THE METABOLISM OF LIVER TISSUE FROM RATS OF DIFFERENT AGES.

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Falk, Noyes and Sugiura (1) have studied the lipase or ester-hydrolyzing actions of aqueous extracts of the whole rat at different ages covering the life cycle from 3 days before birth until the age of 3 years, and presented the results in the form of curves. They found that the curves for the embryo and youngest rats approached those given by the Flexner-Jobling carcinoma, changing with the age of the rat to the type characteristic of the adult rat and appearing to revert again to some extent to the embryonic type for the oldest rats. Similar experiments with the protease actions of the extracts of whole rats of different ages on three protein preparations did not give differences similar to those found for the lipase actions.

Warburg (2) and his associates as a result of an extensive study of metabolism of tissues consider that they can detect four distinct types, namely; normal resting tissue with a slight anaerobic glycolysis and a high respiratory rate; embryonic tissue with a high respiratory rate and a high anaerobic but a low aerobic glycolysis; malignant tumor tissue with a low respiration and a high aerobic and anaerobic glycolysis; benign tumor tissue with the same type of metabolism as malignant tissue but with less active glycolytic function. Murphy and Hawkins (3) extended Warburg's experiments and concluded that a classification of tissues on the basis of the type of metabolism does not correspond to the biological groupings but that a classification (4) could be made by measuring the anaerobic glycolytic function of the tissues.

The present experiments were undertaken to determine whether there is any difference in the metabolism of the livers of rats of different ages. The livers of rats in 3 groups were used; Group 1, rats 22

months old; Group 2, adult rats approximately 1 year old; Group 3, rats varying in age from 3 to 21 days old.

The method used was that devised by Warburg, the details of which are described by him in his publications (2) and also by Murphy and Hawkins (3). The results of the experiments are given in Table I.

The results in Table I show that there is no difference in respiration and aerobic glycolysis in the livers of rats of different ages. There is practically no anaerobic glycolytic activity in the livers of the old and normal adult rats, but there is a certain amount in the livers of the

TABLE I.

Average for group	No. of animals	Q_{O_2}	$Q_{CO_2}^{O_2}$	$Q_{CO_2}^{N}$
1	15	−11.5	1.0	0.8
2	12	−9.4	0.4	2.0
3	15	−13.2	0.0	5.7

Q_{O_2} = Respiration. C.mm. of oxygen consumed per hour by 1 mg. per dried weight of tissue.

$Q_{CO_2}^{O_2}$ = Aerobic glycolysis. C.mm. of carbon dioxide produced by glycolysis per hour by 1 mg. per dried weight of tissue.

$Q_{CO_2}^{N}$ = Anaerobic glycolysis. C.mm. of carbon dioxide produced per hour by 1 mg. per dried weight of tissue when respiration has been checked by potassium cyanide.

very young rats. This would mean according to Warburg's grouping that the livers of young rats have the same type of metabolism as embryonic tissue. These results would seem to substantiate the conclusions of Hawkins that the glycolytic activity of a tissue is a function of the growth rate, as the growth rate of the livers of the young rats would be greater than that of normal adult or old rats.

Accepting the conclusion that the glycolytic activity of a tissue is a function of its growth rate, these results are in agreement with those of Falk and his associates who found that their curves for embryo and young rats approached those for the Flexner-Jobling tumor.

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