the undissolved material were made by boiling it, for half an hour each time, with solutions of 20 g. of sodium hydroxide in 500 ml. of water. The combined filtered extracts were acidified with hydrochloric acid, and the crude product was collected, washed thoroughly with water and dried (79 g.).

Crystallization of the brownish solid from 300 ml. of petroleum naphtha (boiling range 100–150°) with the addition of some "Filtrol" gave 43 g. of nearly colorless crystals, m.p. 183–184°. An additional 3.1 g. (m.p. 181–183°) was isolated by concentration of the mother liquor. Recrystallization of both crops from 200 ml. of naphtha yielded the pure compound (37 g.), m.p. 183–184°.

Anal. Calcd. for $C_8H_7OBrCl_2$: C, 35.6; H, 2.6; Br, 29.6; Cl, 26.3. Found: C, 35.8; H, 2.4; Br, 30.4; Cl, 25.8.

2,6-Dichloro-3,5-xylenol.—4-Bromo-2,6-dichloro-3,5-xylenol (34 g.) and 600 ml. of 20% potassium hydroxide solution were heated to 90° with stirring. Zinc dust (80 g.) was added slowly to the solution during two hours; stirring and heating 90° was then continued for three hours. The unreacted zinc was filtered off and washed with hot water. The cold filtrate was acidified with hydrochloric acid with ice cooling. The crude product was collected, washed with water and dried in air. It was then refluxed with 100 ml. of alcohol and a small amount of decolorizing carbon and the solution was filtered and diluted with water. The precipitate was washed with water and dried (26 g., containing some inorganic impurities).

On distillation, 18.3 g., b.p. 105–110° (1 mm.), of a colorless solid was obtained. Crystallization from 50 ml. of naphtha yielded 14.4 g. of the pure 2,6-dichloro-3,5-xylenol, m.p. 87–88°, mixed m.p. with 2,4-dichloro-3,5-xylenol 60–65°.

Anal. Calcd. for $C_8H_8OCl_2$: C, 50.2; H, 4.2; Cl, 37.1. Found: C, 50.2; H, 4.2; Cl, 36.9.

For identification, the benzoates of the two dichloroxylenols were prepared: 2,4-dichloro-3,5-xylenyl benzoate, m.p. 114–115°; 2,6-dichloro-3,5-xylenyl benzoate, m.p. 143–145°.

Anal. Calcd. for $C_{15}H_{12}O_2Cl_2$: C, 61.0; H, 4.1. Found for the 2,4-isomer: C, 61.0; H, 4.3; for the 2,6-isomer: C, 61.2; H, 4.2.

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RESEARCH LABORATORIES
THE GIVAUDAN CORPORATION
DELAWANNA, NEW JERSEY

The Isolation of *n*-Octanyl Alcohol from a Marine Tube Worm

BY D. R. IDLER AND U. F. M. FAGERLUND

RECEIVED AUGUST 3, 1953

During recent years several interesting aliphatic acids have been isolated from parasitic worms. However, the mechanism of formation and biochemical function of these acids is not yet determined.[1-3]

Preliminary examination of the tube worm *Eudistylia vancouveri* suggested the presence of an aliphatic alcohol.[4,5]

The alcohol has now been identified as *n*-octanyl alcohol. It possibly arises as a metabolic product of fatty acid degradation or serves as a fatty acid precursor. Preliminary chromatographic evidence indicates that one of the more abundant aliphatic acids present in the tube worm has a chain length similar to *n*-octanoic acid.

This appears to be the first reported isolation of free *n*-octanyl alcohol from an animal organism.

Experimental[6]

Isolation of *n*-Octanyl Alcohol.—The worms were collected at Brockton Point, Vancouver, B. C. They were immediately extruded from their protective casings, by means of a glass rod, into a jar containing a known volume of sea water. Twelve kg. of these fresh worms were put through a meat grinder and the mash was immediately steam distilled. Distillation was continued until one-third of the original volume had distilled over. The distillate was then extracted three times with equal portions of diethyl ether and the ether extract was washed with dilute sodium hydroxide, hydrochloric acid and finally with water.

The ether extract was dried with sodium sulfate and the ether removed on a water-bath. The dry neutral extract represented 0.09% of the wet weight of worms.

A 6.85-g. sample of the neutral material was fractionated through a Todd still fitted with a narrow-bore column. The first fraction (0.59 g.) distilled over at 78° and the second (4.06 g.) at 192°. A further 1.21 g. distilled over *in vacuo* and left a residue of 0.14 g.

The fraction boiling at 192° was identified with synthetic *n*-octanyl alcohol. Both boiled at 192°, d^{20}_4 0.825. Both gave identical infrared spectra.

Anal. Calcd. for $C_8H_{18}O$: C, 73.77; H, 13.93. Found: C, 73.50; H, 14.01.

Derivatives.—Both synthetic *n*-octanyl alcohol and the tube worm alcohol gave the same phenylurethan, m.p. 74°, mixed m.p. 74°, 3,5-dinitrobenzoyl ester, m.p. 61°, mixed m.p. 61°, and α-naphthylurethan, m.p. 66°, mixed m.p. 66°.

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[1] E. Bueding and H. W. Yale, *J. Biol. Chem.*, **193**, 411 (1951).

[2] E. Bueding, *ibid.*, **202**, 505 (1953).

[3] V. Moyle and E. Baldwin, *Biochem. J.*, **51**, 504 (1952).

[4] B. E. Maxwell, *J. Fish. Res. Bd. Can.*, **9**, 164 (1952).

[5] U. Fagerlund and L. A. Swain, *Fish. Res. Bd. Can. Prog. Rep. Pac.*, **92**, 16 (1952).

[6] Boiling points uncorrected. Melting points corrected.

PACIFIC FISHERIES EXPERIMENTAL STATION
CHEMISTRY SECTION
VANCOUVER, BRITISH COLUMBIA

The Molecular Configuration of the Aliphatic Dibasic Acid, $C_4H_4O_6\cdot 2H_2O$

BY M. P. GUPTA

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The object of the present investigation was to determine, using X-ray crystallographic methods, whether molecules of the aliphatic dibasic acid $C_4H_4O_6\cdot 2H_2O$ had the *cis*- or the *trans*-configuration. Chemical evidence in favor of each of these configurations had been presented (see the preceding paper by Dr. E. F. Hartree[1]). Crystals were kindly provided in a form suitable for X-ray examination, by Dr. Hartree, and the results may be summarized as follows.

Crystal Morphology.—The crystals were thin, diamond-shaped colorless plates, showing a good cleavage parallel to the bisectrix of the acute angle and straight extinction parallel to this direction to within 1°. This is in agreement with the data first given by Fenton,[2] who is quoting the results of a crystallographic examination by Mr. Solly. The latter believed that the crystals possessed orthorhombic symmetry.

Unit Cell Determination.—Laue photographs taken with the short diagonal (subsequently taken as the [100] axis) vertical, and with the incident X-ray beam normal and parallel, respectively, to the platy face, showed the existence of strong pseudo-orthorhombic symmetry. The *positions* of the Laue spots corresponded with a strictly rectangular unit cell, but their *intensity* corre-

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[1] E. F. Hartree, THIS JOURNAL, **75**, 6244 (1953).

[2] H. J. H. Fenton, *J. Chem. Soc.*, **65**, 899 (1894).