oval; 117 to 90 mm. in length; 50 to 35 mm. in width; apex obtuse to rounded; apiculus slight; base obtuse to acute; upper surface light yellowish olive; lower surface olive green; of membranous texture; lateral lines well marked; halves of lamina equal; veins very prominent on both surfaces.

It is noteworthy that coca is not cultivated in this vicinity and the occurrence of plants in this locality is possibly due to transportation of the seeds, either by birds or water, from distant coca plantations. The natives regard this plant as a wild growing coca.

SUMMARY.

The salient points of the preceding descriptions are summarized in tabular form as Table 1, page 358. Although variations in general characters of the leaf are to be expected, we may make use of the following characters with reasonable assurance in identification work:

1. The presence or absence of areolae or lateral lines.
2. The presence or absence of an apiculus or short projection of the midvein beyond the lamina.
3. The texture of the lamina.
4. The form of the leaf.
5. The type of apex.
6. The type of base.
7. The position of the midvein (equilateral or inequilateral).

(To be continued)

THE EFFECT OF CERTAIN AMIDES ON THE STABILITY OF MODIFIED DAKIN'S SOLUTION.*

BY JOHN C. KRANTZ, JR., AND MANUEL J. VIDAL.[1]

INTRODUCTION.

Since the introduction of the Surgical Solution of Chlorinated Soda into the Pharmacopœia, a great deal of investigation has been carried out with the purpose of finding a preservative for this solution. Becker[2] has studied the stability of the solution at various temperatures and Harrisson[3] has shown that certain compounds are capable of stabilizing the solution for long periods of time, even when employed in low concentrations.

The latter investigator claims saccharin to be an excellent preservative for the Modified Dakin's Solution and also suggests that the addition of saccharin does not alter the therapeutic value of the solution.

The purpose of this paper is to show that amides in general including saccharin do not stabilize Modified Dakin's Solution and to propose a theory to account for the reactivity of these products with sodium hypochlorite.

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* Section on Practical Pharmacy and Dispensing, A. PH. A., Des Moines meeting, 1925.

[1] Technician in the Pharmacy Laboratory of the University of Maryland.

[2] Becker, JOUR. A. PH. A., 14, 192 (1925).

[3] Harrison, JOUR. A. PH. A., 13, 902 (1924).

EXPERIMENTAL.

Two liters of the hypochlorite solution were prepared by the sodium phosphate method using a chlorinated lime which assayed 29.25% of chlorine. The solution prepared met the alkalinity requirements for this product and assayed 0.483% of sodium hypochlorite. Quantities of 200 cc. of this solution were immediately transferred to amber-colored bottles and the following substances were added:

Solution No. 1	Control	No preservative		
Solution No. 2		Saccharin	M. p. 220.8° C.	0.5000 Gm.
Solution No. 3		Benzenesulphonamide	M. p. 156.0° C.	0.4280 Gm.
Solution No. 4		Benzamide	M. p. 130.0° C.	0.3305 Gm.
Solution No. 5		Acetamide	M. p. 82.0° C.	0.1615 Gm.

Using 0.25% of saccharin as a basis for calculation the other amides were added in molecular equivalent quantities. Graph No. 1 shows the rate of deterioration of these solutions expressed in cubic centimeters of tenth normal sodium thiosulphate solution required for titration of 10 cc. of the hypochlorite solution.

Thirteen cubic centimeters of thiosulphate solution is equivalent to 0.483% sodium hypochlorite.

These data demonstrate the deteriorating influence of these particular amides upon the stability of the hypochlorite solution. It will be observed that molecular equivalents of the amides produce practically the same reduction in the positive chlorine content of the solution.

After twenty-three days these solutions were extracted with chloroform and the residue yielded by evaporation of the chloroform was tested for positive chlorine, by the potassium iodide method. Negative results were obtained in all cases. The residue from the solution containing saccharin did not melt at 220.8° C. as did the saccharin employed, but blackened at 211° C.

Beilstein's test indicated the presence of chlorine, the compound was then dissolved in boiling metallic sodium and the resulting mass after appropriate treatment was dissolved in water acidified with nitric acid and filtered. Upon the addition of silver nitrate solution, the characteristic reaction of the chlorine ion was obtained, indicating that chlorine had entered the organic molecule.

Another sample of the Modified Dakin's Solution was prepared, which met the alkalinity requirements and contained 0.509% of sodium hypochlorite. One hundred cubic centimeter quantities of this solution were placed in amber-colored bottles and again their stability in the presence of saccharin was studied.

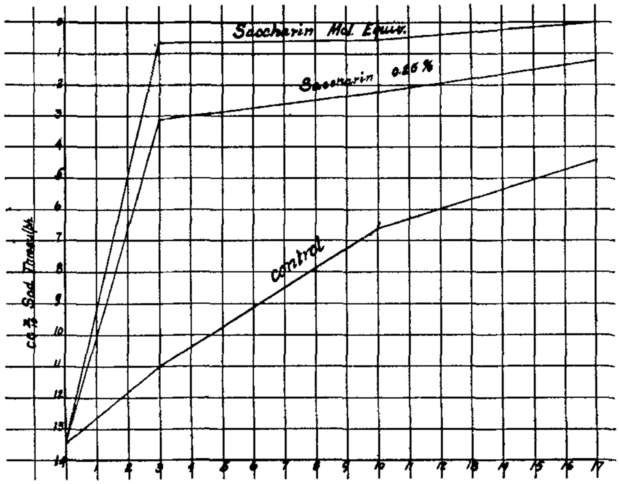
Solution No. 1	Control	No preservative
Solution No. 2	Saccharin	0.250 Gm.
Solution No. 3	Saccharin	1.252 Gm.

Solution No. 3 contained an amount of the amide chemically equivalent to the amount of sodium hypochlorite present, calculated upon the basis of a molecule of sodium hypochlorite for one molecule of saccharin. It is interesting to note that Solution No. 3 contained approximately 5 times as much of the amide as Solution No. 2. The following graph shows the deterioration of these solutions.

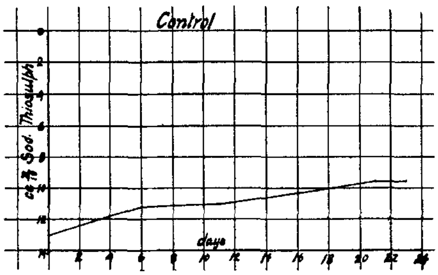
Thirteen and four-tenths cubic centimeters of sodium thiosulphate solution is equivalent to 0.509% of sodium hypochlorite.

Graph No. 2 indicates that the reduction of the positive chlorine content of the solution is a direct linear function of the quantity of saccharin present.

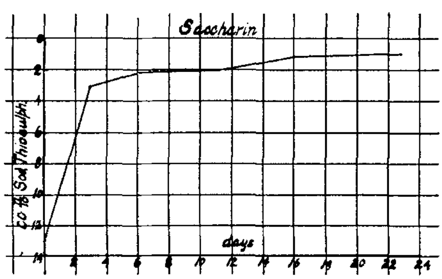
It is well known that when acid anhydrides of which saccharin is a type are dissolved in water, the hydrogen-ion concentration of water is abundantly increased, and as an increase in hydrogen-ion concentration rapidly causes the deterioration of hypochlorite solutions, it occurred to the authors that this might be responsible for the observed results. Accordingly hypochlorite solutions were prepared containing 0.25% of the sodium salt of benzosulphinide and in a similar manner their stability was determined. The solution containing this amount of the sodium salt of saccharin deteriorated quite rapidly (three times



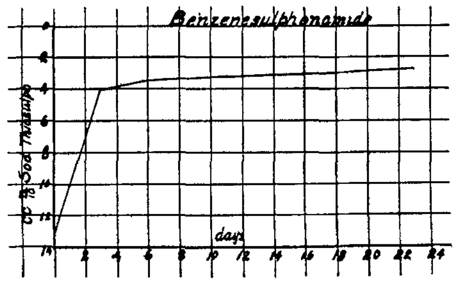
Graph No. 2.



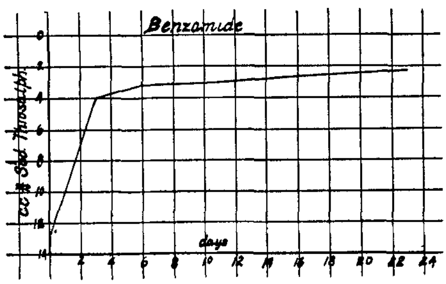
No. 1a.



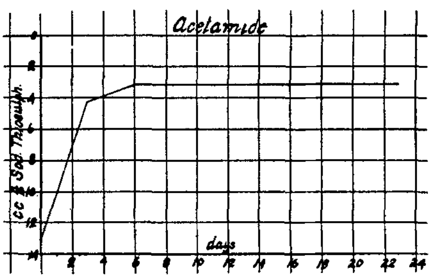
No. 1b.



No. 1d.



No. 1c.



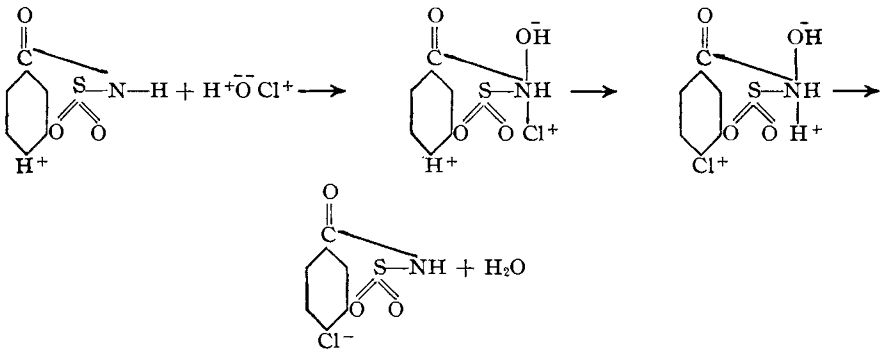
No. 1e.

faster than those without a preservative), however, not quite so rapidly as those containing the free acid anhydride.

THEORETICAL CONSIDERATIONS.

The experimental data herein outlined have shown that certain amides including saccharin react with sodium hypochlorite and that the chlorine ultimately enters the organic molecule, oxidizes the carbon to which it attaches itself and becomes negative chlorine, *i. e.*, nonavailable chlorine. These postulates may be deduced from these experiments. In accordance with the modern views of organic substitution proposed by Kharasch and Jacobsohn,[1] the authors assume the following changes to take place:

1. $Na^{+}-{}^{-}O^{-}Cl^{+} + H^{+}\bar{O}\bar{H} \rightleftharpoons H^{+}\bar{O}\bar{Cl}^{+} + Na + \bar{O}\bar{H}$



CONCLUSIONS.

1. The effect of certain amides on the stability of Modified Dakin's Solution has been studied.
2. Saccharin does not preserve solutions of sodium hypochlorite but causes their rapid deterioration.
3. A theory has been proposed to account for the behavior of sodium hypochlorite in the presence of saccharin.

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A NEW PROCESS OF MAKING BETAINE HYDROCHLORIDE.

Recently a novel process of manufacturing betaine hydrochloride and glutamic acid has been developed by a Multiple Industrial Fellowship of Mellon Institute of Industrial Research, University of Pittsburgh. The construction of a factory for the production of these substances is planned by the Fellowship donor. The proposed plant will produce five hundred thousand pounds of betaine hydrochloride annually. Heretofore this hydrochloride has been available only at a very high price, and consequently the use of it has been limited. Unique properties make it especially desirable for certain therapeutic purposes. It is also a potential source of trimethylamine and other methyl amines, and may perhaps be used as a substitute for tartaric acid in the preparation of effervescent salts.

The investigations concerning the properties and uses of this interesting acid are being continued at Mellon Institute.

[1] Kharasch-Jacobsohn, *J. Am. Chem. Soc.*, 43, 1894 (1921).