

individuals are scarce, but from a study of patients who were practically normal, 3 mg. per hundred c.c. of serum has been the value regarded as the upper limit of normal for the free amino-acid nitrogen.

The total nitrogen of the urine was determined on twenty-four-hour specimens collected under toluol by the Kjeldahl-Gunning method, the urea by Marshall's¹⁶ and the ammonia by Folin's¹⁷ method. The distribution of the urinary nitrogen between urea and ammonia has been shown to be dependent on the total excretion of nitrogen. The normal limits of the various nitrogenous constituents of the urine, with varying levels of nitrogen excretion, are therefore hard to define sharply. However, one can probably safely conclude that with a urinary nitrogen excretion of 10 gm. or more, the lower limit for urea nitrogen is 80 per cent. and the upper limit for ammonia nitrogen is 5 per cent., while with a nitrogen excretion of from 5 to 10 gm., the lower limit for urea is 70 per cent. and the upper limit for ammonia is 8 per cent. Furthermore, excessive acid production in the organism is accompanied with a lowering of the urea percentage and an increase in the ammonia percentage. The free amino-acid in the urine was determined by Van Slyke's¹⁸ method, and 1.5 per cent. has been adopted as the upper limit of normal. Future work may change these values.

SUMMARY OF FINDINGS

Forty-five cases have been studied in this series, in nearly all of which some abnormality of the liver was thought to be present. Some of the cases called cirrhosis were certainly not far advanced, and in some instances it appeared that the diagnosis was not definite, differences in opinion being frequently encountered. On account of lack of space the details of the cases are not given here,¹⁹ but a summary of the results obtained is given in Table 1.

Column 1 shows total number of tests made. Column 2 the total number of positive results, while the

16. Marshall: *Jour. Biol. Chem.*, 1913, xiv, 283; xv, 495.

17. Folin: *Ztschr. f. physiol. Chem.*, 1902, xxxvii, 161.

18. Van Slyke: *Jour. Biol. Chem.*, 1913, xvi, 121.

19. Findings of all tests, clinical notes, necropsy findings in fatal cases together with a discussion of the functional findings appear in the article in the *Proceedings of the Society of American Physicians*, 1914.