paramount importance. This may be briefly outlined as follows:

I.

On the first day of treatment the patient is given a hot bath and provided with plenty of soft soap and a large, moderately stiff nail-brush.

(a) Before entering the bath, he rubs himself thoroughly all over with the soap, massaging it into the skin, and paying particular attention to the fingers, toes, wrists, penis, and axillae. This should be continued for at least ten minutes.

(b) He then enters the bath, which should be both long enough and contain a sufficiency of water to permit of immersion to the neck. After first steeping for fifteen minutes, he scrubs himself vigorously all over with the nail-brush for the purpose of opening burrows and vesicles. If the eruption is particularly severe or painful this part of the procedure may be correspondingly modified. After the bath a final inspection should be made, when any unruptured vesicles can be opened with a surgical needle.

The bath is given with the sole object of opening up the haunts of the acarus and exposing it to the action of the parasiticide to follow. It is obvious that shower or steam baths cannot fulfil this purpose, and examination of a patient so treated will reveal the burrows and vesicles still intact.

II.

After removing the soap and drying, a liberal quantity of sulphur ointment (*B.P.*) is provided, with which the patient rubs himself vigorously all over, from the neck downwards, special attention being paid to the affected parts and to the fingers, wrists, genitals, axillae, toes, and ankles. The ointment must be liberally applied and thoroughly rubbed in, so that when finished he should be literally "soaking" in it.

The inunction is to be repeated in this manner twice daily for three days—that is, until the patient has had in all six applications. Each must be complete, and for this it is obvious that all clothing must first be removed. The treatment of limited parts of the body is useless.

III.

Finally, on the fourth day, but not before, a second bath is given, and all the patient's clothing and bedding sterilized to prevent reinfection. Even such articles as wrist-straps, strings of identity discs, gloves, etc., should be included.

The vast majority of cases, unless there be secondary complications, will be found cured after three such days of treatment. Should any doubt exist, 2 per cent. betanaphthol in vaseline may be used daily for four more days. Only under exceptional circumstances should sulphur ointment be applied for more than three days, since its continued use is liable to cause severe dermatitis. Indeed, in susceptible persons a mild degree may be occasioned by the three-day treatment. This is usually easily cured by zinc ointment or Lassar's paste. At the completion of treatment the existence of some degree of itching is not uncommon; this is due to the remedy, and does not indicate failure of cure; it will rapidly pass off, and should be disregarded. Some days also will probably elapse before all the lesions of scabies have disappeared, although the man is no longer infective. A certain degree of pigmentation may persist indefinitely.

SUMMARY.

1. Scabies in soldiers differs in type from the ordinary form seen in civil practice, particularly in the frequent absence of burrows or other lesions upon the hands, and in the great liability to pyodermic complications.

2. The primary disease is often masked by complications. In every case of impetigo, boils, dermatitis, or inguinal adenitis, scabies must be carefully excluded before the diagnosis is considered complete.

3. Cases of scabies complicated by any of the above necessitate about ten times as long a period in hospital as simple cases, therefore early diagnosis and treatment, before secondary diseases have become established, are of the greatest importance.

4. Regular medical inspection is essential for the detection of "carriers." Infected men should be segregated and treated at the earliest opportunity; horses may also require inspection. Blankets being the chief source of spread should be sterilized as often as possible.

5. Treatment by means of sulphur vapour is a method harmful often to the patient, and at all times dangerous to the community in that it manufactures a class of scabies "carrier." In the interests of the army it should be discontinued.

6. The method of treatment most suitable to service conditions on account of efficiency, simplicity, and cheapness is inunction with sulphur ointment, but this must be carried out in a methodical and thorough manner, and with careful attention to the necessary details.

REFERENCES.

¹ Milian, *Paris Médical*, May 6th, 1916, p. 426. ² *Hebra on Diseases of the Skin*, New Sydenham Society, vol. ii, p. 241.

ON A CONVENIENT METHOD OF PREPARING EUSOL.

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Eusol may be prepared in the following way:

Take 135 c.cm. of the *B.P.* liquor calcis chlorinatae; dilute with water to 1 litre, add 10 grams of boric acid, and shake up till dissolved. The solution remains clear, and without further treatment is ready for use. If preferred, a saturated solution of boric acid may be stocked at room temperature; this contains 4 per cent. boric acid, therefore 250 c.cm. gives the amount required for 1 litre eusol. In making eusol in this way the 135 c.cm. of liquor calcis chlorinatae should be diluted to 750 c.cm. and the 250 c.cm. of boric acid solution added. This prevents the formation of the precipitate which occurs if boric acid be added to undiluted liquor calcis chlorinatae.

By this method eusol can be prepared at a moment's notice simply by diluting and mixing two stock solutions, both of which are stable.

Should eusol be required for intravenous injection in cases of septicaemia, it is necessary to add sodium chloride in the proportion of 8.5 grams to the litre. In this case, therefore, the 135 c.cm. of liquor calcis chlorinatae would be diluted to 500 c.cm. with distilled water, the 250 c.cm. boric acid solution added, and also a solution containing 8.5 grams of sodium chloride dissolved in 250 c.cm. of distilled water.

The quantities here given are calculated on a chloride of lime assaying 25 per cent. available chlorine, which is about the average obtained from commercial samples at the present time.

In our original paper¹ on the preparation of eusol we described the method of making the solution from dry bleaching powder and boric acid, and this method has been found serviceable where large quantities of the antiseptic are used and the supply has to be constantly renewed. It is less suitable where eusol is required in smaller quantities and at irregular intervals. Since liquor calcis chlorinatae keeps well, the method described above has suggested itself as a simple and convenient way of preparing eusol in any quantity desired.

Liquor calcis chlorinatae is a 10 per cent. solution of bleaching powder in water. It is therefore easily prepared, and its keeping power when tested has given the following results: In April, 1915, a bottle of the solution was made by shaking up 100 grams bleaching powder in 1 litre of water. The mixture was allowed to stand overnight and then filtered. At the time it was made it assayed 2.92 per cent. available chlorine. It was kept in a clear glass-stoppered bottle in a cupboard in the laboratory, with temperature rising in warm weather to 18° or 20° C. Over two years later, on the last day of July, 1917, the solution assayed 2.62 per cent. available chlorine; deterioration had thus taken place very slowly. A similar solution, prepared on July 1st, 1917, stored in the same cupboard during the hot weather of July, has remained at constant assay during the month—namely, 2.57 per cent. available chlorine. This solution, it may be remarked, represents a very poor chloride of lime. Generally speaking, the quality of the chloride of lime manufactured has deteriorated very much during the war.

The use of liquor calcis chlorinatae for the preparation of eusol has another advantage in that the available chlorine in the liquor can easily be determined by titration with N/10 sodium arsenite solution. The testing of the strength of the hypochlorous acid is particularly desirable when it is to be used for intravenous injection.

Standard eusol is a solution of which

- 1 c.cm. = 1 c.cm. N/10 sodium arsenite.
- = 0.0035 gram chlorine.
- = 0.0026 gram hypochlorous acid.

The following is an example of the application of the test where the chloride of lime is of poor quality.

Take 10 c.cm. of the liquor calcis chlorinatae; dilute to 100 c.cm. 10 c.cm. of this solution = say 0.74 c.cm. N/10 sodium arsenite solution; the end point of the reaction being determined by potassium iodide starch solution or paper. From this a simple calculation shows that 135 c.cm. of liquor calcis chlorinatae per litre is needed to give the standard eusol. When bleaching powder of high quality is used about 125 c.cm. will be found sufficient.

Sodium arsenite solution is more convenient for testing than sodium thiosulphate. Pure arsenious acid can be obtained easily, and the solution keeps indefinitely. The result is not affected by the presence of chlorates. The following method of preparing the solution is described by Cumming and Kay, and we are indebted to these authors for permission to include the description of their method in this paper.

Weigh out accurately in a small porcelain basin 1.237 grams of pure arsenious oxide (previously dried in a desiccator); add 10 c.cm. of sodium hydroxide solution (twice normal), and warm the basin on the steam bath, stirring the mixture gently until the oxide dissolves (about five minutes). Transfer the solution and the rinsings of the basin to a 250 c.cm. standard flask and add 20 c.cm. of dilute hydrochloric acid (twice normal); then add about 8 grams of sodium bicarbonate (or 100 c.cm. of a cold saturated solution), and dilute the solution to the graduation mark.—*A Text-book of Quantitative Chemical Analysis*, by Cumming and Kay. Second edition, p. 94.

Since liquor calcis chlorinatae deteriorates so slowly, a large amount of a standardized stock solution may be made at one time. Each litre of the liquor yields at least 7 litres of eusol. Further, if the test be once applied it need not be repeated till the stock has been exhausted.

REFERENCE.

- ¹ BRITISH MEDICAL JOURNAL, July 24th, 1915.

A NOTE ON THE CARREL-DAKIN-DAUFRESNE TREATMENT.

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THE results of six months' experience of the Carrel-Dakin-Daufresne treatment in infected wounds in a general hospital, British Expeditionary Force, may be of interest. It was carried out strictly in accordance with the system employed by Carrel at his hospital. The solution, the operative technique, the appropriate number, calibre, and position in the wound of the tubes are of prime importance; indeed, the number of perforations and their size are not negligible.

The Solution.—The Dakin-Daufresne solution is rich in hypochlorite of soda, but must be neutral or alkaline. It must be tested at least every two days for free hypochlorous acid and the sample rejected if any acid be present. The solution is prepared so readily from abundant and cheap chemicals that free use or rejection is of no importance, and the method of preparation is rapid and free from technical difficulties.

Operative Technique.—Whenever possible, the wound should be converted into a broad-based crater and all damaged tissue detritus and free fragments of bone removed.

Haemostasis is most important, by ligature pressure and hot water. It is faulty technique to introduce the irrigation tubes into an oozing wound. The tubes must be inserted first into the depths and recesses, then more superficially. The tubes are made stable by fragments of one-inch web bandage removed from Dakin-Daufresne solution and arranged lightly in contact with the distal extremities of the irrigation tubes. The irrigation tubes (4 mm. calibre and 30 cm. long) are tied at the distal end

with linen thread. Perforations extend from this point for 5 cm., 10 cm., or 15 cm. along the length of the tube, so as to vary with the dimensions of the wound treated. I usually employ an open tube—that is, one not occluded by tying—for the disinfection of medullary cavities.

The Results.—The cases have in general required a longer period of treatment to secure disinfection than is the rule at Carrel's special hospitals. This is to be attributed to the later stage at which the British cases come under treatment. During the first twenty-four hours after infection of a wound smears show no microbes, although these are present in the retained foreign body—shell, clothing, etc.—from the beginning. Carrel receives and treats his cases during this aseptic period, thereby securing a more rapid disinfection process. Five days appears to be the shortest period of disinfection. This factor of delay must be kept in mind when comparing results. The majority of the cases treated by this method at this general hospital were grave wounds of the extremities with compound comminuted fractures of the long bones, often multiple, and frequently with considerable loss of substance.

Since the inception of Carrel's treatment we have found:

1. Absence of secondary haemorrhage.
2. Absence of amputations except in two classes of wounds—namely, infected wounds of the knee-joint with much bony comminution, and badly comminuted ankle-joints.
3. Septicaemia—one case.
4. Mortality—one; a very dirty comminuted knee-joint.

I may say, in conclusion, that the appearance of the patients is very striking. A clear complexion and good appetite is the rule. This immediate change in the facies of the ward gave us all—I include the nursing staff—confidence in the method long before we were justified by the accumulation of results.

THE CARREL-DAKIN TREATMENT AND A METHOD FOR ITS APPLICATION ON AN EXTENSIVE SCALE.

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IN applying the Carrel-Dakin treatment of wounds it was found necessary that the apparatus used should be obtainable at a minimum cost, and that the labour necessary for the satisfactory carrying out of the original method should be reduced by some means.

For the individual or separate treatment of cases, a bottle (Fig. 1) was devised to replace the ampoules and apparatus recommended by Carrel in his book.

The bottle is hung upside down on a stand or prop, which can be moved to the most convenient place about the side of the bed, and is filled by means of a funnel attached to the glass tube A. The glass tube C is cut short to the rubber cork and is the means of communication with the air; the glass tube B conducts the fluid in the bottle to the wound by rubber tubing fixed with a clip. On the bottle is marked a scale in half-ounces. Every two hours when the wound is flushed, say with two ounces of fluid, the clip on the rubber tubing is released until the column of fluid in the bottle is decreased two ounces (or any other amount found necessary) by the scale.

FIG. 1.—Requirements: A wooden stand, a 1lb. bottle with a narrow neck, a rubber stopper (No. 5) bored with three holes, glass tubing 5 mm. in diameter, rubber tubing, one clip and one funnel.