Note

Changes in Plasma and Tissue Free Amino Acids of Rats Fed Excess Glycine Diets

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The glycine concentration was extremely increased and the contents of threonine and alanine were decreased in the blood plasma and tissues of rats fed the excess glycine diets.^{1,2)} However, the amino acid concentrations in the plasma and tissues were generally unchanged by the supplementation of L-arginine and L-methionine to the excess glycine diet compared with those of rats fed excess glycine, though growth depression by excess glycine was prevented by the addition of both amino acids.^{1~5)} Glycine levels in the plasma and tissues showed no difference between 3 and 9 hr after the final feeding of 5 to 6 g of excess glycine diets per 100 g of body weight.²⁾ In the present paper, the changes in the concentrations of free amino acids in the plasma and tissues were determined at 2 and 24 hr after the final feeding.

Materials and methods were as follows. Male rats of the Donryu strain weighing about 60 g fed a 25% casein diet for 3 to 4 days were divided into 3 dietary groups of 4 to 5 rats each. These groups were fed the following diets; 10% casein diet (10C), 10C containing 7% glycine (10C7G) and 10C7G supplemented with 1.4% L-arginine and 0.9% L-

methionine similar to the amounts contained in a 30% casein diet (10C7GArgMet). The composition of the 10C diet (control) was as described previously.¹⁾ Animals were fed *ad libitum* these diets for 14 days. On the 15th day, rats were given 5 g of each diet per 100 g of body weight at around 9 to 11 a.m. after fasting for 12 hr. At 2 and 24 hr after the final feeding, animals were decapitated and immediately the blood was collected in a test tube containing heparin. The liver was removed after perfusing with 0.9% NaCl and homogenized with 4 parts of ice-cold 0.1 M phosphate buffer (pH 7.4). The thigh muscle was removed and homogenized with 10 parts of 6% sulfosalicylic acid. These samples were pooled from each group for the analysis of free amino acids with a JEOL Co., Ltd., type JLC-5AH amino acid analyzer as reported previously.²⁾

Changes in the body weight gain, food intake and liver weight (Table I) of rats fed *ad libitum* the test diets, and the concentrations of free amino acids in the blood plasma, liver and muscle at 2 hr after the final feeding (Figs. 1, 2 and 3) were similar to the results of previous reports.^{1~5)} In the earlier work,²⁾ amino acid contents in the plasma and tissues of animals given excess glycine diets showed generally no difference between 1 and 7 hr after feeding. However, plasma glycine concentrations of the 10C7G and 10C7GArgMet groups at 24 hr in this experiment were much lower than those at 2 hr, though still high compared with that of the control group at 24 hr (Fig. 1). Serine contents in the plasma of each group at 24 hr were much higher than those at 2 hr. The concentrations of liver amino acids at 24 hr in each group were in general much greater than those at 7 hr in the previous work²⁾ and showed almost no difference between the excess glycine and control groups except in the glycine content of the 10C7G group which was still high compared with that of the control (Fig. 2). The contents of muscle amino acids at 24 hr were lower than that at 7 hr reported previously,²⁾ and the glycine concentrations, especially, of excess glycine groups nearly approached that of the level of the control

TABLE I. BODY WEIGHT GAIN, FOOD INTAKE AND LIVER WEIGHT OF RATS FED THE 10% CASEIN DIETS CONTAINING 7% GLYCINE WITH OR WITHOUT L-ARGININE AND L-METHIONINE FOR 14 DAYS

Male rats having about 60 g of body weight were fed the 10% casein diet (control), the 10% casein diet containing 7% glycine (10C7G) and the 10C7G diet supplemented with 1.4% L-arginine·HCl and 0.9% L-methionine (10C7GArgMet) for 14 days. On the 15th, animals were fasted for 12 hr and killed at 2 and 24 hr after the final feeding of 5 g of each diet per 100 g of body weight.

Dietary group (symbol)	Body weight gain (g/14 days)	Food intake (g/14 days)	Liver weight (g)
10C	50.8 ± 6.0 ^{1)a}	169.7 ± 9.7 ^a	4.11 ± 0.23
10C7G	13.8 ± 4.5 ^b	108.2 ± 8.1 ^b	3.62 ± 0.38
10C7GArgMet	58.7 ± 6.7 ^a	164.1 ± 7.3 ^a	4.77 ± 0.55

¹⁾ Mean ± SE. Significant difference between the superscripts of *a* and *b* at *P* < 0.01.

FIG. 1. Plasma Aminogram of Rats Fed the 10% Casein Diets Containing 7% Glycine with or without L-Arginine and L-Methionine for 14 Days.

Treatments of rats are as shown in Table I. Analytical values were obtained from groups of each 4 to 5 rats pooled. Dotted lines indicate the aminogram of the control group.

FIG. 2. Liver Aminogram of Rats Fed the 10% Casein Diets Containing 7% Glycine with or without L-Arginine and L-Methionine for 14 days.

Explanations are as shown in Table I and Fig. 1. Arginine was not detected under the present analytical condition.

group.

The above results indicate that enhanced glycine concentrations in the plasma and tissues of rats fed excess glycine falls only by starvation for about 24 hr, and the addition of arginine and methionine to the 10C7G diet is inclined to accelerate the metabolism of excess glycine. The latter possibility may be supported by increased incorporations of U- 14 C-glycine into body lipids and L-(U-

14 C-leucine⁴) into tissue protein,⁵) and the enhanced activity of liver glycine cleavage enzyme⁶) in the 10C7GArgMet group. However, the levels of glycine in the plasma and tissues may be not directly related to the preventive effect of the supplementation of arginine and methionine on the growth-depression by excess glycine, because rats fed glycine in excess with or without both amino acids kept high levels of glycine in the plasma and

FIG. 3. Muscle Aminogram of Rats Fed the 10% Casein Diets Containing 7% Glycine with or without L-Arginine and L-Methionine for 14 days.

Explanations are as shown in Table I and Fig. 1.

tissues in the 7 hr after the final feeding.²⁾

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