PRACTICAL PHARMACY SECTION

THE CARREL-DAKIN SOLUTION PHARMACEUTICALLY AND PHYSIOLOGICALLY CONSIDERED.*

BY ST. CLAIRE RANSFORD-GAY.

There has been no preparation of recent years, excepting, perhaps Normal Saline, which in effectiveness and simplicity has equaled the Carrel-Dakin solution, and in conceding that it is a most wonderful and practical application of scientific phenomena, we simply prove that it is not necessary, nor is it expedient, to tamper with the laboratory of nature, in order to obtain perfect products for the restoration of body balance. Therefore, synthetic products, while perhaps identically the same in formula but reinforced through the benzole ring, not being natural, do not contain the same amount of energy that is found in the natural product, hence disease will respond, if at all to these latter compounds, only in proportion to the amount of their potential force, which through the agency of the body is convertible to kinetic energy. This is the reason that synthetic preparations for instantaneous use, now marketed in such great profusion, have failed to give satisfactory results, in the hands of experienced practitioners, and, moreover, have seriously interfered with the use of the original solution.

A word as to the best method of manufacture and keeping yet found by us, and some hints from practical experience with a product that corresponds with all of the requirements set down by Dr. Carrel may be an aid to those who for themselves have not had an opportunity to do any special work along this line, and, as well, will serve as an excuse for the reason why this solution should be regarded as purely individual in its curative factors, and general only inasmuch as it contains all the materials for promoting healthy granulation, but the use of the solution must be modified to suit the condition to be treated.

The following formula, with which we obtained the best results, does not appear to be balanced, but a little pharmaceutical arithmetic will show that when U. S. P. salts are used the resulting solution will contain 0.5 percent of sodium hypochlorite, with small amounts of neutral sodium salts:

Chlorinated Lime[1]	200 Gm.
Sodium Carbonate (Dried)	100 Gm.
Sodium Bicarbonate	50 Gm.
Distilled Water	10,000 mils

When made on a large scale, say 25 to 50 gallons, it is very easy to siphon off the supernatant liquid, and filter it, so as to obtain a clear solution, but the manufacture of small quantities is troublesome. It must be understood, too, that the process is not merely one of adding the salts to the water, making the solutions and immediately pouring one into the other, thus obtaining in say an hour, a product

* Read before Section on Practical Pharmacy and Dispensing, A. Ph. A., Indianapolis, meeting, 1917.

[1] Based on strength of 25 percent chlorine determined by titration; a corresponding amount must be used if the chlorinated lime is not of this strength.

fit for use. No indeed, nature takes just so long to act, and in hastening her action, we are depriving the finished product of just so much energy, and that will be manifested in the finished product, when titrated. The following technic and method of keeping, if carefully followed, will give a product which will obviate the necessity of making the solution fresh every three days and thus lower the cost to those who are unable to pay for the extra labor and great waste of material thus entailed. It is the high cost of this solution to those of limited means that keeps many physicians from using the solution even when the necessity is very great. The chlorinated lime U. S. P. should be put into a large bottle, and half of the water added. This is well stirred during six hours, and allowed to stand over night. The sodium salts are dissolved separately, each in a quarter of the remaining water, and allowed to stand over night. In the morning the sodium bicarbonate solution and the precipitate are poured into the chlorinated lime, and the whole well shaken. The sodium carbonate solution and precipitate are then added quickly so as to absorb readily the nascent chlorine which has been previously liberated by the sodium bicarbonate. (We have found that because of its greater solubility in cold water, the lime should be treated with water at a temperature of from 55 to 60° F., and kept at that temperature until the sodium salts are added, they too being in as cold a solution as possible.)

The mixture is now well stoppered, shaken thoroughly for ten minutes, and then allowed to settle. The supernatant liquid is siphoned off, and though filtered through paper, the stem of the funnel is well packed with asbestos, because the quality of the filter paper on the market at the present time leaves much to be desired as far as strength is concerned. The finished product is a clear liquid, with a marked odor of chlorine, which when titrated according to this method, contains 0.5 percent sodium hypochlorite.

"Put 20 mils of solution in a glass, and pour on the surface a little, say 2 cgm., of phenolphthalein powder, and shake with a circular motion, as in rinsing. The liquid should remain colorless, a red discoloration indicating free alkali or too little carbonation which must be corrected before titration."

"Titration: To 10 mils of the solution add 10 mils of distilled water, 2 Gm. of potassium iodide, and 2 mils of acetic acid. Pour into this mixture a $\frac{N}{10}$ (2.48 percent) solution of sodium hyposulphite, until it is decolorized. The number of mils of hyposulphite solution, multiplied by 0.3725, equals the percentage of sodium hypochlorite in the solution." This method is very simple and accurate.

All the technic, however, is not confined to the manufacture, which, as previously stated, should be carried out at as low a temperature as possible, and with as little light (natural or artificial) as convenient. After the solution has been filtered, it should be put up in well corked bottles and kept in the ice-box away from light. In this way it is possible to keep the solution for several weeks without deterioration, but in spite of the fact that these are ideal keeping conditions we titrate it each time before dispensing. The patient and doctor should be advised to observe this method of keeping the solution.

When the solution has turned lavender, it is no longer fit for use. In spite of the fact that every precaution has been exercised in the technic, the doctor sometimes fails to obtain his results, and despite argument on the part of the pharmacist,

he is convinced that it is the fault of the solution. It may be well then, to bear, in mind the following: This solution without dilution, is admirably suited to what may be termed the gross wounds of the battlefield, for two reasons: first, the men sustaining the wounds have gone into battle in perfect physical condition and are really physically "fit" and the infection being recent and local, the system is depleted only from shock and a normal loss of blood because under these conditions clotting must occur in the normal time. Therefore a great deal of the energy of the solution is used up in the removal of all effete material, and the remaining energy of the sodium hypochlorite serves to disinfect the wound, and to promote healthy granulation of the wounded area. If you will notice Dr. Carrel's method of using the solution, you will see that after the granulations have arrived at a certain point, the irrigating then proceeds only at intervals, and the strength is accordingly decreased.

Take, however, the typical hospital case, first of all, only a very few of the ward cases enter the hospital in good condition. Then if the patient has a septic condition warranting operation, the chances are ten to one that it has passed the local stage. Therefore, a solution containing 0.5 percent sodium hypochlorite will not be isotonic with her blood serum, as she will already have more sodium than she can take care of, due to the infection, and an additional amount in the solution will do more harm than good. It is well, therefore, to begin operations with a dilute solution, and to increase the strength if necessary, and we have found that in the irrigation of a kidney, the bladder or the vagina that the solution should be diluted from one-half to one-third. If, therefore, the strength of the solution is adapted to the individual case, even the most inexpert practitioner will be able to obtain results, provided that he supplements his treatment with the other salts required for the maintenance of and the restoration of the body balance which has been so disturbed by the septic condition that an andemia or worse may be the result if great care is not used in the after-treatment of the surgical condition.

UNITED STATES PUBLIC HEALTH SERVICE.

List of changes of duties and stations of commissioned and other officers of the United States Public Health Service for the seven days ended February 13, 1918.

Pharmacist J. A. Wolfe. Return to station, Philadelphia, Pennsylvania. Feb. 12, 1918.

Sanitary Engineer C. N. Harrub. Proceed to Augusta, Ga., on special temporary duty. Feb. 8, 1918.

Sanitary Engineer H. W. Van Hovenberg. Proceed to New Orleans, La., for duty in malaria investigations. Feb. 6, 1918.

Sanitary Bacteriologist E. M. Meyer. Proceed to Berea, Kentucky, for duty in investigations of meningitis. Feb. 4, 1918.

Sanitary Inspector Virgil H. Robinson. Relieved at Tacoma, Washington. Proceed to Seattle, Washington. Feb. 8, 1918.

Pharmacist J. M. Bell. Relieved at the Savannah Quarantine Station. Proceed to Norfolk, Va. Jan. 30, 1918.

Sanitary Engr. J. A. A. Le Prince. Report at Bureau for Conference relative to malaria. Jan. 30, 1918.

Sanitary Bacteriologist C. F. Butterfield. Relieved at Manhattan, Kansas. Proceed to Columbia, S. C., on special temporary duty. Feb. 2, 1918.

Special Expert W. C. Purdy. Proceed to New Orleans, La., for training in laboratory procedures relating to malaria. Feb. 1, 1918.

PROMOTIONS.

Pharmacist Cletus O. Sterns. Promoted and appointed a Pharmacist of the first-class, effective November 5, 1917. Pharmacist Walter H. Keen, promoted and appointed Pharmacist of the first class, effective December 31, 1917. Jan. 23, 1918.