

trustworthy. She was so anxious to lose weight that at times difficulty was experienced in making her eat all the food on her trays. In the hospital the intake did not exceed that shown by the figures. During the eight months when she was not in the hospital she reported at regular intervals and stated that she was following closely the diet. I feel that while she is to be trusted there was more opportunity for error during this period.

A second patient (L. S.), female, weight 292.5 lbs., height 67.5 in., surface area 2.4 sq. m., age 26, basal requirements 2,140 calories, was placed on diets deficient in calories, basal 2,140; basal —30%, 1,500; basal —46%, 1,160; which however contained 120 gm. of protein. She lost weight very slowly from 292.5 lbs. to 260 lbs. over a period of 172 days. At one time her weight remained practically stationary for 50 days on a basal —30% diet (1500 calories).

Her basal metabolic rates also remained normal in the face of this severe undernutrition. She too remained in nitrogen equilibrium and at times appeared to be actively storing nitrogen. This second patient is a well educated young woman, of German extraction, and a teacher in the City Schools of Chicago. She was fully acquainted with the significance of the experiment and the necessity for accuracy. She showed on many occasions her willingness to cooperate when this cooperation involved a distinct sacrifice. I feel that her statements are to be trusted absolutely. This maintenance of nitrogen equilibrium and tendency to store nitrogen has been found present in 3 other female obese patients who were on diets containing 90 gm. of protein and approximately 1000 calories.

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Blood Lactic Acid in Relation to Metabolic Rate.

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The newer physiology of muscle contraction leads one to the hypothesis that, at least in muscle, it is the rate of glycolysis (or anaerobic cleavage of sugar with production of lactic acid) which determines the rate of respiration (oxygen absorption) of the tissue.^{1, 2, 3} It would be interesting to know how far one could account for conditions of increased metabolism of the whole organism, other

than in muscular exercise, on the basis of increased glycolysis by the tissues and hence, increased oxidation to keep pace therewith. For later researches by Meyerhof⁴ and Warburg⁵ and their collaborators show that the glycogen, lactic acid, oxygen relationship is not peculiar to muscle tissue but should be regarded rather as an attribute of all living cells. At least, the quantitative relation between oxygen absorption and lactic acid removal is the same for all cells and tissues hitherto examined, *i. e.*, Lactic acid removed/Lactic acid oxidized = 4/1 to 5/1, which is at least a broad hint of the fundamental identity of the energy-yielding reactions in all forms.

We have examined the concentration of lactic acid in the blood of man and animals under several conditions of increased or decreased metabolism. It is conceivable that although respiration may keep pace with glycolysis and prevent accumulation of lactic acid, nevertheless, in a case of increased rate of glycolysis, equilibrium might be reached at a higher concentration of lactic acid, which might be demonstrable by blood analysis. In man, we have increased the metabolism by large feeding of meat; while with rabbits we have used thyroid feeding to increase the metabolic rate and thyroidectomy to reduce it.

The lactic acid determinations were made by the Clausen⁶ method, with substantially the same modifications as those suggested by Brehme and Brahdy.⁷ Oxygen absorption was measured by the McKesson modification of Krogh's apparatus in the experiments on man, while the apparatus of Foster and Sundstroem⁸ was used for the rabbits.

Meat Ingestion. The experimental subjects (healthy young men in the postabsorptive state) lay at complete muscular rest for 40 to 50 minutes before the basal oxygen measurement and blood sample. Blood was taken from an arm vein with little or no stasis. Five hundred gm. of cooked lean beef were fed and observations made at intervals thereafter, the subject lying quietly throughout, and especially quiet for 30 minutes preceding each sample or measurement.

Ingestion of the meat caused in all cases a marked increase in metabolism. In no case did the blood lactic acid increase. These experiments show that increases in metabolism of 25 to 30% above the basal level caused by meat ingestion are not attended with any demonstrable rise in lactic acid.

Thyroidectomy and Thyroid Feeding. Young rabbits weighing about 1.5 kg. were completely thyroidectomized. Three or 4 weeks after the operation observations of blood lactic acid and basal metabolism were made. Great care was taken to exclude muscular activ-

ity before taking the blood samples or while measuring oxygen absorption.

In no case was there any significant change in lactic acid although thyroidectomy caused a 25% decrease in the basal metabolism, and thyroid feeding of the operated animals caused approximately 100% increase above the cretinoid level which existed before thyroid administration was begun.

¹ Meyerhof, O., *Pflug. Arch.*, 1921, clxxxviii, 112.

² Meyerhof, O., Lohmann, K., and Meier, R., *Biochem. Zeitschr.*, 1925, clvii, 473.

³ Hill, A. V., Long, C. N. H., and Lupton, H., *Proc. Roy. Soc.*, 1924, 97B, 84 and 155.

⁴ Meyerhof, O., *Biochem. Zeitschr.*, 1925, clxii, 43.

⁵ Warburg, O., Posener, K., and Negelein, E., *Biochem. Zeitschr.*, 1924, clxx, 309.

⁶ Clausen, S. W., *J. Biol. Chem.*, 1922, lii, 263.

⁷ Brehme, Th., and Brahdry, B., *Biochem. Zeitschr.*, 1926, clxxv, 348.

⁸ Foster, G. L., and Sundstroem, E. S., *J. Biol. Chem.*, 1926, lxi, 565.

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General Tuberculin-like Reactions in Rheumatic Fever Patients Following Intravenous Injection of Streptococcus Vaccines or Nucleoproteins.

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Several years ago one of us¹ suggested that rheumatic fever had many points of similarity with tuberculosis. Since then we^{2, 3} have shown that rabbits may be rendered hypersensitive to streptococci by the production of focal lesions with various types of non-hemolytic streptococci which have been isolated from patients with rheumatic fever and other diseases. As these streptococci have been shown⁴ to belong to various immunological groups, we formulated the hypothesis that if they had any etiologic relationship with the disease it was because of a peculiar type of tissue reactivity acquired by the rheumatic patient. We have, therefore, tested the reactivity of a number of patients in the late stages of rheumatic fever to intravenous injection of streptococci or products derived from them. These test materials were heat killed suspensions, vaccines, prepared from both green and hemolytic streptococci and nucleoproteins made from hemolytic streptococci. In all instances the initial