The Use of Potassium Gluconate in Hypopotassemia

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The approach to the problem of hypopotassemia has been greatly simplified by the development of the flame photometer. Hypopotassemia has been found in diabetic acidosis, infantile diarrhea, and after major surgical operations. The prompt administration of potassium has been found to be extremely beneficial when such insufficiencies have been shown to exist.

The ideal substance for the administration of potassium would be a salt in which the anion of the compound exerts slight or no pharmacological action. Compounds of this nature would be the metallic salts of gluconic acid. The parent radical of this group of salts, gluconic acid, is chemically a penta-hydroxy caproic acid, which is derived by oxidation of the aldehyde group in the sugar D-glucose. Gluconic acid does not display any marked physiological action, and it has been shown that gluconic acid is tolerated without injury or disturbance to the digestive system. The radical is also of relatively low toxicity upon parenteral injection. One of these compounds, calcium gluconate, has been successfully employed during the past 20 years in the treatment of tetany and other calcium deficiencies.

This communication reports the use of another gluconate, the potassium salt, in hypopotassemia, and its method of preparation. Potassium gluconate[1] is a white crystalline powder having a mol wt of 234.24, and containing 16.7% potassium. It has a mild saline taste, is quite soluble in water, and is stable in air. A 30% solution of potassium gluconate is prepared with pyrogen-free triple-distilled water, filtered through a fritted Pyrex glass disk, transferred to 20-ml size ampules, and autoclaved.[2] Twenty ml of this solution contains 1 g of potassium (25.5 mEq). The solution has a pH of 7.0 and is colorless and stable. It may be added to the usual parenteral infusion mixtures. Although the usual source of potassium for both oral and parenteral administration has been potassium chloride, the gluconate is the solution of choice when the chloride ion is undesirable.

Potassium gluconate may be given orally in orange juice, Coca-Cola, tea, etc. One g of potassium gluconate is equivalent to 167 mg or 4.2 mEq of potassium. Parker (*1*) has shown that the gluconate when given orally seems to be less irritating than the chloride, and is well tolerated.

Potassium gluconate has been used as a source of potassium in hypopotassemia in the surgical and medical wards of the Lenox Hill Hospital for the past 6 months with excellent results. A more detailed report will be submitted at a later date.

[1] Potassium gluconate through the courtesy of Chas. Pfizer & Co., Brooklyn, N. Y.

[2] We are indebted to Samuel Gordon, Endo Products, Richmond Hill, N. Y., for supplying ampules of potassium gluconate.

Reference

1. PARKER, F. P. *Southern Med. J.*, **33**, 1301 (1940).

Tetrazolium Salt

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2,3,5-Triphenyl tetrazolium chloride, commonly known as tetrazolium salt, or TTC, was first prepared by von Pechmann and Runge (*1*) in 1894. It occurs as a white to pale-yellow crystalline powder that darkens on exposure to light. The reasons for this color change have been investigated by Weygand and Frank (*2*), and further by Hausser, Jerchel, and Kuhn (*3*). It is readily soluble in water, and melts with decomposition at about 245° C.

In 1941, Kuhn and Jerchel (*4*) synthesized a number of substituted tetrazolium salts by an improved procedure and called attention to the fact that their dilute solutions stained yeast, garden cress, and bacteria. They found that the reduction of the colorless salt solutions to red compounds that dyed the plant tissues was not due to the presence of glutathione, ascorbic acid, or cysteine, for the latter substances did not reduce these salts below a pH of 9.0, whereas the characteristic reductions observed on yeast, garden cress, and bacteria took place in neutral solutions.

As a result of various studies, Lakon (*5*) substituted triphenyl tetrazolium chloride for the toxic compound sodium selenite in his "topographic method" for testing the germinating ability of seeds. By a comprehensive series of comparative staining and germination tests, he was able to show that it was possible to predict the germinability of corn, oats, rye, wheat, and barley by observation of the embryo parts that were stained red by the insoluble formazan deposited in viable tissues.

Nadvornik (*6*), using Lakon's method, found that results concordant with those obtained by germination and superior to those given with selenite could be obtained with seeds of shrubs and fruit trees. Porter, Durrell, and Romm (*7*) used the method and found a close agreement between the percentage of stained embryos and the percentage of normal sprouts obtained in standard germination tests with corn, wheat, rice, buckwheat, popcorn, soybeans, and Bahia grass. Less satisfactory agreement was found in a comparison of the two methods when applied to vetch and to some lots of oats, peas, and barley. Cottrell (*8*) found good agreement between results obtained with the tetrazolium salt test and those obtained by the standard germination tests; the results were within the legal requirements for accuracy for cereal seed testing. Bishop (*9*) has discussed its use in the evaluation of malting barley. Shuel (*10*) reported that new barley, oats, and wheat incubated in a 1% solution at