10561 P

Origin of Fasting Ketosis in the Rat Following a Diet Low in Choline and Protein.

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When rats are fasted they develop a ketonemia and frequently it is high enough to produce a measurable ketonuria. The height of the ketosis is determined by many factors. When the diet is low in choline and in protein the liver becomes fatty[1] and on subsequent fasting there is a very substantial ketonuria.[2, 3] It seemed probable that this was incident to the fatty liver. However, since we have been unable to obtain a good correlation between the degree of ketosis and the amount of fat in the liver we have examined the factors which determine the extent of the fasting ketosis in question.

Deuel, *et al.*,[4] have found that choline administered during the period of fasting does not appreciably affect the ketosis of fasting fatty liver rats. We have confirmed this observation. Neither does the addition of choline to the diet prior to fasting, although it prevents the accumulation of fat in the liver, influence the subsequent ketosis. The only possibility left is that the ketosis of fasting rats is determined by their protein intake prior to fasting. This has been demonstrated in diets containing variable concentrations of casein, all containing 0.5% choline hydrochloride which insured livers low in fat when the fasting was commenced. The "0" protein diet was composed of sucrose 60, cod liver oil 2.5, Crisco 30, Standard Salt Mixture (Osborne and Mendel) 5, and Yeast Extract (Vitamin B Powder, The Harris Laboratories) 2. The other diets contained 5, 15 and 30% of casein respectively at the expense of the sucrose. Each group consisted of 5 adult male rats with an average body weight of 324 g. They had been receiving the special diets for 10 days before fasting was commenced. The protein intake tabulated per rat per day is the average of the 10-day period of feeding.

The data of a typical experiment recorded in Table I show very clearly the influence of the protein intake preceding a period of fasting upon the degree of fasting ketosis. Our ketonuria data as a

[1] Best, C. H., and Wilkinson, H., *Biochem. J.*, 1935, **29**, 2651.

[2] MacKay, E. M., *Am. J. Physiol.*, 1937, **120**, 361.

[3] MacKay, E. M., Sherrill, J. W., and Barnes, R. H., *J. Clin. Invest.*, 1939, **18**, 301.

[4] Deuel, H. J., Jr., Murray, S., Hallman, L. F., and Tyler, D. B., *J. Biol. Chem.*, 1937, **120**, 277.

TABLE I.
Ketone Bodies Excreted in the Urine per Rat per Day.

Protein intake prior to fasting g/rat/day	Day of Fasting				
	1	2	3	4	5
0	2	38	63	54	22
0.53	3	14	48	48	20
1.50	1	16	16	24	14
2.80	0	3	5	8	2

measure of ketosis is supported by the blood ketone levels which for the sake of brevity have not been included here.

In fasting rats the ketosis really develops after the glycogen stores are depleted at the beginning of fasting. The ketosis then might be dependent upon the antiketogenic action of the amount of "stored" protein now available for catabolism. However, nitrogen excretion figures do not support such a supposition.

10562

Basal Metabolism of 38 American-born Male Japanese University Students.

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The effect of racial influence on the basal metabolism of Orientals, particularly the Japanese, has been debated for a long time. MacLeod, Crofts and Benedict[1] believe that there is an appreciable racial difference between the Americans and the Orientals, while Okada, Sakurai and Kameda[2] and other Japanese investigators deny its existence in the Japanese when they are compared with the classical American prediction standards. It is not the purpose of the present study to confirm or refute either one of these views, but the final results seem to indicate that there is a retention of racial characteristics in respect to the basal metabolism of Japanese. Whether or not this factor of race is influenced by differences in diet* and climate

1 MacLeod, G., Crofts, E. E., and Benedict, F. G., *Am. J. Physiol.*, 1925, **73**, 449.

2 Okada, S., Sakurai, E., and Kameda, T., *Arch. Int. Med.*, 1926, **38**, 590.

* While no attempt was made to control the dietary of the subjects, it is safe to say that the majority consumed two typically American meals (breakfast, lunch) consisting of cereals, milk, bread, and other essentials. The evening dinner meal was typically Japanese, the essential difference being the substitution of rice for bread in the American dietary.