peppers which develop a distinct brownish color before becoming a clear red at maturity. It was suspected that this color was due to the retention of chlorophyll in the ripening fruit instead of to the partial to complete loss of chlorophyll which normally accompanies the softening, coloring, and other physiological processes of ripening. Thus, with the normal red pigments developing at maturity the combination of chlorophyll and red pigments produced the brown. To determine this, F. P. Zscheile extracted mature fruit with an acetone-hexane mixture. Upon saponification, chlorophyll in high concentration was removed, leaving a reddish-orange solution in hexane. Adsorption of this mixture on a magnesia column and development with acetone in hexane demonstrated the presence of a wide variety of carotinoids, from light yellow to dark orange in color. No other types of pigments were observed.

Preliminary data on inheritance indicate that the brown fruit color is due to a single recessive gene which inhibits the normal chlorophyll destruction at fruit maturity. In a cross with a normal red-fruited form, the F_1 had normal red fruit and the F_2 population segregated 61 red to 20 brown—a very good 3:1 ratio.

Since the action of this gene appears to be the prevention of the normal chlorophyll breakdown at maturity, it should be possible to produce a green mature-fruit color by crossing with a pepper having a yellow mature-fruit color. Such a combination might possibly have some value for prolonging the sale period of green salad peppers.

This gene is of considerable theoretical interest in providing additional material for a study which is under way of the mechanism of chlorophyll decomposition during the fruit-ripening process.

PAUL G. SMITH

Division of Truck Crops, University of California, Davis

Crystalline Synthetic Vitamin A and Neovitamin A

At a meeting of the American Chemical Society on September 15, 1947, announcement was made of the commercial synthesis of vitamin A (J. D. Cawley, C. D. Robeson, L. Weisler, E. M. Shantz, N. D. Embree, and J. G. Baxter), and evidence was presented to prove that the synthetic vitamin is identical with natural vitamin A of marine origin. It was also shown that the synthetic concentrates contain neovitamin A, the geometrical isomer of vitamin A previously isolated from fish-liver oils (C. D. Robeson and J. G. Baxter. *J. Amer. chem. Soc.*, 1947, 69, 136). Since a number of geometrical isomers of vitamin A could have been produced in the synthetic process, it is of interest that only the naturally occurring forms actually resulted. This note is concerned with the identification of the two vitamins in the concentrates and with the determination of the relative amounts of each present.

The synthetic concentrates are bright orange, viscous oils, with potencies as high as 2,400,000 U.S.P. units/gm and with extinction coefficients at 325 mμ as high as 1,250. Crystalline vitamin A was obtained from the concentrates by the method developed for crystallizing the natural vitamin (J. G. Baxter and C. D. Robeson. *J. Amer. chem. Soc.*, 1942, 64, 2411). The synthetic and natural crystals were found to be substantially identical in biological potency (3,300,000 U.S.P. units/gm), ultraviolet absorption coefficient [$E(325m\mu) = 1{,}800$], and in the blue color obtained with antimony trichloride [$E(620\ m\mu) = 4{,}400$]. Further confirmation of the identity of the synthetic and natural vitamins was obtained by comparing the melting point and other properties of the crystalline acetate and anthraquinone-β-carboxylate esters of the synthetic vitamin with those of the corresponding esters of natural vitamin A (J. G. Baxter and C. D. Robeson. *J. Amer. chem. Soc.*, 1942, 64, 2407).

It was found that the synthetic concentrates also contain neovitamin A. This was demonstrated by crystallizing the synthetic neovitamin as the red anthraquinone-β-carboxylate ester (m.p. 133–135°) by essentially the same process as that used with natural neovitamin A (*J. Amer. chem. Soc.*, 1947, 69, 136). The vitamin A in a rich synthetic concentrate was removed as completely as possible by crystallization from ethyl formate at −70°. The neovitamin present in the noncrystallizable residue was further concentrated by selective adsorption on sodium aluminum silicate. A fraction was thus obtained containing neovitamin A and vitamin A in the proportion of 90:10. Esterification of this concentrate with anthraquinone-β-carboxyl chloride followed by crystallization from methyl acetate gave an ester identical in properties with that obtained from natural neovitamin A.

Assays of two synthetic concentrates by the maleic anhydride method (*J. Amer. chem. Soc.*, 1947, 69, 136) indicated that the proportions of vitamin A and neovitamin A present were 1.5:1 and 2:1. These ratios closely approximate those earlier reported for fish-liver oils. The similarity suggests that vitamin A either *in vivo* or *in vitro* is converted, in part, by catalytic agents into neovitamin A, and therefore that the occurrence of neovitamin A in liver oils is not necessarily indicative of any peculiar requirement of the fish for this isomer. Instead, it appears that "vitamin A," physiologically speaking, must be considered as a mixture of the two geometric isomers.

We wish to thank A. J. Chechak, F. B. Clough, C. C. Eddinger, H. M. Kascher, and Max H. Stern for valuable technical assistance, and the Spectroscopy, Biochemistry, and Custom Distillation Departments of this Company for their generous cooperation.

J. D. CAWLEY, C. D. ROBESON, L. WEISLER, E. M. SHANTZ, N. D. EMBREE, and J. G. BAXTER

Distillation Products, Inc., Rochester, New York