

Liver Fats and Glycogen of Hypophysectomized Rats on High Carbohydrate and High Fat Diets.*

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During balance studies on hypophysectomized rats fed high carbohydrate and high fat diets by stomach tube in amounts sufficient to maintain the body weight of control animals, it was observed that the fat-fed animals would withstand a 30-33-hour fast without showing signs of hypoglycemia. This was not true of the carbohydrate-fed hypophysectomized rats. Hypophysectomy had been performed 17 days before the fasting period was begun. The composition of the livers of rats two hours after feeding was compared with that of the livers of the fasted animals.

The livers were removed under amytal anesthesia, digested with 30% potassium hydroxide, and the glycogen precipitated with 50% ethanol. The glycogen precipitate was thoroughly washed and the combined supernatant solutions were analyzed for total fatty acids according to a modification of the method of Lemeland.¹ The non-saponifiable fraction was carefully separated in this analysis. Table I gives values for control and hypophysectomized rats on the two types of diet without fasting and after inanition.

Both Guest² and McKay, *et al.*,³ found that glycogen in the livers of animals on a high carbohydrate-low protein diet disappeared rapidly. These workers found that increasing the protein content of the diet lowered the original amount of glycogen. It also lowered the rate of disappearance of this compound from the liver. In our experiments the same conserving action on glycogen seemed to be exerted by large amounts of fat in the diet, the protein representing only 15% of the calories in both diets. It can be seen that the rate

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¹ Lemeland, P., *Bull. Soc. Clin. Biol.*, 1923, **5**, 110.

² Guest, M. Mason, *J. Nutrition*, 1941, **22**, 205.

³ MacKay, Eaton M., Carne, Herbert O., Wick, Arne N., and Visscher, Frank E., *J. Biol. Chem.*, 1941, **141**, 889.

TABLE I.
Liver Lipids and Glycogen in Hypophysectomized and Control Rats Fed Equicaloric Amounts of High Carbohydrate and High Fat Diets.

	High fat diet		High carbohydrate diet	
	Hypophysectomized	Controls	Hypophysectomized	Controls
Not Fasted:				
No. rats	6	9	6	9
Fatty acids				
mg/100 g body wt	245	585	98	241
Non-saponifiable				
mg/100 g body wt	16.8	10.9	10.0	8.3
Glycogen				
mg/100 g body wt	51.3	95.6	108	140
Fasted 30-33 hours:				
No. rats	14	15	9	9
Fatty acids				
mg/100 g body wt	127	529	87	224
Non-saponifiable				
mg/100 g body wt	19.3	12.0	9.3	7.7
Glycogen	9.1	19.7	0.16	2.5
Glycogen lost during fasting				
mg/100 g body wt	42.2	75.9	107.8	137.5
Mean mol. wt.				
fatty acids	290 ± 1.8	286 ± 1.9	294 ± 2.0	279 ± 1.9
% fat in carcass	10.80	9.53	13.23	8.14

of disappearance of glycogen in the fat-fed animals was much less than in the carbohydrate-fed groups. The difference in rate of disappearance was almost the same whether the animals were hypophysectomized or not (65.6 mg and 61.6 mg in 30 hours, respectively). The glycogen-sparing action of a fat diet did not appear to be influenced by pituitary removal.

The failure of the fat-fed hypophysectomized rats to show signs of hypoglycemia was probably due to the decreased utilization of carbohydrate during fasting and the greater amount of glycogen consequently remaining in the liver.

On both diets the hypophysectomized rats showed in the liver only approximately half the amount of fat which was present in this organ in the controls. On the other hand, the amount of fat in the carcass, other than the liver, was slightly higher. This would seem to agree with the view that the mobilization of peripheral fat is increased by pituitary secretion.

The mean molecular weights of the liver fats found in the control animals indicate that the average length of carbon chains was less on the carbohydrate diet. This agrees with Longenecker's observations⁴ on storage fat obtained from carbohydrate. In the hypo-

⁴ Longenecker, Herbert E., *J. Biol. Chem.*, 1939, **128**, 645.

physectomized rats there was no significant difference in the average molecular weight between the 2 groups, although the animals on the carbohydrate diet had liver fat with the highest molecular weight of the 4 groups. These animals also had the least amount of fat in the liver. The difference may be due to this being largely a residuum of phospholipid.

Summary. On a high fat diet the glycogen content of the liver was originally lower than on a high carbohydrate diet, but it did not disappear so rapidly from the liver. Hypophysectomized rats had less liver fat and more body fat than controls on the same caloric intake of a given diet. They showed the same conserving action of the fat diet on glycogen. The molecular weight of the liver fatty acids of the control rats on a high carbohydrate diet was significantly lower than those of the 3 other groups.

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Response of Bone Marrow in AKH and RFI Mice to Nucleic Acid.*

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Furth and his associates¹ and MacDowell and Richter² and others have shown that a leukemia similar to the human disease occurs spontaneously in mice, and that by inbreeding of selected individuals the percentage incidence of the condition may be increased to as high as 80%. Furth has developed two strains known as the Akh and the Rfi. The Akh strain carries lymphoid leukemia, and 60% to 80% of all animals which live to be 8 months of age suffer from the disease. The Rfi strain carries myeloid leukemia, and in somewhat older mice from 1% to 2% develop this variety of leukemia. This preliminary report is concerned with attempts to demonstrate additional constitutional differences between these two strains of mice. The most logical approach appeared to be some test of the response of the bone marrow to stimulation. Menkin³ showed that

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¹ *Am. J. Cancer*, 1937, **31**, 276.

² *Cancer Probl. Symposium*, September, 1937, 42-44.

³ Menkin, V., *Am. J. Path.*, 1940, **16**, 13.