TECHNICAL PAPERS

Lipodieresis in Liver Tissue of Depancreatized Dogs

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The phenomenon of lipodieresis, first described in 1922 by Roger and Binet (*4*), consists of the disappearance of a part of the lipids stored in a tissue which has been kept for some time in aseptic autolysis. This observation has been the subject of various speculations. However, in this paper we shall only point out that subsequent extensive researches by various investigators have shown that lipodieresis occurs most markedly in liver tissue, that it is by no means quantitatively a constant phenomenon, and that it is apparently a reversible process (*2, 3*).

While more extensive references to the literature will be given and discussed in a later paper, we summarize here some of the early findings of the above authors. When suspensions of finely chopped liver tissue of normal dogs are kept under aseptic conditions (with 1% sodium fluoride or thymol), it is observed that after 18–22 hrs there is a progressive decrease in the amount of its lipid content (as determined by the modified Kumagawa-Suto technique). This decrease, which may amount to 20% of the total lipid originally present, usually is maximal after 30 hrs or less. Subsequently it was shown that, if the suspensions are kept in the incubator under the same conditions for longer periods of time (*i.e.* 48–120 hrs), their fat content is progressively restored until the initial values of total lipid are reached again.

The present note deals with the effect of some pancreatic extracts upon the phenomenon of lipodieresis. It has been shown that, when suspensions of liver tissue taken from depancreatized dogs are used, the phenomenon of lipodieresis never occurs; that is, the lipid content of livers from depancreatized dogs always remains about constant during the whole period of autolysis (Table 1).

However, the addition of a small amount of pancreatic extract[1] to the same suspensions of liver tissue from depancreatized dogs restores the phenomenon of lipodieresis and the subsequent reappearance of fat. In other words, during 18–22 hrs of aseptic autolysis the lipid content decreases (as much as 30%) and then increases with time to its original value (Table 2). We have also examined the effect of that pancreatic extract having apparently lipotropic activity (so-called "lipocaic"), obtained as described by Dragstedt (*1*). It was found that this substance has an effect similar to, but quantitatively much less powerful than, that of the pancreatic extract first used.

[1] This extract was obtained simply by glycerine-water extraction and precipitation by calcium chloride and sodium phosphate. The amount of purified precipitate used was in the order of 1–2 mg/specimen of tissue.

TABLE 1*

LIPODIERESIS IN LIVER TISSUE OF DEPANCREATIZED DOGS

Dog No.	Liver lipids in weight %					
	Hours →	0	18	48	76	120
2	5-gm sample	12.7	12.3	12.7	12.8	12.2
4	" " "	26.5	26.01	26.2	26.11	26.4
5	" " "	19.21	19.13	19.09	19.14	19.22
6	" " "	23.15	23.04	23.07	23.14	23.17

TABLE 2*

LIPODIERESIS IN LIVER TISSUE OF DEPANCREATIZED DOGS WITH ADDITION OF SOME PANCREATIC EXTRACTS

Dog No.	Liver lipids in weight %					
	Hours →	0	18	48	76	120
1	5 gm liver + 5 mg lipocaic	12.72	12.11	12.14	12.10	12.63
2	5 gm liver + pancr. extract	26.50	18.21	23.43	23.90	26.72
2	5 gm. liver + 50 mg lipocaic	26.52	21.82	23.77	25.68	26.16
4	5 gm liver + pancr. extract	19.21	14.02	16.59	18.77	19.04
4	5 gm liver + 50 mg lipocaic	19.21	14.50	17.05	18.92	19.11
5	5 gm liver + pancr. extract	23.10	17.01	21.60	22.07	23.12
5	5 gm liver + 50 mg lipocaic	23.12	17.20	21.05	21.60	22.92

* Only a few of the data collected are reported in these tables.

Work is in progress now to test the effects of several other lipotropic substances, to determine the behavior of each lipid fraction separately, and to identify any water-soluble lipid material which might have been formed. Further research is warranted to determine the exact nature of the phenomenon of lipodieresis per se. While it is quite probable that this phenomenon may find its

explanation on a chemical-physical basis, its significance may be of interest also on the biological level, with regard to both fat transport and fat metabolism.

All that the above data appear to suggest at this point is that (1) liver suspensions of normal and of depancreatized dogs do not behave in the same manner as far as their lipid content is concerned when incubated for varying periods of time, (2) the addition of pancreatic extracts to the liver suspensions of depancreatized dogs seems to nullify this difference in behavior, and (3) the pancreatic extract called "lipocaic" appears to act, though less efficiently, in the same manner as the more easily obtainable extract first used.

References

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Aspects of the Biologic Decay Periods of Sodium in Normal and Diseased Man[1]

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A knowledge of the duration of time for which a radioactive element is retained in the body has important significanee physiologically, in safety considerations, and in dosage calculations in tracer studies and isotope radiation therapy. The biologic decay-life of sodium in man can be determined satisfactorily with the long half-life Na^{22} ($T_{\frac{1}{2}} = 3$ yrs) but not with Na^{24} ($T_{\frac{1}{2}} = 14.8$ hrs). During the course of experiments using Na^{22} in man and designed for other purposes, data were obtained which indicated the rates of elimination of sodium. Na^{22} with an activity such that 10,000,000–17,725,000 disintegrations occurred per minute was injected into each subject. A daily blood serum concentration of Na^{22} was determined for from 30 to 60 consecutive days. All samples of urine were collected separately and the Na^{22} excretion determined for each. The subjects consisted of 4 control subjects free from cardiovascular and renal disease, 6 subjects with chronic congestive heart failure (2 were slowly improving, 2 rapidly improving, and 2 becoming worse), and 2 subjects with chronic glomerular nephritis of the nephrotic type.

Since only the serum concentration of Na^{22} and the rate of urine excretion of the radioelement were measured, it was not possible to know the time required to excrete one-half of the injected Na^{22}, the biologic half-life period ($B_{\frac{1}{2}}$), *per se*. Therefore, it was necessary to introduce the following terms:

(1) $C_{\frac{1}{2}}$ = time required to reduce the serum concentration of Na^{22} to one-half the value obtained at any time after equilibrium of distribution has been reached.

(2) $U_{\frac{1}{2}}$ = time that would be required to eliminate one-half of the administered Na^{22} if it were being excreted only in the urine at the rate observed.

The results are briefly summarized in Table 1. It can be seen that with the exception of Subject No. 2 the $C_{\frac{1}{2}}$ periods were less than the $U_{\frac{1}{2}}$. This is to be expected because of the influence of other factors, such as other avenues of sodium excretion, shifts of sodium within the sodium compartments of the body, and variations in the volume of these compartments. The subjects with chronic congestive heart failure and those with chronic glomerular nephritis of the nephrotic type had $C_{\frac{1}{2}}$ and $U_{\frac{1}{2}}$ periods which were much longer than those of the controls (Table 1). Sodium and water diuresis in the subjects whose congestive heart failure rapidly improved resulted in a definite shortening of the $C_{\frac{1}{2}}$ and $U_{\frac{1}{2}}$ periods, the times be-

TABLE 1

Subject No.	$C_{\frac{1}{2}}$*	$U_{\frac{1}{2}}$†	Days of continuous observation	Weight change (lb)
		Control		
1	14	30	62	− 3.5
2	13	9	22	−14
3	12	42	45	−11
4	14	34	65	+ 2.3
Mean	13.3	28.8	48.5	− 6.6
		Congestive heart failure (Slowly improving)		
5	40	60	35	−18
6	42	72	46	− 7
Mean	41	66	40.5	−12.5
		Congestive heart failure (Rapidly improving)		
7	13	26	62	−29
8	28	33	58	−17
Mean	20.5	29.5	60	−23
		Congestive heart failure (Slowly becoming worse)		
9	24	72	68	+17
10	30	48	58	− 5.5
Mean	27	60	63	+ 5.8
		Chronic glomerular nephritis (Nephrotic type)		
11	58	660	45	+15
12	54	366	71	−86
Mean	56	513	58	−35.5

* Time in days required for the serum Na^{22} concentration to reach one-half at any time after equilibrium of distribution.

† Time in days required for one-half of the total Na^{22} injected to be eliminated by the urine.

[1] Aided by a grant from the Life Insurance Medical Research Fund, the War Contract No. W–49–007–MD–389, the Helis Institute for Medical Research, and the Mrs. E. J. Caire Fund for Research in Heart Disease.