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Metabolism Studies with Rats Suffering from Fat Deficiency.*

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Wesson and Burr[1] showed that rats reared on the fat-deficient diet of Burr and Burr[2] gave respiratory quotients above unity and exceptionally high metabolic rates after a carbohydrate meal. Normal rats had lower basal rates and did not show the very high respiratory quotients or great specific dynamic action of the food.

This work has been continued over a period of 2 years with selected rats and their litter mate controls. A different technique has been used in order to follow gas exchange of the rats under normal conditions over long periods of time. An open-circuit apparatus with constant air stream has been used in conjunction with an automatic sampler (to be described elsewhere) which collects the dry samples over mercury and holds them for analysis. The Haldane-Carpenter[3] apparatus was used for determining the CO_2 and O_2.

The rats have been divided into 3 groups: those reared on stock diet; those reared on fat-deficient diet; and those reared on fat-deficient diet and then cured with certain fats. Three different methods of study have been applied. Some rats were starved 16 hours and then 2 periods of starvation metabolism were taken, followed by 4 periods while eating the normal diet. Other rats were run for 24 hours on the normal diet, then the food was removed and the behavior during 24 hours of starvation was followed. Still other rats were kept in the metabolism cage 48 hours on the normal diet. The periods were 4 hours long so that 6 samples were required for a 24-hour run. All runs were made at 28.5-29.0°C. The colony temperature is kept at 24-26°C. at all times.

The results show clearly that fat-deficient rats are very different from stock animals and that fat-deficient rats which have been cured with small doses of fats return to a much more nearly normal gas exchange. The most marked differences shown by the fat-

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1 Wesson, L. G., and Burr, G. O., *J. Biol. Chem.*, 1931, **91**, 525.

2 Burr, G. O., and Burr, M. M., *J. Biol. Chem.*, 1929, **82**, 345.

3 Carpenter, T. M., Fox, E. L., and Sereque, A. F., *J. Biol. Chem.*, 1929, **83**, 211.

deficient rats are higher basal rate, higher specific dynamic action of food, and higher respiratory quotients. These results are of especial interest since the runs were made over long periods of time under normal conditions. The respiratory quotients of the fat-deficient rats remain above unity for as long as 12 hours out of 24. They, therefore, synthesize every day large amounts of fat, but this synthetic fat does not prevent the fat deficiency.