

**THE EFFECT OF FOOD RESTRICTION ON THE ACTIVITY
OF HEPATIC ARGINASE OF RAT**

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The effect of a diet low in both protein and calorie on the activity of hepatic arginase was studied in adult mature rats. The activity of the enzyme increased and the liver nitrogen decreased after 10 and 20 days, indicating that protein was used as a source of energy. The subsequent decrease in the liver enzyme activity and liver nitrogen after 31 days indicate conservation of protein in the liver. The suppression of this pathway means that not only the liver but also the body as a whole benefits from the more economical use of amino acids when restricted amount of food is consumed.

INTRODUCTION

Many investigators have studied the effects of diets deficient in protein or energy on the enzyme concentration in the tissues, particularly liver tissue. Generally the results of such studies indicate a depressing effect of such deficiencies on the concentration of many enzymes. The level of protein in the diet has direct effect on the activity of urea cycle enzymes. High protein diets raise the arginase level (Miller, 1950; Mandelstam and Yudkin, 1952; Ashida and Harper, 1961) and low protein diet or adrenalectomy, which decrease protein catabolism, causes a decrease in the activities of most of the urea cycle enzymes (McLean, 1961 and Freedland, 1964). On the other hand these enzymes were more active in rats which were starved (Schimke, 1962).

Since the formation of urea is a vital segment of protein catabolism in the mammals, this stage provides a natural place to look for metabolic

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Arginase Activity :

The specific activity of arginase in *ad-libitum* and restricted groups killed after 10, 20 and 31 days was (91.2 and 134.2) (94.7 and 115.4) and (90.4 and 82.0) respectively. Significant differences were noticed only after 10 and 20 days. The specific activity reduced after 31 days but the difference was non-significant, however the specific activity in the restricted group at 31 days was significantly ($P < 0.001$) lower than the restricted group at 10 days.

The total activity in the restricted animals increased significantly ($P < 0.047$) compared with the rats fed *ad-libitum* for 10 days. No significant difference was observed between restricted and *ad-libitum* groups after 20 and 31 days. The total activity in the livers of rats fed restricted diet for 31 days reduced significantly ($P < 0.047$) as compared with the restricted group at 10 days.

It is apparent from the results that rats on restricted diet showed an increase in the activity of the enzyme with a decrease in liver nitrogen after 10 and 20 days, indicating that protein was used to provide energy. When the food restriction was prolonged to 31 days the activity of the enzyme did not reduce significantly which could be due to high variation in the results but the liver nitrogen indicates conservation of nitrogen in the liver as there was no significant difference in nitrogen contents of livers of the rats fed *ad-libitum* or restricted diet. The animals adapt to reduced food intake and need less energy to maintain their body weights so do not oxidise protein for energy (Khan and Bender, 1974).

There are some observations on the effect of protein content of the diet on the activity of certain liver enzymes. Schimke (1962) has shown that on protein free diet the activity of the most of the urea cycle enzymes is reduced. Mariani *et al.* (1963) observed that a low protein diet causes an increase in the activity of amino acid activating enzymes in the liver. It was postulated that amino acid activating enzymes in the liver are regulated by the size of free amino acid pool. When the pool decreases the enzymes increase in activity and so does the fraction of free amino acid directed towards protein synthesis.

The adaptive changes in the enzyme activity must presumably be that a free amino acid molecule, entering liver pool, whatever its origin, has a larger chance of being incorporated in protein and a smaller chance of being degraded to urea. The end result would be an increased economy or re-utilization of amino acids in the liver. Since urea is formed only in the liver, partial suppression of this pathway means that not only the liver, but the body as a whole benefits from this more economical use of amino acids.

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