A General Method for the Synthesis of Optically Active β-Hydroxy Acids

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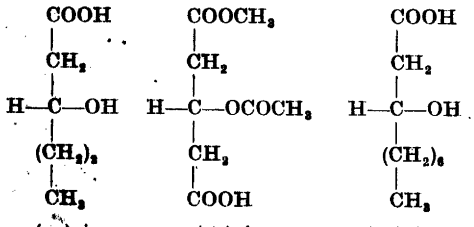
Racemic methyl hydrogen β-acetoxyglutarate, a viscous, slightly hygroscopic liquid with b.p. 150°/0.5 torr (slight decomposition), n_D^{25} 1.4470 and d_4^{25} 1.234, was made from the known anhydride of β-acetoxyglutaric acid [1,2] and methanol. The optically pure antipodes of this half-ester were obtained in about 30 % yield by fractional crystallization of the cinchonidine and strychnine salts from ethyl acetate and chloroform-ether, respectively. They are liquids with $[\alpha]_D^{25} \pm 6.1°$ (chloroform; *c* 20; *l* 1).

Electrolysis of the dextrorotatory antipode with propionic acid gave, *via* the acetylated methyl ester, β-hydroxyhexanoic acid (I) with m. p. 42° and $[\alpha]_D^{22} -28°$ (chloroform; *c* 2; *l* 1). As this acid is known to have the D configuration [3], formula II represents the Fischer projection of the dextrorotatory half-ester. It may be named (+)-methyl 3D-acetoxy-4-carboxybutanoate. *Cf.*[4,5].



(—) in chloroform (+) in chloroform (—) in chloroform (+) in in ethanol

I II III

Electrolysis of the levorotatory half-ester with *n*-heptanoic acid gave similarly 3 L-hydroxydecanoic acid with m. p. 48.4°; $[\alpha]_D^{22}$ +20° (chloroform; *c* 2.5; *l* 1); −3° (ethanol; *c* 2.5; *l* 1). The antipode of this acid has been isolated from natural sources [6-8] and it follows that this has the D-configuration (III). *Cf.*[3] A specimen kindly supplied by professor S. Bergström gave in equimolecular mixture with the synthetic acid the racemic 3-hydroxydecanoic acid with m. p. 56.6°. Skogh [9] reports m. p. 56.4–56.6°.

Apparently optically pure β-hydroxynonanoic with $[\alpha]_D$ +2° 26′ (ethanol) has been obtained by degradation of ricinoleic acid [10]. From the foregoing it seems highly probable that it has the D-configuration. Ricinoleic acid should thus be 12D-hydroxy-*cis*-9-octadecenoic acid.

It is obvious that the optically active half-ester (II) and its antipode can be used as starting material for the synthesis of a great many optically active hydroxy-compounds of the type $RCH_2CHOHCH_2R'$.

A full account of this work will be published later. Grants from *Norges Almenvitenskapelige Forskningsråd* and from *Statens Medicinska Forskningsråd* are gratefully acknowledged.

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Received June, 7, 1955.