

sible to make certain of a complete diversion of the portal circulation.

The fact that 3 dogs out of 4 with their portal circulation diverted from the liver survived injections of a lethal dose of a toxic proteose fraction is strongly indicative of a more or less complete acute hepatic portal occlusion as the probable cause of the bloody diarrhea and hemorrhagic mucosa which results from such injections. It is believed that this intestinal condition is a major factor in causing the death of such animals.

5248

Carotene from Lettuce and Its Relation to Vitamin A.

H. S. OLCOVICH AND H. A. MATTILL.

From the Biochemical Laboratory, State University of Iowa.

Carotene was obtained from a methyl alcohol solution of the unsaponifiable fraction of the lipids of lettuce. After recrystallization from petroleum ether, the melting point was 179.5-180°. 200 mg. were obtained from approximately 150 kilos of fresh lettuce.

The crystal form differs depending on the solvent from which it is crystallized: from petroleum ether, rhombohedrons; chloroform and methyl alcohol, needles; carbon disulfide and absolute alcohol, clusters of needles; petroleum ether and methyl alcohol, square plates; acetone, triangular plates. The different crystal habits are all members of the hexagonal system.

On long standing at room temperature, or on heating for 24 hours at 105°, the crystals bleach, without losing their form. This fading is from the outer edge inward, showing a sharp line of demarcation between the unchanged carotene and the bleached or "achroo-carotene". There is no change in weight, and the bleaching is accomplished as easily in nitrogen as in oxygen. Formerly hexagonal, the crystals are now isometric, denoting a radical change in the molecular structure. Achroo-carotene has no physiological activity.

Carotene is efficacious in curing the xerophthalmia, and allowing a resumption of growth, in vitamin A deficient rats. 0.005 mg. per day seems to be the practical minimum dose, although several individual rats have been able to grow on less. The effect of giving carotene continues for some time after the dosage has been stopped, and there seems to be a quantitative relationship between the amount

given and the weight increase obtained, whether the carotene be given in one dose or in divided doses. 0.005 mg. allows a growth of at least 2 gm., the average growth increment being 3 to 5 gm. for this amount. This corresponds closely to Sherman's vitamin A unit.

The rate of fading of carotene dissolved in different solvents was determined by comparing 0.017% solutions with a standard $K_2Cr_2O_7$ solution colorimetrically. Carotene fades very rapidly in ethyl oleate, less in ethyl laurate. The color is fairly stable in ethyl oleate with hydroquinone (0.1%), and disappears most slowly in cotton-seed oil. If a synthetic solvent is to be used, ethyl laurate protected with hydroquinone seems the logical choice. Whether the fading in solution is comparable to the fading of the crystals, is uncertain, but in either case, the physiological activity is lost.

Carotene is a pro-oxidant. 0.06% dissolved in an autoxidizable oil shortens its induction period by one-half. It is possible that this property is closely allied to its function as vitamin A.

5249

Determination of Butyl and Ethyl Alcohols in Fermentation Mixtures.

C. H. WERKMAN AND O. L. OSBURN.

From the Department of Bacteriology, Iowa State College, Ames, Iowa.

An accurate and rapid method for the quantitative determination of alcohols in fermentation mixtures would prove of value to the zymologist engaged in studies of the chemism of microbial action. A method which has been found very satisfactory is based upon the oxidation of the alcohols in the neutral volatile distillate by potassium dichromate and phosphoric acid. Ethyl alcohol yields acetic acid and butyl alcohol yields a mixture of butyric and acetic. The acids are quantitatively determined by the partition method.¹ The method is presented in its present form for the quantitative determination of unknown mixtures of butyl and ethyl alcohols, such as are found in the "butyl-acetone" fermentation. This fermentation has extensive industrial use in the production of butyl alcohol and acetone.

Fifty cc. of the alcohol mixture are pipetted into a 200 cc. balloon flask containing 10 gm. of potassium dichromate and 25 cc. of c.p. 85% phosphoric acid. Three or 4 small pieces of porcelain are

¹ Werkman, C. H., *Ind. Eng. Chem.* (analytical edition), 1930, **2**, 302.