Blood Flow and Metabolic State of the Adipose Tissue

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It was intended to observe whethere metabolic state of the fatty tissue was reflected in the blood flow through the tissue.

Methods: (A) The blood flow through the fatty tissue (F.B.F.) was determined with ^{133}Xe local clearance according to Larsen and Lassen. The thickness of the fatty tissue was measured with a needle inserted vertically to the fascia of the abdominal muscles and/or at the other sites of the body. Materials included five diabetes mellitus, three essential hyperlipemia, four patients with long-tern steroid therapy and eleven obesity. (B) In relation between glucose tolerance and G.B.G., special observations were carried out on four patients with long-term steroid therapy (two the diabetic due to steroid, two the non-diabetic). The procedure of glucose tolerance was as the following: fifteen gm of glucose mixed with 10μCi of glucose-^{14}C (U) was intravenously injected, and then for three hours at interval of 30 minutes the blood sugar levels and expired $^{14}CO_2$ were measured.

Results: (1) In a patient of essential hyperlipemia, F.B.F. was different from the parts of the body: fatty tissue in abdomen, buttock, xanthoma. This suggested that F.B.F. was not always same at the sites of the fatty tissue. (2) Although F.B.F. in the abdominal fatty tissue was decreased with increasing thickness of the fatty tissue, this relation was not statically significant. (3) Little relationship was seen between F.B.F. and thickness of the fatty tissue, particularly in the diabetic and/or patients with long-term steroid therapy. (4) Comparable observations were made in four patients with the same thickness (28mm) of the abdominal fatty tissue, two of whom were steroid-diabetes and the other two were the non-diabetic. F.B.F. in the diabetic was 6.6 ml/100 g/min. and that in the non-diabetic was 3.2 ml/100 g/min. The glucose tolerance curve in the steroid-diabetes was poor, and the expired $^{14}CO_2$ for three hours of the diabetic was about half of the non-diabetic. The adipose tissue of the steroid-diabetes was probably at lipolytic state.

Conclusions: (1) There was little reverse relationship between F.B.F. and thickness of the adbominal fatty tissue in the heterogenous metabolic diseases; that was in disagreement with the result of Larsen & Lassen whose observations were on hogenous obesity. (2) It seems likely that F.B.F. increases at lipolytic state of the fatty tissue.

Fatty Acids Metabolism in Obese and Hyperlipidemic Mice Induced with Goldthioglucose

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In a previous study, we reported the characteristic abnormality of fatty acids metabolism by whole blood cells and platelets from human arteriosclerotic hyperlipidemic subjects. There was a striking increase of ^{14}C-incorporation from 1-^{14}S-acetate into oleic acid, in contrast to control's.

In this report, we studied fatty acid metabolism in Goldthioglucose treated mice. Mice used in this report were CBA strain, weighing 20-25 cm (control) and obese and hyperlipidemic ones induced with Goldthioglucose (GTG).

As metabolic precursors, 1-^{14}C-acetate, ^{14}C-palmitic acid (U), 1-^{14}C-linoleic acid or 1-^{14}C-γ-linolenic acid was a administered intraperitoneally. At intervals of 1, 4 and 24 hours after administration, animals were bled to death and liver was removed for analysis. Liver lipids extracted were separated by thin layer chromatography of silicic acid. Finally, fatty acid methylesters were obtained from each major lipid fractions and they were separated by gas liquid chromatography. Peaks of each fatty acids were trapped separately and radioactivity was determined, with liquid scintillation counter (Shimadzu LSG 2).

Results are summerized as follows, I. When 1-^{14}C-acetate was administered, 1) More radioactivity incorporation was observed in total fatty acids per gram liver of GTG than in that of control at 1 and 4 hrs. after administration. (2) As to fatty acids synthesized in GTG lier, palmitic, palmitooleic, stearic and oleic acids increased and particularly, oleic acid was prominent at 4 hrs. 3) The percentage of radioactive triglycerides in total lipids was about 75% in both series at 1 hrs. But after 4 hrs., it decreased rapidly in control, on the contrary, stationary in GTG. II. When ^{14}C-palmitic acid (U) was administered, declining curve of radioactivities showed different courses in both series, that is, radioactivities in palmtic acid and total fatty acids and triglyceride were diminished quickly in control group, on the other hand, they were slowly decreased in GTG. III. 1-^{14}C-linoleic acid was administered, 10% of radioactivity of total fatty acids was detected in arachidonic acid in both series at 24 hrs. after administration and a ratio of ^{14}C incorporated into arachidonic acid against to ^{14}C detected in linoleic acid was greater in GTG than in control. IV. When 1-^{14}C-γ-linoleic acid was administered, 50% of radioactivity of total fatty acids was recovered in arachidonic acid in both series at 24 hrs. after administration and a ratio of radioctivity detected in arachidonic acid against to ^{14}C recovered in γ-linolenic acid was much greater in GTG than in control.

These data demonstrated that, compared with control series, synthesis of fatty acids and conversion's pathway to arachidonic acid from precursors were enhanced, on the other hand, triglyceride discharge from live might be disturbed in GTG's ilver. Moreover, it is interesting to find out that synthetic patterns in GTG liver were similar in whole blood cells and platelets from hyperlipidemic human subjects, at oletic acid synthesis and Wakil's chain lengthening pathway of fatty acid synthesis.

Analysis of Long Chain atty Acids Biosynthesis in Acute Irradiation Injury Radio-Gas-Liquid Chromatography

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With the purpose to elucidate how the bodily irradiation would alter the biosynthesis and decomposition of long chain fatty acids in vivo we performed a series of experiments by the radio-gas-liquid chromatogaphy.

Experimentals: The animals used were mice and non-irradiated one served as the contro group. To the test animals the whole body irradiation of 800R was given, and 40μCi of ^{14}C-acetate was injected intravenously immediately after the irradiation. These animals were sacrificed by bleeding at the intervals of 1, 3, 6, 12, 24, and 48 hours after the injection. Then the extraction of lipids from the livers of these animals was carried out by Folch's method, and for the methylation of lipids the diazomethane method was employed. Analysis of fatty acid were carried on Radio-gas liquid chromatography (Shimazu RID-2C anthracen scintillation type and Shimazu GC-IC).

Result: In the test group, the activity of each fatty acid reaches its peak one hour after the injection of ^{14}C-acetate, but in the control