—for example, acute middle-ear disease. In such cases an otologist ought to be available.

A NOTE ON THE PREVENTION OF PEDICULOSIS.

BY

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THAT, under certain conditions of warfare, the difficulty of keeping the soldier free from pediculosis is a matter of great difficulty, is now too well known to require comment; and the prevention of pediculosis is of importance not only on account of the distress which the condition directly causes, but also by reason of the part it may play in the dissemination of disease.

A method of prophylaxis which I adopted nearly two years ago has perhaps some elements of novelty. Early in 1915 I learnt from officers and men who had taken part in the previous winter campaign that simple cleanliness, however scrupulous, was, under certain conditions, inadequate to prevent infection by pediculi. It appeared clear that some antiparasitic prophylactic was necessary.

The possibility which seemed at first practical and most likely of success was to obtain some solution of a parasiticide substance in a volatile solvent which could be sprayed on those parts of underclothing chiefly haunted by the parasite. While I was investigating a spray for this purpose, Mrs. Arthur Thomson brought me some under-

vests, which were being made by a work party in Oxford for distribution to soldiers, with the query whether they could be dipped, previous to distribution, in some anti-parasitic solution. Those undervests were made of a material called butter-muslin, which is very thin and light and so cheap that I believe the intention was that the garments could be thrown away after being worn once. With such a tenuous material it appeared likely that dipping of the whole garment might be adopted without the use of such a quantity of solution as to render the cost prohibitive for wide use. There are, of course, other drawbacks to dipping the usual types of underwear in solutions of any kind.

From a consideration of such literature as was immediately available to me, the parasiticides which appeared most promising were naphthalene and sulphur, and, after some experiments, I finally adopted a solution of naphthalene and sulphur, 1 per cent. of each, in benzol. This solution, at first intended as a spray, was now used to dip the undervests; though it could still be used as a spray. When the undervests are dipped in this solution and wrung, the benzol, of course, evaporates in a few minutes and leaves the garments impregnated with sulphur and naphthalene in minute particles. I found that undervests so treated did not cause any irritation when worn next the skin, and that they retained the naphthalene and sulphur sufficiently long for practical purposes. By this method those substances not merely are deposited on the surface of the garment, but actually penetrate the fibre.

The cost of such an undervest in the spring of 1915 was about fourpence; and the cost of dipping, when batches of about fifty were done at a time, was about one farthing a garment. Owing to the increase in prices the cost both of the garment and of the dipping has about doubled when the various materials are privately purchased.

Benzol, which was first used, later became unobtainable, and the second grade of petrol was used instead. The latter does not seem to be quite such a good solvent, especially for sulphur; but in either case it is well to allow at least twenty-four hours for solution, the substances being used in fine powder. The solution can be made with sufficient accuracy by using an ounce and a half each of naphthalene and sulphur to one gallon of benzol or petrol. Solution may not be quite complete. The quicker the manipulation the larger the number of garments that can be dipped in a given quantity of solution; and various devices towards such economy will suggest themselves.

Undervests of this material are very comfortable to wear. Owing to their thinness they do not, in cold climates, constitute an undesirable addition to ordinary underwear; and in tropical climates I believe they have been worn alone. Impregnation with sulphur and naphthalene does not give rise to such an objectionable aroma as one might imagine. It would be an obvious advantage, for more complete protection, to have pants made and treated in the same way, and I understand that this is now frequently done.

Since June, 1915, undervests of this material and dipped in this way have been sent out in large numbers to officers and men at the seats of war. Those who received them were requested to return a report as to their value in preventing infection by pediculi. I should have published this note at an earlier date but for the fact that my knowledge was based largely upon hearsay. There was the obvious source of fallacy that men who received the garments as a gift would not perhaps care to send back adverse reports. I am indebted to Mrs. Gorrans not only for taking the actual dipping in hand, but also for her trouble in corresponding with the men who have received the vests. She has now distributed some thousands of these garments. The testimony of officers and men has been so unanimous in favour of the high or complete protection which these vests have afforded against *Pediculus corporis* that I feel that further hesitation in making the method more widely known may be unjustifiable. In any case this note may relieve me of further correspondence on the subject.

I have no personal knowledge of other methods which may be in use for the same object, but from recent evidence I am inclined to think that such as are in use are not entirely successful. Some weeks ago two officers admitted to my wards suffering from trench fever complained of having been infested with pediculi, and incidentally remarked that the only officer who seemed to

escape infection was one who was wearing one of the vests above described.

The experiments and observations of Kinloch and others have also shown that naphthalene possesses a high value in killing and warding off pediculi; its use for this purpose is, of course, not new. The value of sulphur, which one thought was established, has, however, been disputed. Nevertheless I have retained it, for two reasons. In the first place I hoped it might prevent the generalized spread of scabies, another parasitic disease which has been prevalent at home and abroad; and there is some evidence in favour of this view. In the second place, I am not yet convinced that sulphur is quite innocuous to the pediculus. This conclusion cannot, for instance, be drawn from the fact that the louse can remain alive on sulphur ointment. It is only when sulphur is changed into sulphides that it becomes active; and, at ordinary temperatures, the concentration of vapour of sulphide over sulphur ointment must be small. When, however, sulphur in the state of fine division in which it is precipitated from benzol is left in contact with the skin and therefore at body temperature, the vapour of sulphide, partly prevented from escape by surrounding garments, may reach a concentration sufficiently high to be injurious to the pediculus.

Dipping the garment in a solution of sulphur and naphthalene in benzol has advantages over merely sprinkling the garment with the same substances in powder (1) because the distribution of the powder is uniform and universal, (2) because, being impregnated in the fibre of the garment, it is longer retained, and (3) because the treatment is not left to the soldier himself, who receives the garment already treated. I may add an extract from a letter recently received from an officer in France who has taken much trouble to report on the efficacy of these antiparasitic vests.

The shirts are doing good work and there is quite a demand for them. The billets we occupy at present are not very clean and consequently scabies is quite common. For scabies the shirts are excellent. For lice they do the work, but in some cases take time before they actually kill the lice. For some days the latter lie dormant on the shirts before they die. One man showed me a shirt with over 200 dead on it. This is encouraging as to their efficacy.

From this letter and others it may be gathered that a man who receives a prophylactic vest tends to keep it in reserve until he is actually infected. With a restricted distribution of the garments this is unavoidable. Indeed it may be suggested, to prevent disappointment, that there is probably no practical method possible which will ensure that a man, sufficiently exposed to infection, will never be bitten by a louse. Also it is obvious that such a prophylactic as here suggested has a time limit, and unless a man has a continuous supply for use he will be reinfected. If, however, all the individuals of a group of soldiers living in close association were systematically provided with such a prophylactic, it might go far towards solving the problem of pediculosis and scabies among them. The problem involves not merely infection of the individual but his infecting, and being infected by, his comrades. A complete solution is possible only when prophylaxis applies to them all. Moreover, the infection of bedding, etc., is a further problem which can only be partly attacked by depriving the parasites of possible hosts.

The evidence upon which this note is based is not the result of direct observation, and suffers from all the defects that such want involves. On the other hand, I have no reason to suppose that reports received steadily since June, 1915, can all be misleading, and I think the method is worthy of a more extended trial. I should suggest, therefore, that it would be a valuable experiment to provide all the members of an associated group of soldiers with antiparasitic vests and to observe the result in regard to the prevention of pediculosis and scabies. It has not been found possible to perform such an experiment by private effort directed at home.

It is possible that some such device might find its uses in civil practice. It is at once a method of prevention and treatment. For example, my friend Captain Girdlestone has applied the vests in patients underneath plaster jackets. In the cases in which he has so far used these vests there have been no cases of pediculosis, and no skin irritation has been produced.

PRELIMINARY NOTE ON A NEW TREATMENT OF BRONCHIAL ASTHMA.

BY
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THIS communication refers to a particular treatment which I have recently been applying to certain selected cases of bronchial asthma. The patients have been free from all disease, other than the bronchial affection, and although more or less emphysema and bronchial catarrh have been present, they have not been of a high degree, or such as to create dyspnoea in the intervals of freedom (more or less) from the attacks.

I may be permitted, first of all, to make reference to the view as to the nature of bronchial asthma which I submitted in the course of a lecture on this subject in 1908.¹ It was to the effect that the asthmatic attack is a reaction on the part of the lungs to a toxic substance "either of distinctly pathological origin, or else a product of normal metabolism which gradually accumulates in the blood." In the following year Auer and Lewis,² of the Rockefeller Institute, showed that the lung of the guinea-pig in anaphylaxis presented conditions identical with those of bronchial asthma. They found the pulmonary distension to be due to imprisonment of the air in the alveoli from an intense bronchiolar constriction which was exclusively of peripheral origin. The symptoms could be relieved or averted by atropine. The anaphylactic nature of bronchial asthma has since then been expounded by Meltzer and many others, though the particular protein substance responsible is unknown. The various authorities also regard hay fever as an anaphylactic condition. Anaphylaxis does not attack the bronchial muscle in all animals, but it does so in man.

There are one or two points concerning anaphylaxis which require to be stated. It is generally believed that the reaction is one of extreme delicacy and very specific. So it is, but under certain conditions this specificity disappears, as has been clearly proved by the work of Dale,³ who showed that if a guinea-pig be sensitized to several antigens simultaneously, and an anaphylactic reaction be subsequently induced by a fairly large dose of one of the antigens, the animal thereby may be made refractory to the other antigens. Again, he found that if an animal be immunized to an antigen by giving a certain number of doses subcutaneously at short intervals, the animal as a whole being thus rendered immune, yet the excised uterus, or other susceptible organ, remains sensitive, not only to the antigen, but also to other substances akin to the antigen—for instance, to sheep's serum, where horse's serum was employed for immunizing. As the organ becomes desensitized to a second dose of sheep's serum the genuine nature of the anaphylaxis is proved. In like manner Kraus, Doerr, and others showed that animals sensitized to their own lens protein were susceptible to lens protein in general. The fact that an animal may be itself insensitive while its excised organ remains sensitive is explained by the neutralization of the antigen in the blood by antibodies before it has had time to attach itself to the fixed cells of the organ. Certain of the above facts recall the Abderhalden reaction.

Just as animals may be sensitized with their own lens protein, so autosensitization may take place in the case of bronchial asthma. Another possible instance of autosensitization, according to Rosenau and Anderson, is eclampsia, due to placental protein.

In applying the foregoing considerations to the condition of bronchial asthma, it was necessary to select a substance for the purpose of immunizing, which, if it did not contain the actual anaphylactic protein poison, nevertheless might contain one nearly akin to it. This condition appeared to be fulfilled in the case of peptone. Certain experiments of Biedl and Kraus were of great interest in this connexion.⁴ They obtained bronchial spasm in guinea-pigs after the administration of Witte peptone, and they claim to have produced an anti-anaphylaxis in serum-sensitized dogs by means of the same agent. They hold the Witte peptone to be identical with the anaphylactic poison.

The method I have been employing is immunization by the subcutaneous injection of a water solution of peptone,