rat but not in the mouse must remain unexplained at the present time.

Summary. Unlike the rat, the induction of deciduomata does not prolong pseudopregnancy in the mouse. The mechanism responsible for this marked species difference in response to apparently identical physiological conditions is obscure.

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Circulating Antibodies in Vitamin Deficiency States: II. Thiamin and Biotin Deficiencies.

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Introduction. In the first paper of this series,[1] we presented data concerning the effects of pyridoxin, pantothenic acid, and riboflavin deficiencies upon antibody production by the rat in response to human red blood cells as antigenic stimulus. The present paper deals with the effects of thiamin and biotin deficiencies upon antibody production under similar experimental conditions.

Experimental. Male weanling albino rats of the Sprague-Dawley strain were distributed as indicated in Table I. The animals were housed individually in wide-mesh, screen-bottom cages and weighed weekly. Both the thiamin-deficient rats and their controls received a basal diet with the following percentage composition: sucrose, 56.76; Labco "vitamin-free" casein, 25.00; salts,[2] 4.00; cod liver oil, 2.00; hydrogenated vegetable oil, 10.00; corn oil, 2.00; choline chloride, 0.20; *i*-inositol, 0.03; and 2-methyl-1, 4-naphthoquinone, 0.001. For the biotin-deficient rats and their controls, this diet was modified by replacing 60% of the casein with dried egg white. All rats received additional vitamins in the form of a daily pill. Each of the pills given to the 2 control groups supplied the following vitamins: thiamin, 40γ; riboflavin, 60γ; calcium pantothenate, 200γ; pyridoxin, 50γ; biotin, 4γ; folic acid, 1γ; nicotinic acid, 100γ; and *p*-aminobenzoic acid, 1mg. For the thiamin- and biotin-deficient groups, the appropriate vitamin was omitted from the pill. The basal diets were fed *ad libitum* to the 2 deficient groups, while the daily food intake of each rat in the control groups was restricted to that consumed during the previous day by its paired member in the corresponding deficiency group.

In Series I, immunization of the thiamin-deficient rats and their controls was begun after 3 weeks on experiment. At this time, the animals were progressively losing weight. Three of the controls and 2 of the deficient rats died during the immunization period. Because of this high mortality, this experiment was repeated exactly in Series II and immunization was instituted after 2 weeks. Although a similar weight loss occurred, no mortality was noted. The biotin-deficient rats and their controls of Series I were immunized after 6 weeks on experiment. At this time, the deficient animals had plateaued in weight and exhibited the typical symptoms of biotin deficiency, *i.e.*, alopecia, dermatitis, blepharitis, and cheilosis.

A 10% suspension of washed, Group O, Rh positive human erythrocytes in normal saline was given intraperitoneally as antigen. An initial dosage of 0.5 ml of the red cell suspension was followed by 2 one cc injections. Inoculations were made on alternate days. Five days after the final injection the

[1] Axelrod, A. E., Carter, B. B., McCoy, R. H., and Geisinger, R., PROC. SOC. EXP. BIOL. AND MED., 1947, **66**, 137.

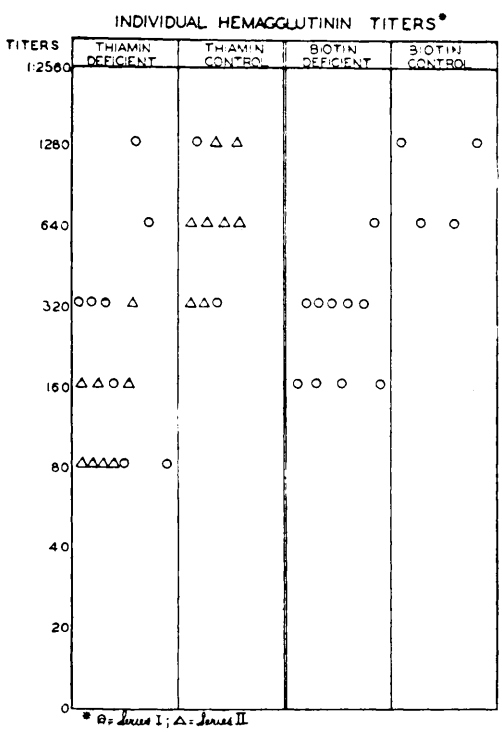
[2] Jones, J. H., and Foster, C. J., *J. Nutrition*, 1942, **24**, 245.

TABLE I.
Summary of Growth and Food Consumption Records.

Series	Group	No. of rats	Body weight*		Daily food consumption*
			Initial	Final†	
I	Thiamin-deficient	8	42	41	2.9
	Thiamin control	2	41	55	2.9
	Biotin-deficient	10	43	176	9.6
	Biotin control	4	44	218	9.6
II	Thiamin-deficient	8	61	64	4.4
	Thiamin control	8	61	70	4.4

* Group avg in g.
† At the time of bleeding.

TABLE II.



rats were bled and the serums tested for agglutinin titer as previously described.[1] Serums of rats from our stock colony possessed no agglutinins for human Group O, Rh positive red blood cells.

Results. The individual hemagglutinin titers are recorded in Table II. It is evident that the content of circulating antibodies in the thiamin and biotin deficient rats was less than that of the control rats. It is of interest that the decreases noted in the present work are not as marked as those previously observed, in pyridoxin and pantothenic acid deficiencies.[1] It would seem, therefore, that biotin and thiamin are not as critical as pyridoxin and pantothenic acid for optimal antibody response.

Stoerk, Eisen and John[3] and Ruchman[4] failed to observe any influence of a thiamin deficiency upon antibody response in the rat. A direct comparison of our results with those of these workers is difficult because of the variance in experimental procedures.

Summary. (1) Hemagglutinin production in response to inoculation with human erythrocytes has been investigated in thiamin- and biotin-deficient rats. (2) A moderate impairment of antibody response was observed in both deficiencies.

[3] Stoerk, H. C., Eisen, H. N., and John, H. M., *J. Exp. Med.*, 1947, **85**, 365.

[4] Ruchman, I., *J. Immunol.*, 1946, **53**, 51.