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Inhibition of Pigment Deposition in Incisor Teeth of Rats Deficient in Vitamin E from Birth.*

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Feeding fat-containing vitamin E-deficient diets to rats from weaning results in disappearance of the normal yellow-brown pigment of maxillary incisor teeth in about 20 days.¹ The present study was designed to determine the effect of similar diets on incisor pigmentation from birth.

For this purpose, 14 female albino rats were mated with normal males and maintained on a normal stock diet until delivery; then, with their offspring, they were divided into 6 groups and maintained for a 60-day period on the following rations: group I (3 females with 26 young): sucrose 65%; casein, alcohol-extracted, 20%; dried yeast, ether-extracted, 10%; salt mixture no. 2, U.S.P., 5%; tetrasodium salt of 2-methyl-1,4-naphthohydroquinone diphosphoric acid, 1 mg %; vitamin A and D concentrate in oleic acid, 2 drops weekly per animal corresponding to 560 i.u. A and more than 80 i.u. D. Group II (3 females with 29 young): same as group I but with 20% sucrose replaced by 20% cod liver oil. Group III (3 females with 29 young): same as group I but with 20% sucrose replaced by 20% lard. Group IV (2 females with 26 young): same as group I plus 10 mg % of *d,l*-alpha-tocopherol acetate. Group V (2 females with 31 young): same as group II plus 10 mg % of *d,l*-alpha-tocopherol acetate. Group VI (2 females with 29 young): same as group III plus 10 mg % of *d,l*-alpha-tocopherol acetate. The young received milk from the mothers, but after the first two weeks gradually began to eat of the diets themselves.

From about the 24th day, the offspring of the mothers from groups I (vitamin E-deficient, fat-free), IV (vitamin E-sufficient, fat-free), V (vitamin E-sufficient, 20% cod liver oil), and VI (vitamin E-sufficient, 20% lard) developed incisor enamel pigment at the normal rate (Fig. 1) as measured by a method previously described.¹ No pigment developed in the incisor teeth of either jaw in the young of groups II (vitamin E-deficient, 20% cod liver oil) and III (vitamin E-deficient, 20%

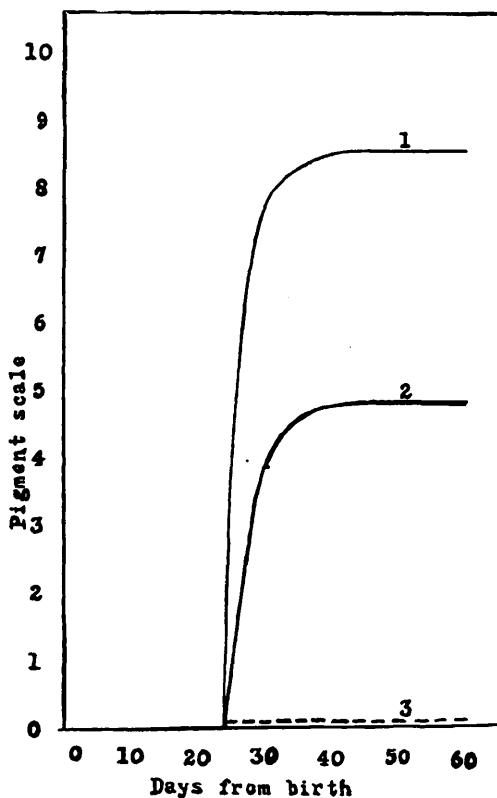


FIG. 1.

Lines 1 (maxillary) and 2 (mandibular) represent degree of pigmentation in the incisors of the offspring of animals 1, 4, 5, and 6. Line 3 indicates incisor pigmentation in the young of 2 and 3.

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¹Granados, H., and Dam, H., *Science*, 1945, **101**, 250.

lard). However, incisor pigmentation in the mothers of these last 2 groups was not influenced during the experimental period.

That the incisor teeth of the young of group I, receiving the E-deficient fat-free ration, were not depigmented demonstrates a direct causal relationship between fat in the diets of mothers II and III, and failure of enamel pigmentation in their offspring. Further, the results indicate that the types of fat represented by cod liver oil and lard function essentially alike in inhibiting incisor pigmentation in E-deficient rats. Necessity for *dietary* fat in the prevention of pigment deposition when vitamin E-deficient rations are given from birth is disclosed by the fact that consumption of fat contained in the milk of mothers of group I, fed a fat-free diet, did not inhibit the development of pigment in the offspring.

Maintenance of normal incisor pigmentation in mothers II and III during the experimental period shows that the age at which the vitamin E-free, high fat diets are given, influences the disappearance of the pigment. Depigmentation occurs in rats reared on similar diets for 159 days² from weaning, but is limited to maxillary incisors, indicating that the enamel organ of the mandibular incisors has a prolonged ability to continue the formation and deposition of pigment. Apparently, the absence of deposition in both maxillary and mandibular incisors also depends upon

the age at which the experimental diets are given.

Evidence has been reported^{3,4,5} that iron is an important component of the enamel pigment; that the color intensity is directly proportional to the iron content of the enamel; and that unpigmented enamel encountered under certain circumstances has a decreased iron content. It seems likely, therefore, that dietary fat in E-deficient rats affects the normal ability of ameloblasts to produce or deposit the iron-containing pigment.

The brown pigment of adipose tissue⁶ developed as early as the 21st day of age in offspring of group II, fed a high cod liver oil, vitamin E-deficient diet; but not in the young of III, on the E-deficient lard ration. A difference in the effects of the two fats on the production of adipose pigment is apparent, whereas their influences are alike in regard to incisor pigment.

Summary. Fourteen normal female rats, in the presence of their offspring, were maintained for 60 days from delivery on vitamin E-deficient rations containing no fat, 20% cod liver oil, and 20% lard respectively. Production of normal pigment failed to occur in the enamel of the incisor teeth of the young of animals receiving cod liver oil and lard.

³ Ratner, S., *J. Den. Res.*, 1935, **15**, 89.

⁴ Murray, M. M., and Glock, G. E., *Brit. Den. J.*, 1939, **66**, 345.

⁵ Stein, G., and Boyle, P. E., *J. Den. Res.*, 1941, **20**, 261.

⁶ Dam, H., *J. Nutrition*, 1944, **27**, 193.

² Granados, H., Mason, K. E., and Dam, H., *J. Den. Res.*, Proc. 23rd General Meeting International Association for Dental Research, 1945.