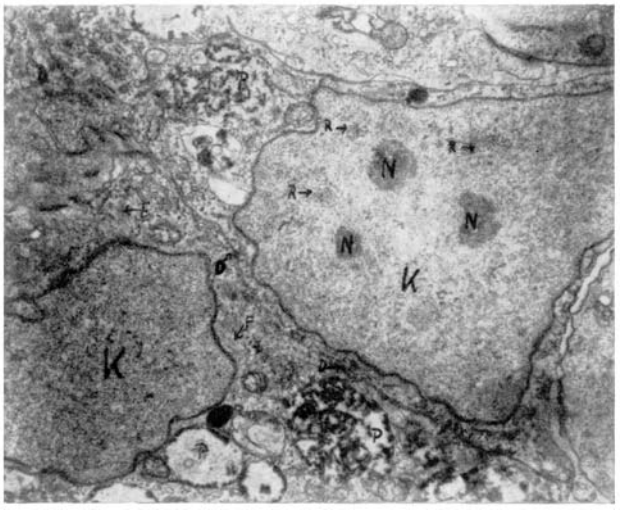

Fig. 1. Thymus der Ratte drei Tage nach Röntgenganzkörperbestrahlung (300 R). Zwei epitheliale Retikulumzellen mit phagocytierten Zellresten (P). D = Desmosomen, F = fibrilläre Strukturen, K = Kern, N = Nukleolus, R = ribosomenartige Partikel. Vergr. 12000:1.

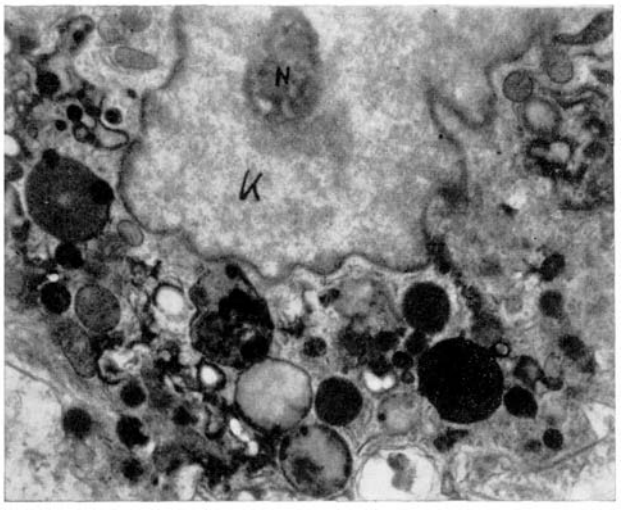

Fig. 2. Thymus nach Bestrahlung (300 R). Mesenchymale Retikulumzelle mit zahlreichen phagocytierten Zellresten im Cytoplasma. K = Kern, N = Nukleolus. Vergr. 14400:1.

Lymphocytenkerne identifiziert werden können. Sehr häufig kann man an der Peripherie dieser Kernreste stark osminophile Substanz von tröpfchenartiger Form erkennen.

Somit ist anzunehmen, dass der Abbau der phagocytierten Lymphocyten bei den epithelialen und mesenchymalen Retikulumzellen verschieden ist. Eine ausführliche Darstellung wird an anderer Stelle erfolgen.

Summary. Part of the lymphocytes of the thymus were phagocytized by epithelial and mesenchymal reticular cells in rats after X-ray irradiation of the whole body. The intracellular decomposition is obviously brought about by the two cellular forms in a different way. Pearl-string-like structures – probably nucleoproteids – were found in the cytoplasma in the case of the epithelial cells. On the other hand, numerous cytoplasma inclusions of different size, which are evidently reduced lymphocytic nuclei, could be observed in the case of the mesenchymal cells.

H. KLUG

Labor für Elektronenmikroskopie, Strahlenbiologische Abteilung, Charité-Geschwulstklinik, Berlin (DDR), 15. Oktober 1964.

Lipoprotein Lipase Activity in Normal Human Adipose Tissue and its Absence in Human Lipomas

Heparin, administered parenterally, has been shown to activate or release into the circulation an enzyme which hydrolyzes the triglyceride moiety of low density lipoproteins. KORN[1] has demonstrated this enzyme to be different from pancreatic and gastric lipases and has suggested the name 'lipoprotein lipase' (LPL) for it. It has been demonstrated that adipose and myocardial tissues of several animals contain large amounts of the enzyme[2]. Although ANGERVALL[3] and ENGELBERG[4] were unable to demonstrate LPL activity in acetone powder extracts of human adipose tissue, NESTEL and HAVEL[5] demonstrated the presence of the enzyme in slices of human subcutaneous and omental adipose tissue.

The human lipoma, a frequently occurring benign tumor composed of adipose tissue, arises most often in the subcutaneum and is morphologically indistinguishable from normal adipose tissue. GELLHORN and MARKS[6] reported the fatty acid composition and rate of oxidation of acetate to carbon dioxide in the lipoma to be similar to that of normal adipose tissue. However, they found the rate of incorporation of acetate into mixed lipids to be greater in the lipoma than in ordinary adipose tissue. The latter finding may explain in part the clinical observation that lipomas ordinarily do not regress and may grow in spite of progressive emaciation of the patient[7]. Since LPL has been implicated in the tissue uptake of plasma tri-

[1] E. D. KORN, J. biol. Chem. *215*, 1 (1955).
[2] E. D. KORN and T. W. QUIGLEY, J. biol. Chem. *226*, 833 (1957).
[3] G. ANGERVALL, Acta physiol. scand. *48*, 71 (1960).
[4] H. ENGELBERG, J. Lipid Res. *2*, 169 (1961).
[5] P. J. NESTEL and R. J. HAVEL, Proc. Soc. exp. Biol. Med. *109*, 985 (1962).
[6] A. GELLHORN and P. A. MARKS, J. clin. Invest. *40*, 925 (1961).
[7] H. T. KARSNER, *Human Pathology* (J. B. LIPPINCOTT Co., Philadelphia 1942).

glycerides[8,9], it was of interest to determine what difference, if any, could be found between LPL activity in human lipomas and ordinary adipose tissue.

Materials and methods. Tissues: Subcutaneous and omental adipose tissue was obtained from individuals within 24 h of post mortem, whereas lipomas were obtained at surgery. Tissues were stored at – 20°C for a week to several months before use in the studies reported here. Tissue slices, approximately 0.5 mm thick, weighing 100–200 mg, were made with a Stadie-Riggs microtome. Lipoma homogenates were made by homogenization in a glass-teflon, Potter-Elvehjem homogenizer using 1 Vol of tissue to 2 Vol of cold 0.025 *M* ammonia.

Assay system: The method of KORN[10] was used to measure LPL activity. The incubation medium contained bovine albumin (Fraction V, Nutritional Biochemicals, 4%), ammonium sulfate (0.05 *M*) and a triglyceride emulsion (Lipomul, i.v., 0.3% triglyceride) which was previously activated with human plasma and washed with 0.9% sodium chloride solution. A total of 4.0 ml of incubation medium was employed and samples of 0.8 ml were removed following 0, 30 and 60 min of incubation at 37°C in a Dubnoff, shaking incubator. The samples were extracted and assayed for unesterified fatty acids (UFA) by the method of DOLE[11].

Results and discussion. The results of nine experiments are presented in the Table. Lipase activity is expressed as the number of microequivalents (μEq) of UFA produced per g of tissue per h. Lipase activity was determined for the four human lipomas along with human subcutaneous and omental adipose tissue whenever possible. In most cases, the lipolytic activity of chicken subcutaneous adipose tissue was determined simultaneously. The mean lipolytic activity for chicken subcutaneous adipose tissue from seven animals was found to be 24 ± 13 (standard error of the mean) μEq of UFA/g/h. Samples of human subcutaneous adipose tissue from four individuals showed a mean activity of 22 ± 10 μEq UFA/g/h. Human omental adipose tissue from one individual showed somewhat less activity with 15 ± 3 μEq UFA/g/h. The mean activity for nine experiments, in which human lipomas from 4 individuals was investigated, was found to be 2 ± 2 μEq UFA/g/h. It can be seen that no activity was observed in five experiments while a small amount of activity was observed in four experiments. Some portions of Lipomas 3 and 4 were exceptionally well vascularized. In investigating as much of the tissue as possible, some samples of these lipomas were more vascular than others. It appeared that the samples from vascularized areas of the tissue yielded the small amount of activity observed. This observation may be explained on the basis of the LPL content of blood vessel walls reported by ROBINSON et al.[12].

One possibility which might explain the lack of LPL activity noted with the lipomas would be the presence of an inhibitor(s) of the enzyme. To test this hypothesis, 0.4 ml of lipoma homogenate was added to the medium in which human omental adipose tissue was incubated. Triplicate determinations of the lipolytic activity of omental adipose tissue with and without the addition of homogenates of lipomas 1 and 3 were determined in two experiments. With the addition of lipoma 1 homogenate, a mean activity of 12 ± 0 μEq UFA/g/h was observed for omental adipose tissue. Similarly, with the addition of lipoma 3 homogenate, a mean activity of 22 ± 2 μEq of UFA/g/h was observed. When these values are compared to their respective controls (experiments 1 and 2, Table), it can be seen that no reduction in activity was found. It appears, therefore, that lipoma homogenates contain no inhibitors of LPL activity.

Although direct evidence for the absence of LPL in human lipomas is lacking in these experiments, the possibility presents itself. If the lack of LPL activity in the human lipoma is responsible for the lack of regression of the lipoma in the face of emaciation of the host, LPL may be involved in the reduction of triglyceride content of adipose tissue as well as in the uptake of plasma triglyceride[13].

Lipoprotein lipase activity – tissue slices

Tissue sample No.	Number of vessels	Mean activity (μEq UFA/g/h)	
Chicken subcutaneous adipose tissue			
1	2	16	
2	2	24	
3	3	16	Mean activity = 24 ± 13
4	2	13	
5	2	46	
6	3	16	
7	5	37	
Human subcutaneous adipose tissue			
1	3	25	
2	7	34	Mean activity = 22 ± 10
3	3	10	
4	3	17	
Human omental adipose tissue			
1	3	17	Mean activity = 15 ± 3
2	3	12	
Human lipomas			
1	6	0	
2	7	1	
	10	0	
3	3	0	Mean activity = 2 ± 2
	3	6	
	2	0	
4	3	0	
	3	5	
	2	2	

Résumé. Il a été trouvé que des spécimens de tissus souscutanés humains et des tissus adipeux omentaux hydrolyseraient un substrat triglycéride activé avec du plasma humain quand incubés dans un medium contenant de l'albumine bovine et du sulfate d'ammonium. Les spécimens de lipomes humains n'ont pas montré d'activité lipolytique signifiante. Les homogénates de lipomes n'ont pas diminué l'activité lipolytique des spécimens de tissus adipeux humains.

F. N. MARSHALL

Biomedical Research Department, Pitman-Moore Division of the Dow Chemical Company, Indianapolis (Indiana USA), July 29, 1964.

[8] M. RODBELL, J. biol. Chem. *235*, 1613 (1960).
[9] A. BEZMAN, J. M. FELTS, and R. J. HAVEL, Clin. Res. *10*, 84 (1962).
[10] E. D. KORN, *Methods of Biochemical Analysis* (D. Glick, Ed., 1959).
[11] V. P. DOLE, J. clin. Invest. *35*, 150 (1956).
[12] D. S. ROBINSON, P. M. HARRIS, and C. R. RICKETTS, Biochem. J. *71*, 286 (1959).
[13] Acknowledgment: The author wishes to thank Dr. T. EVANS, Methodist Hospital, Indianapolis (Indiana), for some of the tissues used in this study.