

higher than 1:8 and the colostrum, upon examination, revealed the same titer. Those findings suggest that the content of Rh antibodies in breast milk is relatively high in the first days following delivery, especially in the colostrum. In the few cases we examined, we have not been able to demonstrate antibodies

in the breast milk unless they were present in the serum. Assuming that Rh antibodies in the breast milk pass through the intestinal canal and enter the circulation, breast milk might be the cause of further damage to blood cells of erythroblastotic children.

14121 P

Inherited Differences in the Choline Requirement of Rats.*

R. W. ENGEL. (Introduced by P. H. Phillips.)

From the Laboratory of Animal Nutrition, Alabama Polytechnic Institute, Auburn.

In a previous report¹ it was emphasized that there was considerable variation in the minimum choline requirement of rats from different litters. An experiment was conducted to determine whether or not this variation was hereditary. Two female and 2 male rats which had produced offspring having a relatively high choline requirement were mated, and their progeny were designated the F₁ of strain HCR. Likewise a similar number of rats which had produced offspring having a relatively low choline requirement were mated and their offspring were designated the F₁ of strain LCR. The F₁ rats of both strains were brother-sister mated simultaneously so that seasonal and other environmental influences would be uniform in the 2 strains.

At 23 days of age the F₂ rats were placed on the choline-deficient diet 31PMC² supplemented with adequate amounts of thiamine, riboflavin, pyridoxin, Ca pantothenate, carotene and calciferol. A suboptimum level of 4 mg of choline chloride per rat daily was also fed. Seventy-six progeny from 4 F₁ females of the strain HCR and 126 progeny from 6 F₁ females of strain LCR were tested over a period of 6 months. Weight gains of the progeny were equal in the 2 strains and ranged from 15 to 20 g per rat during the

first week. Kidney hemorrhage, characteristic of choline-deficiency, developed in 6 to 10 days, and the severe cases culminated in death. The kidneys of survivors were examined at the end of a 2-week feeding period. The presence and severity of kidney hemorrhage were used as an index to the adequacy or inadequacy of choline nutrition.

The results are presented in Table I. With a daily intake of 4 mg of choline chloride, 100% of the F₂ males of strain HCR developed kidney hemorrhage, and 58% of them died. The incidence of hemorrhage among the F₂ males of strain LCR receiving the same level of choline was only 48%, with a mortality of only 10%. As previously reported, the females required less choline than the males, but again the incidence of hemorrhage was markedly higher in the F₂ females of strain HCR. All the F₁ females of strain HCR produced young about equal in their choline requirement, and similarly the offspring of the F₁ females in strain LCR, regardless of litter were uniform in their requirement of choline.

Preliminary results indicate that the daily requirement for choline is nearly twice as great in strain HCR as in strain LCR. That such unusual differences in the requirement for a specific nutrient can be demonstrated in the second generation seems highly significant, and illustrates clearly how genetic variation in the stock used may affect the results of nutrition experiments. The physiological basis for this genetic difference in the requirement of choline is yet unknown.

* Published with the approval of the director of the Alabama Agricultural Experiment Station.

¹ Engel, R. W., *Proc. Soc. Exp. Biol. and Med.*, 1942, **50**, 193.

² Engel, R. W., and Salmon, W. D., *J. Nutrition*, 1941, **22**, 109.

TABLE I.
Strain Differences in Choline Requirements.

Sex	Strain	F ₂ rats, No.	Incidence of kidney hemorrhage		Mortality	
			No.	%	No.	%
Male	LCR*	60	29	48.3	6	10.0
Male	HCR†	43	43	100.0	25	58.1
Female	LCR	66	13	19.7	1	1.5
Female	HCR	33	31	93.9	14	42.4

* Low choline requirement strain.

† High choline requirement strain.

Griffith³ has shown that the choline requirement increases with increased rate of growth, which is not an explanation for the present results since the growth rate was identical in the 2 strains.

Lamoreux and Hutt⁴ found that white Leghorn chicks survived longer on a thiamine-deficient diet than Rhode Island Reds. The same authors⁵ developed strains of White Leghorn chicks which appeared to have dif-

ferent requirements for riboflavin.

So far as the author is aware, apart from a report by Light and Cracas⁶ who observed differences in thiamine requirements in different strains of white rats, it has not previously been demonstrated that laboratory rats vary in their requirements for specific nutrients.

Summary. Two strains of rats were developed which in their second generation differed markedly in their requirement of dietary choline.

³ Griffith, W. H., *Biol. Symposia*, 1941, **5**, 193.

⁴ Lamoreux, W. F., and Hutt, F. B., *J. Agr. Res.*, 1939, **58**, 307.

⁵ Lamoreux, W. F., and Hutt, F. B., *Genetics*, 1943, **28**, 79.

⁶ Light, R. F., and Cracas, L. J., *Science*, 1938, **87**, 90.

14122

Cathartic Salts on Motility of Thiry-Vella Jejunal Loops.

E. WILLIAM LIGON, JR. (Introduced by George B. Roth.)

From the Department of Pharmacology and Therapeutics, School of Medicine, The George Washington University, Washington, D.C.

Intralumen pressures in, and flow through, Thiry-Vella jejunal loops of 3 trained unanesthetized dogs were recorded photokymographically by the open tube method of Brody, Werle, Meschan and Quigley.¹ The solutions studied were: water; isotonic solutions of NaCl, Na₂SO₄, and MgSO₄, respectively; hypertonic solutions of 5 times the isotonic concentration of the above salts. Apparatus used is shown in Fig. 1.

Effect of pressure. Perfusion of the jejunal

loop with isotonic (0.9%) NaCl at an inflow pressure of 20 cm of water and an outflow pressure of zero produced basal pressures around 10 cm, average peak pressure around 40 cm, flow about 10 cc/min, and contractions 12 to 15/min. On lowering inflow pressure to zero, basal pressure fell to about 3 cm, average peak fell to about 10 cm, and flow ceased. On raising inflow pressure to 40 cm, basal pressure rose to 20 cm, average peak rose to 75 cm, and flow doubled. On clamping inflow and outflow and introducing 10 cc of 0.9% NaCl, basal pressure rose to 70 cm and average peak to 100 cm. Rate of contraction remained

¹ Brody, Werle, Meschan and Quigley, *Am. J. Physiol.*, 1940, **130**, 791.