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A note on the preparation of Dakin's hypochlorite solution.

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In the preparation of Dakin's hypochlorite solution it has been customary to adjust the reaction by the use of solid phenolphthalein. In the preparation from sodium carbonate and bleaching powder Dakin[1] added boric acid to the strongly alkaline hypochlorite solution until it no longer colored solid phenolphthalein. Daufresne[2] modified this technique by using a mixture of sodium carbonate and sodium bicarbonate for decomposing the bleach and also used solid phenolphthalein as the test for the reaction of the solution.

Investigations in this laboratory indicate that the reaction at which solid phenolphthalein turns red with a hypochlorite solution is at a hydrogen ion concentration of about 1×10^{-10} (pH = 10), *i. e.*, an alkalinity in terms of hydroxyl ions about 1,000 times that of water. Alkaline phenolphthalein solutions show a flash color in hypochlorite solutions at a hydrogen ion concentration of about 1×10^{-8} (pH = 8) or in the same unit an alkalinity 10 times that of water or one one-hundredth that of the turning point of solid phenolphthalein in hypochlorite solution. Hypochlorite solutions at a reaction corresponding to the color change of phenolphthalein solution, *i. e.*, pH = 8, are not stable. It is desirable therefore to find the minimum alkalinity at which a hypochlorite solution can maintain its concentration for a convenient period. We have found that this point is at a hydrogen ion concentration of about $10^{-8.5}$ (pH = 8.5). At this reaction a solution will maintain its hypochlorite content within the desired range for about two days. Hypochlorite solutions prepared by the use of phenolphthalein may vary as much as one hundred times in alkalinity, depending upon the bleach and conditions. This explains the variations in irritation that different observers have reported.

[1] Dakin, H. D., *British Med. Journal*, August 28, 1915.

[2] Daufresne, M., *Presse med.*, 24, 474, 1916.

We have developed the technique and tables for preparing hypochlorite solutions at the desired reaction from any bleaching powder, containing more than 20 per cent. available chlorine, in accordance with the following outline. The bleaching powder is decomposed with just enough sodium carbonate to insure complete precipitation of all the calcium, the filtrate is neutralized to solid phenolphthalein with dilute (10 per cent.) hydrochloric acid and the solution is then brought to the desired reaction, and a sufficient amount of buffer salts provided, by the addition of a definite volume of sodium bicarbonate solution.

We have also determined the amounts of carbonate and the technique for preparing hypochlorite solution of the desired reaction from liquid chlorine. We have been assisted in this by two engineering firms who have adopted their chlorine measuring devices to this purpose.[1] The method consists of running chlorine gas into a solution containing a weighed amount of carbonate until the desired percentage of hypochlorite is reached. The solution is then of correct reaction and contains a sufficient amount of buffer. We believe that on the basis of convenience, economy and accuracy that this is the method of choice.

We have moreover found that the indicator o-cresol-phthalein[2] changes color in hypochlorite solutions at about the "ideal" reaction and believe we can still further simplify the preparation by its use.

The methods we have indicated have been in use at our hospital for over two months and have proven themselves to be entirely satisfactory. They have also been found to be of such simplicity that they may be easily mastered.

[1] Wallace and Tiernan Co., New York; The Electro Bleaching Gas Co., New York

[2] Clark, W. M., and Subs, H. A., *J. Inf. Diseases*, 2, 1, 1917.