

LETTER TO THE EDITOR

THE EFFECT OF PROTEIN DEFICIENCY ON THE ACTIVITY OF
GAMMA-GLUTAMYL TRANSPEPTIDASE IN THE
SMALL INTESTINE OF RATS

Sir,

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The gamma-glutamyl cycle has been suggested to be one of the pathways for the absorption of amino acids (5). We wish to report here the effect of protein deficiency on the activity of gamma-glutamyl transpeptidase (GTP), the key enzyme of gamma-glutamyl cycle.

The albino rats (Wistar) weighing 50-55 g were used. The age of male rats was 28-30 days and those of female 35-38 days. The animals divided into four groups, each consisting of 7 male and 7 female rats, were fed *ad libitum* following diets : group C, casein diet for 28 days; Group PF, protein-free diet for 28 days; group M, maize diet for 28 days; group PF-C, protein-free diet for 28 days and then casein diet for 32 days. The composition of diets is given in Table I. The protein content of the casein and maize diets, as estimated by micro-kjeldhal method (1), was 15.4 and 3.0 percent, respectively.

TABLE I : Composition of diets (g/100 g diet).

Ingredients	Casein diet	Maize diet	Protein-free diet
Edible casein ^a	20	—	—
Maize flour	—	27	—
Groundnut oil	8	8	8
Salt mixture ^b	4	4	4
Vitamin mixture ^b	1	1	1
Cellulose	1	1	1
Starch upto	100	100	100

^aEdible casein contained 12.06% nitrogen.

^bSalt mixture (USP XIX) and vitamin mixture were prepared according to AOAC (1). Vitamin A, 2000 IU; vitamin D, 200 IU; choline chloride, 200 mg/100 g diet; all were separately mixed in the diet.

After dietary treatments the animals were fasted overnight and then sacrificed by decapitation. The small intestine was cut longitudinally, washed with normal saline and then homogenized at 4°C in a medium containing 0.15 M potassium chloride, 0.001 M magnesium chloride and 0.005 M mercaptoethanol. The homogenate was spun at 3000 rpm at 0°C for 15 min, and gamma-glutamyl transpeptidase assayed (6) in the supernatant. The unit of enzyme is defined as the amount that catalyzes the release of one μmole of p-nitroaniline per min from L-gamma-glutamyl-p-nitroanilide under standard conditions at 37°C. The protein content of the homogenate was determined by the method of Lowry *et al.* (4).

The body weights of rats decreased by about 30 to 40 percent when they were fed for 28 days the maize-or protein-free diet. The body weights of rehabilitated protein-deficient rats (PF-C group) were almost similar to those of normal rats fed the casein diet (group C).

The activity of GTP was higher in rats fed protein-deficient diets than in those fed control diet (Table II). The increase in the activity of GTP was greater in rats fed the protein-free diet than in those fed the maize diet. Hence, GTP activity increased with the severity of protein-deficiency.

TABLE II : Activity of gamma-glutamyl transpeptidase (units/g protein) in the small intestine of rats given different dietary treatments.

Groups	Male	Female
C	16.1±0.6 ^a	26.3±1.5 ^a
PF	31.4±5.0 ^b	35.2±0.6 ^b
M	31.3±1.9 ^b	30.1±1.2 ^c
PF(C)	24.7±1.9 ^c	31.4±1.9 ^c

Values are mean \pm SEM for 7 animals.

The values with different superscripts in vertical rows are significantly different ($P < 0.05$), as tested by Duncan's new multiple range test.

The absorptive capacity of intestinal cells is known to be higher in protein-deficient than in normal rats (2,3). Increased activity of GTP might be of some importance in augmenting the absorptive capacity of intestinal cells during protein deficiency. The elevation in the activity of GTP in protein-deficient rats was a temporary adaptation to the conditions that resulted in reduced intestinal cell population (2), as the rehabilitation of

protein-deficient rats using a casein diet, decreased the augmented activity of GTP in the small intestine. Thus, the metabolic functions in the intestine adapt to protein deficiency by increasing the activities of certain enzymes in the epithelial cells.

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