Rate of Absorption and Formation of Liver Glycogen by Glycine.* (19890)

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The rate of absorption of glycine from the gastrointestinal tract of the white rat has been studied by Wilson and Lewis(1), Wilson (2,3), and Butts, Dunn, and Hollman(4). Application of the Van Slyke amino nitrogen method gave rates varying from 50 to 75 mg per 100 g per hour for free glycine and from 30 to 90 mg for the half sodium salt.

Wilson and Lewis(1) were unable to find any increase in liver glycogen after feeding glycine and Wilson(2) found a slight increase in 3 hours and substantially the same value in 16 hours. Butts *et al.*(4) reported a definite increase after 8 hours while Stöhr(5) found variable results. Mackay, Wick, and Carne (6) found that glycine formed glycogen rather slowly, the maximum value was 2.36% after 14 hours and a smaller peak occurred at 4 hours. Olsen, Hemingway, and Nier(7) fed glycine with the carboxyl carbon labeled with the stable isotope, to mice and found the peak of glycogen formation to be at 14 hours. Preliminary to a study of the effect of cortisone on liver glycogen formation following the feeding of glycine we have investigated its rate of absorption and capacity to form liver glycogen.

Experimental. White rats, weighing 100 to 150 g, fasted for 48 hours, were fed the amino acid by stomach tube. Glycine, dissolved in water, was administered at levels of 100, 150, 300 and 450 mg per 100 g of body weight for 0.5, 1, 2, and 3 hour absorption periods, respectively. For the glycogen studies for periods longer than 3 hours 450 mg per 100 g was used.

At the end of the absorption period the animals were sacrificed and the entire gastrointestinal tract and the liver removed. The gastrointestinal tract was ground in a Waring blendor with 50 ml of a 10% aqueous solution of trichloracetic acid, the extract filtered with suction through a Celite pad and aliquots of the filtrate taken for analysis. The glycine was determined by the specific method of Alexander, Landwehr, and Seligman(8), all the absorption results are corrected for the loss of 3.6% that occurred in the procedure. Confirmatory values in excellent agreement with the colorimetric values were obtained by the amino nitrogen method of Pope and Stevens (9) which we have used previously in similar studies(10). The formation of liver glycogen was followed using the method of Good, Kramer, and Somogyi(11). The glycogen values for periods of time longer than 3 hours are averages of determinations on from 4 to 6 animals.

TABLE I. Rate of Absorption of and Glycogen Formation by Glycine.

No. of animals	Time, hr	Rate, mg/100 g/hr	Glycogen, %
6	.5	96.9 ± 6.6*	.34†
8	1	111 ± 8.8	.53
6	2	102.5 ± 7.1	.29
6	3	94 ± 4.9	.46
Avg 26		102.1 ± 6.8	

* Stand. dev.

† The glycogen content of livers of 12 control rats averaged .04%.

Glycine was absorbed (Table I) at a faster rate than reported by Wilson and Lewis(1) and somewhat faster than found by Wilson (3) after a 2-hour absorption period. The rate is approximately the same as reported by Wilson(3) for the half sodium salt, we conducted several experiments with the half sodium salt and found its rate of absorption to be somewhat less than that of the amino acid itself. Glycine is definitely glyconeogenic giving a peak value for liver glycogen at 14 hours (Fig. 1). A peak at one hour was noted, Mackay *et al.*(6) had found a peak at 4 hours, these early peaks may represent cortical stimulation.

Summary. The rate of absorption of gly-

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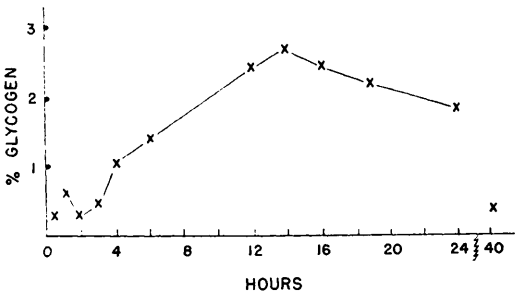

FIG. 1.

cine from the gastrointestinal tract of the white rat was found to be 102 g per 100 g of body weight per hour. The rate did not vary significantly during absorption periods of from 0.5 to 3 hours. Glycine is definitely glyconeogenic reaching a peak of glycogen production 14 hours after its administration. A smaller but definite peak was observed at one hour.

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Effect of High Fat Diet on the Potassium Deficiency Syndrome in the Rat.* (19891)

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Potassium deficiency has been studied by a number of workers and physiological and pathological effects of the deficiency have been described in rats, mice, dogs, and calves(1). In a previous experiment it was observed(2) that when rats were fed potassium deficient diets containing 5% and 20% corn oil, the resulting deficiencies were more severe when the diet contained 20% corn oil. Since these diets were fed *ad libitum*, the observed results could have been due to decreased feed and potassium consumption by the rats receiving the 20% corn oil diet. The experiment herein described was designed to determine if this were the case, or if the higher level of fat in the diet increased the rat's need for potassium.

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TABLE I. Percentage Composition of Diets.

	Diet 1	Diet 2	Diet 3	Diet 4
Sucrose	39.2	73.2	39.2	73.2
Casein*	19.3	19.3	19.3	19.3
Corn oil	20	5	20	5
Na and K free salts	2.5	2.5	2.5	2.5
$NaHCO_3$	.91	.91	.91	.91
$KHCO_3$	.08	.08	.08	1.28
Vitamins†	.053	.053	.053	.053
Choline	.1	.1	.1	.1
Cellu-flour‡	19	—	19	—

* GBI-vit. free.
† Vitamins—mg/kg of diet: thiamine, 3; riboflavin, 3; pyridoxine, 2; Ca-pantothenate, 20; inositol, 100; niacin, 20; para-aminobenzoic acid, 250; biotin, .1; folic acid, .25.
‡ Chicago Dietetic Supply House, Chicago, Ill.

Experimental procedure. Six 40-50 g weanling male albino rats of the Sprague-Dawley strain were placed on each of the 4 diets given in Table I. The salt mixture employed was that used by Grunert and Phillips(3) with sodium and potassium added as the bicar-