(thiamin chloride), riboflavin and vitamin B_6 produced an immediate growth response. The rôle of nicotinic acid as a component of the original filtrate may be masked by a double deficiency. It is possible that although adenine nucleotide is utilized, this is not the case with yeast nucleic acid, and it is also possible that the K_{12} ration fed by Frost and Elvehjem conceivably supplies factors lacking in our ration.

All rats except those receiving liver filtrate showed a non-specific type of skin lesions dissimilar to the florid acrodynia type of dermatitis characteristic of vitamin B_6 deficiency. The fur was dull and without luster.

Summary. Female rats received a diet in which all the known factors of the vitamin B_2 complex were supplied except that found in a multiply adsorbed liver filtrate. They failed to show a growth response on the addition of nicotinic acid, yeast nucleic acid, or a combination of the two to their ration. Liver filtrate, on the other hand, produced an immediate and marked stimulus to growth.

9790 P

Growth-Stimulating Action of Alpha Tocopherol.*

HERBERT M. EVANS, GLADYS A. EMERSON AND OLIVER H. EMERSON.

From the Institute of Experimental Biology, University of California, Berkeley.

It would now appear to be well established that in the rat a continuance beyond the fourth month of normal general body growth requires a nutritive factor which is either vitamin E or a substance closely related to it.[1-5] The growth-stimulating factor was found to be present in wheat germ and cottonseed oils and in their non-saponifiable fractions, a distribution which parallels that of vitamin

* Aided by grants from the Research Board and the College of Agriculture of the University of California and the Rockefeller Foundation of New York City.

We wish to acknowledge the assistance rendered by the Federal Works Progress Administration (Project No. 5778).

We wish to thank Merck & Company, of Rahway, New Jersey, for a stipend to one of us (G. A. E.).

1 Evans, H. M., *J. Nutr.*, 1928-29, **1**, 23.

2 Blumberg, H., *J. Biol. Chem.*, 1935, **108**, 227.

3 Olcott, H. S., and Mattill, H. A., *J. Biol. Chem.*, 1936, **114**, lxxvii.

4 Olcott, H. S., and Mattill, H. A., *J. Nutr.*, 1937, **14**, 305.

5 Emerson, G. A., and Evans, H. M., *J. Nutr.*, 1937, **14**, 169.

E. Martin[6] believed that he had satisfactorily separated the growth-promoting and fertility-conferring effects, but took care to point out that the apparent difference might be a quantitative one, rather than due to two separate factors.

The results herein reported deal with the growth-stimulating action of alpha tocopherol. This compound was prepared as described by Evans, Emerson and Emerson[7] by hydrolysis of alpha tocopheryl allophanate (m.p. 158-160°). The purity of the compound seems established.

Female rats were reared from weaning on vitamin E-low diet 427[5] and had plateaued in weight at about 120 days of age. When 195 days of age, 6 animals were given, for 50 days, 6 times weekly, 1 mg. of alpha tocopherol dissolved in 80 mg. of ethyl laurate. Three controls received 80 mg. of ethyl laurate alone. The results are shown in Table I.

TABLE I.
Growth Response to Alpha Tocopherol of Rats Maintained on a Vitamin E-Low Ration.

Supplement 6 times weekly	No. of rats	Days	Average gain in wt., gm.
1 mg. alpha tocopherol in 80 mg. ethyl laurate	6	195-245	22
80 mg. ethyl laurate alone	3	195-245	0

The particular sample of alpha tocopherol when assayed with young female rats of proved sterility gave results as shown in Table II.

TABLE II.
Vitamin E Activity of Alpha Tocopherol.

Level fed single dose, mg.	No. of rats fed	No. of litters	% littering	Av. No. living young per litter	Av. wt. per rat, gm.	Dead young
1	5	2	40	9.5	5.4	0
3	4	4	100	5.5	5.3	6

Summary. Alpha tocopherol potent as vitamin E in a single dose of 1-3 mg. stimulated growth in rats that had plateaued in weight on a vitamin E-low diet.

[6] Martin, G., *J. Nutr.*, 1937, **13**, 679.

[7] Evans, H. M., Emerson, O. H., and Emerson, G. A., *J. Biol. Chem.*, 1936, **113**, 319.