

whether the changes seen in complete vitamin B complex deficiency represent a cumulative effect of all the constituents of the complex; or whether in the absence of one of the constituents the others, even if present in the diet, cannot be properly utilized. The latter condition might then be comparable to that shown to exist relative to the essential amino acids.⁸

Summary. In growing vitamin B complex-deficient rats, there is retardation and, finally,

cessation of growth of cartilage and bone associated with serous atrophy of the bone marrow. The male is more sensitive to the deficiency than the female. After refeeding a stock diet, skeletal growth is resumed at an intensified rate resulting in early restoration of normal conditions.

⁸ Cannon, P. R., Steffee, C. H., Frazier, L. J., Rowley, D. A., and Stepto, R. C., *Fed. Proc.*, 1947, **6**, 390.

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Toxicity of Equine Serum Treated by Alkali.

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Observations on the removal of antigenicity of proteins by alkali were early made by Wells,¹ TenBroeck² and have been confirmed and extended by a number of later workers. Recently, Davis and Eaton,³ as well as Kazal, DeFalco and Arrow,⁴ paid special attention to the toxicity of the resulting products but came to apparently conflicting conclusions. The former found alkali-treated bovine serum albumin to be non-toxic for white mice, rabbits, and for 2 dogs when given intravenously. On the other hand, Kazal *et al.* confirmed an earlier report by Lewis⁵ that purified bovine plasma protein treated by sodium hydroxide gained acute toxicity for guinea pigs as soon as its antigenicity was lost. In view of the importance of these findings especially in relation to possible practical application, it seems worthwhile to make a similar study on horse serum treated by alkali and to observe its toxicity in rabbits, guinea pigs, and white mice. The results obtained are herewith presented.

After several preliminary trials, it was found that one-quarter normal solution of sodium hydroxide would, after a period of 30 days at 37°C, render normal horse serum so altered in antigenicity that rabbits immunized with the treated serum produced no precipitin against both normal and treated sera, gave occasional complement fixation reaction with either, and in half of these immunized animals, skin allergy to normal serum alone was demonstrated. Furthermore, of 10 guinea pigs sensitized to treated serum, only 3 out of 7 reacted mildly with normal, and 4 out of 6 similarly to alkali-treated serum without a single death. At the same time, 4 controls died when shocked with normal serum. Nine rabbits tolerated as much as one gram of treated serum protein per kilo body weight without any symptoms, whereas only 5 out of 12 immunized rabbits reacted with an elevation of body temperature to half a degree Centigrade following intravenous injections of 20 ml (800 mg protein) of the treated serum. Among 26 white mice weighing 20 g given intravenously 0.5 ml of the same (20 mg protein), 2 died in 6 hours, and one died in a week. The rest survived 4 weeks, the period of observation. However, among 9 guinea pigs weighing 200-250 g, only 2 out of 3 receiving less than 100 mg of treated serum protein intracardially survived, while all 6

¹ Wells, H. G., *J. Inf. Dis.*, 1909, **6**, 506.

² TenBroeck, C., *J. Biol. Chem.*, 1914, **17**, 369.

³ Davis, H. A., and Eaton, A. G., *Proc. Soc. Exp. Biol. and Med.*, 1942, **59**, 246.

⁴ Kazal, L. A., DeFalco, R. J., and Arrow, L. E., *J. Immunol.*, 1946, **54**, 245.

⁵ Lewis, J. H., *Science*, 1943, **98**, 371 (quoted in 4).

receiving 120-240 mg of the same died almost immediately, following intracardial injection, from shock symptoms not unlike those described by Kazal *et al.*

Thus it seems clear that, as in the case of alkali-treated bovine serum, alkali treatment of equine serum rendered it practically non-

antigenic, but definitely toxic for guinea pigs. At the same time, it remained practically innocuous for rabbits and for white mice. The toxicity of treated serum for larger laboratory animals and the nature of this toxic substance will be the subjects of further investigation.

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Treatment of Euthyroid Cardiac Patients by Producing Myxedema with Radioactive Iodine.*

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Significant clinical improvement in euthyroid cardiac patients following total thyroidectomy has been reported.¹ The rationale of this procedure was verified in that the degree of alleviation of angina pectoris and congestive failure was generally proportional to the degree of reduction in the metabolic rate.² The advent of radioactive iodine has raised the possibility of achieving the same result.

Abstract of Cases. *Case 1.* EM, 46-year-old woman, entered the hospital in 1941 because of progressive ankle edema, dyspnea and orthopnea during the previous year. She had chorea at the age of ten. Physical examination revealed rheumatic heart disease, cardiac enlargement, mitral and aortic stenosis and insufficiency, auricular fibrillation, congestion of the lungs and liver, ankle edema

and orthopnea. She improved after one week in the hospital. In 1942, symptoms and signs of thyrotoxicosis appeared; the basal metabolic rate was approximately plus 33%. A maximal subtotal thyroidectomy was done in 1943. Myxedema developed following this procedure; the signs and symptoms of congestive heart failure markedly improved and she returned to work. Thyroid extract, 0.065 g, was administered daily until January, 1947, when, for the fifth time, the patient entered the hospital with orthopnea, pleural effusion, ascites, and peripheral edema. Thyroid medication was omitted. Despite adequate digitalization, mercurial diuretics, and salt and water restriction, little improvement resulted during 3 weeks of treatment. Following discharge from the hospital, the above signs and symptoms became progressively worse, paroxysmal nocturnal dyspnea appeared, and she again entered the hospital on June 14, 1947. Slight improvement resulted from the above regime of treatment. The basal metabolic rate averaged approximately plus 5%, the serum cholesterol was 220 mg/100 cc. On July, 5, '47, 5 millicuries I^{131} were administered. The total 3-day urinary excretion was 71%. Approximately 10 weeks later the basal metabolic rate was minus 14% and the serum cholesterol 400 mg %. On November 1, '47, 13.6 millicuries I^{131} were administered. A tracer study on December 4, 1947, showed

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¹ Blumgart, H. L., Levine, S. A., and Berlin, D. D., *Arch. Int. Med.*, 1933, **51**, 866.

² a. Blumgart, H. L., Berlin, D. D., Davis, D., Riseman, J. E. F., and Weinstein, A. A., *J. A. M. A.*, 1935, **104**, 17; b. Blumgart, H. L., Riseman, J. E. F., Davis, D., and Weinstein, A. A., *Am. Heart J.*, 1935, **10**, 596.