

cis-INOSITOL, A 1:3:5-TRIAXIALLY SUBSTITUTED cycloHEXANE DERIVATIVE

By S. J. Angyal and D. J. McHugh

N.S.W. University of Technology, Sydney

Each of the isomeric inositols (*cyclohexanehexols*) predicted by theory is known except the one in which all the hydroxyl groups are in a *cis* relationship to one another.¹ This isomer would be of particular stereochemical interest because it would have three axial substituent groups on the same side of the *cyclohexane* ring. No compound possessing this structural feature is known,² and it has been questioned whether such a compound can exist.

We have now obtained this isomer by the hydrogenation of hexahydroxybenzene and propose to name it *cis-inositol*. The hydrogenation of hexahydroxybenzene using a special palladium catalyst has been described by Wieland and Wishart,³ and by Kuhn *et al.*⁴ who obtained *mesoinositol* as their only product. We have reinvestigated this reaction and have found that it yields a complex mixture of inositols, *cyclohexane-pentols* and *-tetros*, and *hydroxyketones*. The inositols accounted for about a quarter of the starting material, and, in accordance with the German workers, *mesoinositol* was predominant (*ca.* 17% yield). The mixture was fractionated by passing it in acetone-water (8 : 2 v/v) solution through a cellulose powder column. From the fraction with R_f 0.22, the new inositol crystallized in *ca.* 4% yield. It gave the Scherer test characteristic for inositols but was different from all the known isomers. It readily gave a hexa-acetate, m.p. 208°, and a hexabenzate, m.p. 252°. The

inositol itself decomposed on slow heating, but was found to melt at *ca.* 390° by placing samples on a pre-heated aluminium block.

Anderson and Wallis⁵ hydrogenated hexahydroxybenzene with Raney nickel under high pressure and isolated a new inositol for which they gave m.p. 213-214° and for its acetate, m.p. 205-206°. We have repeated this hydrogenation and, by the use of cellulose powder chromatography, we have isolated *cis-inositol* from the products. It appears that, despite the great discrepancy in the m.p., Anderson and Wallis had *cis-inositol* in hand.

Three other inositols, namely *scyllo-*, *epi-*, and *DL-*, have been isolated from the hydrogenation mixture but *allo-*, *muco*, and *neo-inositol* could not be found. A new inosose (*pentahydroxycyclohexanone*), m.p. 179-180° decomp., has been isolated which gives *cis-inositol* on hydrogenation with PtO₂ and therefore has the all-*cis* configuration. On hydrogenation with PtO₂ in acid solution,⁶ *cis-inosose* gives a new *cyclohexanepentol*, *cis-quercitol*, which has also readily been obtained from the hexahydroxybenzene hydrogenation mixture in 2% yield.

The reactions of *cis-inositol* are being studied and it is intended to publish full details elsewhere.

Received June 2, 1955

References

- ¹ Angyal & Matheson, *J. Amer. chem. Soc.*, 1955, in the press
- ² Angyal & Mills, *Revs. Pure Appl. Chem. (Australia)*, 1952, 2, 188
- ³ Wieland & Wishart, *Ber. dtsch. chem. Ges.*, 1914, 47, 2082
- ⁴ Kuhn, Quadbeck & Röhm, *Liebigs Ann.*, 1949, 565, 1
- ⁵ Anderson & Wallis, *J. Amer. chem. Soc.*, 1948, 70, 2931
- ⁶ Posternak, *Helv. chim. Acta*, 1941, 24, 1045