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.

BY

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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.

This system works admirably for individual cases, but when the treatment must be carried out on a number of cases it requires a great amount of attention and labour day and night in order that the patients may obtain two-hourly flushes and the nurses may know the quantity of fluid each patient requires, and the necessary precautions to prevent each bottle running short of fluid.

For the treatment of a large number of patients we devised the system of bottles 2 and 3; neither need be of a greater capacity than four ounces. The system is one of siphonage with automatic flushing and refilling, so that once started no attention is required. The glass tubes A and C in these two bottles are the same, but in bottle 2 the tube B differs in that it has three bends; it produces

FIG. 2.

FIG. 3.

a siphon action, so that when the fluid in the bottle has reached a corresponding height to that in the siphon it overflows and flushes the wound. These tubes can be made of different lengths so as to give varying flushes, or this can be arranged by raising or lowering the height of the siphon tube. The various quantities of a flush should be marked on the bottles.

Into the length of tube A, which conducts the fluid from the reservoir to the bottle, is let in by rubber tubing a dropper to regulate the number of drops required to give

FIG. 4.—Glass dropper. A, glass tubing 4 cm. long by 1 cm. diameter; B, one half of a 2 mm. glass tubing 4 cm. long slightly drawn out in a pin-head and cut in two (glass tubing of sizes required in A and B can be obtained from Messrs. Baird and Tatlock, London); C, a small piece of rubber tubing passed over the end and turned back; D, a slightly larger piece of rubber tubing drawn over the doubled rubber tubing and serving to retain the dropper in its position in the glass tube; E, rubber tubing which connects dropper to the tube of the circulating system; F, rubber tubing which connects the dropper to the inlet tube of the bottle.

any quantity of flush every two hours; for example, if it is found necessary for the dropper to drop twenty drops a minute to give by overflow of the siphon a 2 oz. flush in two hours, the rate of the drops is arranged by a screw clip on the tubing leading from the reservoir; the drop-rate necessary for a flush of any amount of fluid at the same interval or for the same amount of fluid at different intervals can be calculated.

The system of bottle 3 is the same, but a wide-necked bottle is used and the siphon tube B is placed inside the bottle because it is less likely to be broken, and there is only one bend instead of three, which is important, for if the bends are not perfectly made an air lock may prevent siphonage.

Bottles 2 and 3 are fixed most conveniently on a little wooden bracket hung on the wall behind the patient's head.

For the purpose of treating a larger number of patients we have devised the following system. A large reservoir

holding from 2 gallons upwards, preferably of glass (one made of papier maché could be used), is fixed at the end of the ward at a height of about 6 ft. Connected to it by rubber tubing is gas piping 7 mm. in diameter fixed round the ward behind the heads of the beds. At points in this gas piping, corresponding to the heads of the beds, are branches of smaller gas piping, about 5 mm. in diameter and 8 in. in length; to these are attached rubber tubing leading to the tube of each bottle, which is placed on the bracket about 2½ ft. above the level of the patient's body. A screw clip is placed on the rubber tubing leading from the inlet tube of the bottle to the gas piping, which is used to graduate the flow of drops from the dropper.

The end of the gas piping opposite to its connexion with the reservoir should be carried to a higher level than the reservoir, and left with an open end, so as to prevent air locks. The open end is bent in a half circle so that the opening of the gas piping is directed downwards to prevent the entry of dust into the tube.

This method requires only that the reservoir should be kept supplied with fluid. The "automatic flushing" from each bottle every two hours does not require any further supervision.

With this method of automatic flushing any number of patients can be treated without any further trouble or supervision after the requisite dosage to each patient is arranged by the regulation of the screw clip, and could be carried out easily on hospital trains and ships without interfering with the dressing of the patient, as it would require only that the tubes to the wounds be disconnected and attached again to the tubes leading from the bottles.

Memoranda: MEDICAL, SURGICAL, OBSTETRICAL.

A CASE OF INTRAURETHRAL PRIMARY SYPHILITIC CHANCER.

The patient stated that the last exposure to infection was on January 14th, 1917 (last day of ten days' leave). He noticed a purulent discharge from the urethra on January 16th, reported sick on January 22nd, and was admitted to No. — General Hospital on January 28th, where he was detained and treated for a few days, and transferred to No. — General Hospital on February 4th.

He then had purulent discharge from the urethra in which gonococci were found. He was treated for gonorrhoea and was marked clear on March 4th.

On March 5th he reported that owing to incessant frequency of micturition he was unable to get much sleep during the night. At the same time he noticed a hard lump in the penis, about the level of the anterior part of the corona.

On March 6th he complained of pain and swelling in the right groin. This was treated with hot baths and fomentations until March 17th, but the swelling in the groin gradually got larger. On March 10th he noticed his foreskin was swelling. This gradually increased.

When examined on March 18th there was considerable non-inflammatory oedema of the foreskin, which was of a bluish colour, quite dry, and a little indurated. There was no visible sore present on the penis or in the urethra on opening the external meatus, but there was a brownish sero-purulent discharge from the external meatus.

On palpation of the penis a uniform stony-hard tender swelling of the urethra was felt, commencing half an inch from the external meatus and extending for one and a quarter inches. The swelling was approximately three-eighths of an inch in diameter. On squeezing it a slightly purulent blood-stained discharge could be expressed from the urethra. The lymphatic glands in the right groin were much enlarged, stony-hard, discrete, and painless. There was no adenitis of glands in the left groin. There were no other evidences of syphilis.

The diagnosis of a primary intraurethral syphilitic chancre was made.

A smear taken of the discharge expressed from the urethra and stained by Giemsa's method showed gonococci, spirochaetes (resembling *Treponema pallidum*), some blood and pus cells.

On examination with a small-sized urethroscope, which was passed with some difficulty on account of the pain, an ulcer was seen in the urethra. The nearer edge of the ulcer was about three-quarters of an inch, and the further edge about one and a quarter inches, from the meatus. The edge of the ulcer was sharp, well defined, and not raised above the surrounding normal walls of the urethra. The surface of the ulcer, from which a copious brownish-tinged serum could be seen exuding, was slightly depressed, and was composed of rugged, irregular, greyish-brown granulation.