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The Influence of High and Low Protein Diets on Blood Chemistry.*

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This paper is part of an investigation of the influence of high and low protein diets on basal metabolism, blood chemistry, and the urinary nitrogenous compounds. For a period of 37 days 6 apparently normal women, all engaged in laboratory work, received a high protein diet containing 2 gm. of protein and sufficient carbohydrate and fat to make 40 calories per kilo of body weight. An interval of 3 weeks was then allowed in which the protein intake was lowered until it reached 0.5 gm. per kilo. Although the carbohydrate and fat intake on the low protein diet was adjusted so that the caloric value of the two diets remained the same, all subjects lost weight during the first 10 days. The protein value was then increased to 0.6 gm. per kilo and the weight remained stationary. The low protein diet was continued for 30 days.

All foods were carefully weighed. On 4 days of each week basal metabolism was taken, specimens of blood and urine were collected, and samples of foods were saved and analyzed. Blood was drawn from the cubital vein without turniquet before breakfast, after 30 minutes rest, and was analyzed for sugar, total non-protein nitrogen, urea nitrogen, creatine, creatinine, uric acid, and lactic acid. Total non-protein nitrogen was determined by Koch's method and lactic acid by Clausen's procedure modified by Friedemann. Folin's methods were used for all the other constituents. All determinations were made in duplicate.

No consistent differences were found in blood sugar levels on the two diets. In 3 subjects the blood sugar showed a rise on the low protein diet, but in the other 3 it remained the same on both diets. The average figures for 6 subjects for the 5 weeks on the high pro-

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tein diet ranged between 86.9 and 80.9 mg. per 100 cc. of blood, while the corresponding values for the low protein diet were 91.6 and 83.5.

Lactic acid, on the other hand, was decidedly higher on the low protein diet. These values range from 11.1 to 20.7 mg. per 100 cc. of blood on high protein, and from 18.1 to 29.4 on low protein diet. Since lactic acid is one of the intermediary products of carbohydrate metabolism, it is possible that the increase in this constituent is due to the necessary high carbohydrate content of the low protein diet.

The high protein diet brought a marked rise in both total non-protein nitrogen and urea nitrogen in all 6 subjects. The values obtained on low protein diet are within normal range: 31.8 to 27.5 mg. per 100 cc. of blood for total non-protein nitrogen and 10.9 to 9.0 for urea nitrogen. On the high protein diet the total non-protein nitrogen ran between 57.2 and 37.0, and the figures for urea nitrogen were 20.6 and 13.0. A much greater variation in the same indivi-ual from week to week was found in both the total non-protein nitrogen and the urea nitrogen on the high protein diet.

Four subjects showed a slight rise in uric acid during the high protein diet. No difference was found in the other two. The figures on this diet ranged between 4.8 and 2.9 mg. per 100 cc. of blood. Those for low protein diet were between 3.9 and 3.1. The creatinine value was remarkably constant in all subjects on both diets and no difference was found in the two diets. The average creatinine value of all subjects was 1.4 mg. per 100 cc. of blood for both diets. On the other hand, creatine, while showing constant values on the same diet, was found in much higher concentration in the blood on the high protein diet, in spite of the fact that most of the protein of the diet was derived from milk and eggs. It would appear, therefore, that while the creatinine of the blood is maintained at a constant level in the same individual, independent of the protein of the diet, the creatine, on the other hand, rises and falls with the protein intake.

Attention should again be called to the very high non-protein nitrogen values on the high protein diet. The greater number of these figures are decidedly higher than the normal range allowed in most clinical laboratories.