

tuted, and that within a week after the restoration of tryptophane to the diet, nitrogen equilibrium was restored.

It appears, therefore, that nitrogen equilibrium cannot be maintained unless tryptophane is supplied in the diet, and that tryptophane must therefore be regarded as a dietary essential for the human species.<sup>†</sup>

### 13441 P

#### Nitrogen Balance in Experimental Lysine Deficiency in Man.\*

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As part of a general study designed to determine the amino acids essential for man, the nitrogen balance was studied in 5 human vol-

<sup>†</sup> We have been unable to find in the literature observations dealing with tryptophane deficiency in man, but we have recently had the privilege of examining the data from a single unpublished experiment performed by Dr. Warren M. Cox, Jr., in which a tryptophane deficient diet, continued for 4 days, induced a negative nitrogen balance. (Cox, W. M., Jr., Mueller, A. J., and Fickas, D., to be published.)

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unteers who were given a diet deficient in lysine for periods of 2 to 5 weeks in length. The basic diet and the conditions of the experiment were similar to those outlined in the accompanying report<sup>1</sup> on tryptophane deficiency. The amino acid mixture deficient in lysine was prepared by deamination of casein, a process which has been shown to destroy the biological activity of lysine;<sup>2</sup> this was followed by acid hydrolysis, with the addition of 1.5% tryptophane (to replace that lost during hydrolysis) and of 1% cystine.

Before the deficient diet was instituted the subjects were given a diet identical with the experimental diet except that an amino acid mixture containing lysine was supplied. This mixture consisted of an enzymatic hydrolysate of casein, enriched by 1% cystine. A control period on an amino acid mixture containing lysine followed the deficiency period. In subjects Es. and Ha. the amino acid mixture in the control period was identical with that of the experimental period except that 6% lysine was added. In subjects Ra., He. and Hs., the amino acid mixture in the control period was identical with that used in the foreperiod.

The observations on nitrogen balance in 4 male subjects are shown in Fig. 1. It may be seen that each subject developed a negative nitrogen balance within a few days after the lysine-deficient diet was started, and that nitrogen equilibrium was promptly restored when lysine was again supplied. The failure to maintain nitrogen equi-

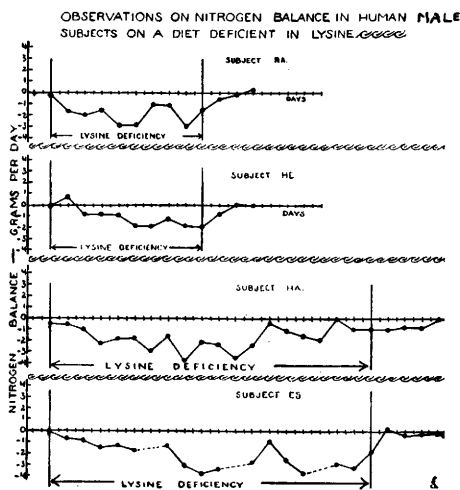
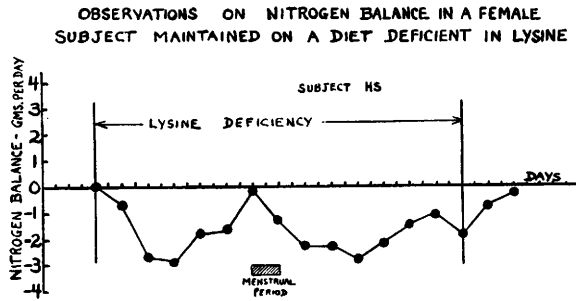


FIG. 1.

<sup>1</sup> Holt, L. E., Jr., Albanese, A. A., Brumbaek, J. B., Jr., Kajdi, C., and Wangerin, D. M., *PROC. SOC. EXP. BIOL. AND MED.*, 1941, **48**, 726.

<sup>2</sup> Dunn, M. S., and Lewis, H. B., *J. Biol. Chem.*, 1921, **49**, 327.



brum in the absence of an adequate supply of this amino acid indicates clearly that lysine is a dietary essential for the human subject.

The single experiment performed on a female subject (Fig. 2) also shows the prompt development of a negative nitrogen balance on withdrawal of lysine and the return to nitrogen equilibrium when lysine was restored. It may be noted, however, that on one occasion during the deficiency period the negative nitrogen balance virtually disappeared. This point coincided with the onset of menstruation. We are inclined to attribute this brief period of nitrogen equilibrium to a decrease in the metabolic requirements associated with menstruation, a phenomenon described by Benedict and others.<sup>3</sup> The menstrual period in our subject was characterized by an unusually scanty flow and by the complete absence of symptoms of premenstrual distress—swelling of the breasts, headache and gain in weight—which the subject usually experienced. This finding is of interest in view of the known influence of a lysine-deficient diet in suppressing the estrous cycle in animals.<sup>4</sup>

### 13442 P

#### Clotting Action of Rabbit-Clotting Globulin.

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Parfentjev<sup>1</sup> has shown that a "pseudoglobulin" fraction derived from rabbit plasma acts as a powerful blood coagulant. Taylor and

<sup>3</sup> Pearson, P. B., *Am. J. Physiol.*, 1937, **118**, 786.

<sup>4</sup> Benedict, F. B., and Finn, M. D., *Am. J. Physiol.*, 1928, **86**, 59.

<sup>1</sup> Parfentjev, A., *Am. J. Med. Sc.*, 1941, **202**, 578.