Nutritional Studies with the Guinea Pig. XI. Pyridoxine. (29228)

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A previous report(1) from this laboratory indicated a requirement of the guinea pig for pyridoxine. The present study is concerned with a determination of the quantitative requirement for the vitamin and the outstanding effects of its absence from the diet.

Methods. Male guinea pigs, Hartley strain, 3 to 5 days old, were fed a purified diet, No. 13(2) containing all the known essential nutrients except pyridoxine. Seven groups of animals, total number 91, were fed diets with pyridoxine additions ranging from zero to 8 mg/kg of diet. Most of the experiments were terminated at the end of 6 weeks but a few were continued to 8 weeks.

Results. In the group receiving no pyridoxine 15 of the 27 animals survived at the end of 8 weeks. Between the second and fourth weeks reductions in food intake and growth were observed (Table I). No scaly dermatitis was seen in any of the animals. One guinea pig had a deposit of red crusty material about the nostrils and another animal showed circling movements in the cage. On autopsy the chief symptoms observed were a gaseous distension of the cecum and large intestine, dryer than normal contents of the cecum, the presence of caked material on the wall of this organ which may have been undigested fat, a few animals had hemorrhages in the gastrointestinal tract, the sex organs were underdeveloped, the spleens pale, the adrenals enlarged, the livers of several animals were slightly fatty and some appeared to have necrotic areas.

Addition of as little as 1.0 mg of pyridoxine per kg of diet resulted in an improvement in growth and survival. With the addition of 1.5 mg/kg of diet there was 100% survival and close to maximal growth was achieved but the fur coat tended to be slightly rough. Maximal growth was obtained with the 2.0 mg level but the fur appeared to be not as sleek as that seen in the group at the 3.0 mg level.

Discussion. The paleness of the spleens observed in the pyridoxine-deficient animals suggests the possibility of an anemic condition as has been reported for the pig(3) and dog(4).

The requirement of the guinea pig for pyridoxine appears to be about the same as that of the chick(5) namely 2 to 3 mg/kg of diet but greater than that of the mouse (1.0 mg/kg(6)) and rat (1.0 mg/kg(7)). These apparent differences in requirement by the 2 groups of animals may possibly be related to the differences in protein levels of the diets, those of the guinea pig and chick studies being approximately 30% whereas those of the rat and mouse diets being 18%. It has been shown that the higher the protein level of the diet for the rat and mouse, the higher the pyridoxine requirement. However, the results of Miller and Baumann(8) indicated that 1.0 mg of pyridoxine was sufficient for the rat, even with protein levels of 60%.

Summary. The approximate requirement of the guinea pig for pyridoxine with a purified diet containing 30% protein is 2.0 to

TABLE I. Effect of Different Levels of Pyridoxine on Growth and Survival.

Pyridoxine (mg/kg)	No. of exp	No. of animals	No. of survivors	Avg wt (g) 2 wk	4 wk	6 wk	8 wk
None	5	27	15	143 ± 15	181 ± 39	218 ± 53	242 ± 38
1.0	1	5	5	146 ± 14	209 ± 28	283 ± 35	333 ± 29
1.5	1	5	5	146 ± 8	215 ± 16	309 ± 12	408 ± 18
2.0	4	20	20	148 ± 11	234 ± 25	344 ± 31	446 ± 16
3.0	1	4	4	149 ± 18	236 ± 24	340 ± 28	461 ± 29
4.0	3	15	15	149 ± 18	233 ± 34	322 ± 56	
8.0	3	15	15	157 ± 15	251 ± 29	344 ± 37	

3.0 mg/kg of diet.

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Effect of Exclusion of Hepatic Circulation on Oxidation of Octanoic Acid in the Rat.* (29229)

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The ability of the liver to synthesize and oxidize long chain fatty acids and triglycerides has been well established. It has also been shown that peripheral tissues are capable of oxidizing long chain fatty acids for energy, although the tendency to regard the liver as the major oxidative site for lipids *in vivo* has persisted. Some excellent studies in recent years have challenged this entrenched, older concept and have yielded an ever increasing role to the peripheral tissues, especially muscle, in direct utilization of long chain fatty acids(1). There have however been conflicting reports(1,2,3) concerning the oxidation of short chain fatty acids by extrahepatic tissues. The studies presented here were designed to explore the extent to which peripheral tissues of rats, in which the liver had been excluded from the circulation are capable of oxidizing a C^{14}-labeled, 8-carbon fatty acid.

Method. Ten fasted male albino rats weighing 300-475 g were anesthetized intraperitoneally with sodium pentobarbital (30 mg/kg), divided into 2 equal groups and prepared for surgery.

Group 1. In each animal a 1½ cm inguinal incision was made, the femoral vein was isolated and a small polyethylene catheter was inserted through this vein for a distance of 1.5 cm into the inferior vena cava. The catheter, which was attached to a 2 ml syringe, was secured and maintained in place throughout the experiment.

Group 2. A 4 cm median abdominal incision was made in each rat and the following steps taken in the order listed: 1) ligatures were tied around mesenteric and hepatic arteries; 2) portal vein was ligated at the hilus of the liver; 3) a catheter was inserted into the inferior vena cava just above the entrance of the common iliac veins and maintained in place. Throughout the experiment a slow infusion of 5% dextrose in water at the rate of 2 ml per hour was administered.

A 10% solution of sodium octanoate was prepared at a pH of 7.5. Each milliliter of this solution contained 90 mg of sodium octanoate and 2 microcuries of carboxyl-C^{14} sodium octanoate, prepared by the New England Nuclear Corp. with a specific activity of 13.7 millicuries per millimole. After completion of the surgery, each rat was immediately placed in a clear plastic container, which was connected to a system for continuous analysis of expired radioactive CO_2 as described pre-

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