

ter, however, was not so pronounced as on the previous occasion.

In conclusion it may be stated that nutritional edema is definitely related to the level of plasma proteins which can be easily influenced by the level and quality of protein intake. It seems that 1 gm. of animal protein per kilo is much superior to the same amount of vegetable protein in building up plasma proteins and reducing edema, and that 2 gm. of vegetable protein seem necessary to secure the same effect as produced by 1 gm. of animal protein.

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Nutritional Edema. II. Effect of Alkali and Acids on Nitrogen Balance, Plasma Proteins and Edema.

S. H. LIU, H. I. CHU, R. C. LI AND C. FAN.

From the Department of Medicine, Peiping Union Medical College, Peiping.

The 2 patients reported in the previous paper were studied from the standpoint of the effects of displacements of their blood acid-base balance on nitrogen balance, plasma proteins and edema. They were given known diets containing 1400 calories and enough vegetable proteins to secure nitrogen balance. The salt and water intake was kept approximately constant. Alkalosis was produced by the administration of sodium bicarbonate 12 to 20 gm. per day for one to two 4-day periods, and acidosis by 10% hydrochloric acid 30 cc. per day for 3 days or ammonium chloride 8 gm. per day for 4 or 5 days. There were altogether 3 experiments with alkali, one experiment with hydrochloric acid and one experiment with ammonium chloride with each individual. The results can be summarized as follows:

With each alkali administration, there was definite increase in edema with increase in body weight reaching a maximum within 3 or 4 days. Thereafter the edema began to subside and weight began to decrease in spite of continued alkali ingestion. With hydrochloric acid edema showed a slight diminution in Case 1 and remained unchanged in Case 2. The ingestion of ammonium chloride, however, resulted in a decrease of edema and weight in both cases.

The nitrogen balance in either case remained undisturbed with alkali or acid administration. The plasma proteins showed a slight lowering during several of the periods of alkali adminis-

tration, but practically no change during the remainder. The variations in plasma proteins during acid periods were slight and inconsistent.

The action of alkali in accentuating edema has been noticed by Falta and Quittner¹ in severe undernourished cases of diabetes mellitus and by Albright and Bauer² in a case of chronic nephritis of the nephrotic type. The former authors also attempted to produce edema by large doses of sodium bicarbonate in normal individuals without success. The diuretic effect of acids and acid-producing salts like ammonium chloride is well known and has been used in the treatment of various types of edema.

It is surmised here that the ease with which the water balance is so easily influenced by alkali and acid in cases of nutritional edema, nephrosis and severe diabetes with poor nutrition is probably related to the low level of plasma proteins found in such conditions. However, it can not be said that alkali or acid acts directly by altering the level of plasma proteins, as the changes in the latter accompanying alkalosis or acidosis are slight and not consistent.

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Small-Flaking or "O" Agglutinin After Intravenous Injections of Typhoid Vaccine.

S. H. ZIA. (Introduced by R. H. P. Sia.)

From the Department of Medicine, Peiping Union Medical College, Peiping.

Since the introduction of the use of prophylactic typhoid vaccine, confusion has risen in interpreting the Widal agglutination reaction in the diagnosis of typhoid fever. Recently Felix¹ introduced the technic of demonstrating the presence of small-flaking or "O" agglutinin, which he claimed to occur only in infection but not after subcutaneous inoculation of the vaccine. Gardner² found that while "O" agglutinin can be produced by subcutaneous inoculation of the vaccine, it very rarely reaches a titer higher than 1:200. We wished to know whether this "O" agglutinin can be produced by re-

¹ Falta, W., and Quittner, M., *Wien. klin. Wchnschr.*, 1917, **30**, 1189.

² Albright, F., and Bauer, W., *J. Clin. Invest.*, 1929, **7**, 465.

¹ Felix, A., *J. Hyg.*, 1929, **28**, 418.

² Gardner, A. D., *J. Hyg.*, 1929, **28**, 376.