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OLIVOMYCIN. II. STRUCTURE OF THE CARBOHYDRATE COMPONENTS

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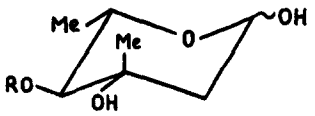
EARLIER we reported the isolation of several sugar derivatives from the acid methanolysis products of the antibiotic olivomycin (1). The present communication shows that the corresponding sugars which we have called olivomycose, olivomose and olivose possess the structures (I), (III) and (IV), respectively.

Olivomycose $C_7H_{14}O_4$ has three hydroxyl groups, two C-methyl groups, in the form of $CH_3-\overset{H}{\underset{C}{C}}-O$ (doublet at 1.30 ppm with J = 6 cps) and $CH_3-\overset{C}{\underset{C}{C}}-O$ (singlet at 1.25 ppm), as well as a $CH_2-\overset{H}{\underset{O}{C}}-O$ fragment (a group of peaks in the region of 1.80 ppm and a quadruplet at 4.35 ppm). (The δ values pertain to the β-methyl olivomycoside) (2). The sugar reduces 2 moles of periodic acid yielding 1 mole of HCOOH, whereas its glycosides consume 1 mole of HJO_4 without formation of volatile products. It follows from these data that olivomyco-

se has the structure of a 3-C-methyl-2,6-dideoxyhexose. The configuration of its C_3, C_4 and C_5 asymmetric centers were elucidated as follows. Tosylation of methyl olivomycoside (TsCl + Py, 20°) gave a monotosylate, which on treatment with 0.4 N methanolic NaOH was readily converted into the 3,4-oxide (m.p.105°, subl.). Moreover it was found that the $[M]_{436}$ of β-methyl olivomycoside in cuprammonium solution (0.2 mole Cu and 13 moles NH_3 per liter) undergoes a considerable negative shift (ΔCu -1670°) which indicates a value of -60° for the projected valency angle between the C_3-O and C_4-O bonds (cf.(3)). From this there follows the trans-diequatorial arrangement of the hydroxyls at C_3 and C_4 in the 1C conformation of the pyranose ring, which is stable only providing the methyl group at C_5 is in equatorial position. Hence olivomycose is 3-C-methyl-2,6-dideoxy-L-arabo-hexose (I).



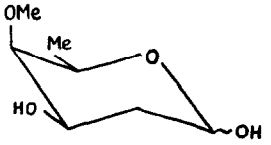
I: R = H

II: R = Me_2CHCO

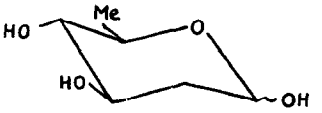
It had previously been shown that in the antibiotic itself olivomycose is in the form of the isobutyrate (1). We found that the latter resists periodate oxydation and therefore its acyl residue must be at C_4-OH (II). Finally, since olivomycose belongs to the L-series, the previously described (1) levorotatory methyl isobutyrylolivomycoside A and methyl olivomycoside A are α-glycosides.

For the second degradation product, olivomose $C_7H_{14}O_4$, the structure 2,6-dideoxy-4-O-methyl-D-hexose was established

(1). Alkylation of its α-methyl glycoside by means of CH_3J + Ag_2O gave the methyl ether ($[\alpha]_D^{23}$ +133°; c 0.6, EtOH), which proved to be identical with the α-methyl 3,4-di-O-methyl-2,6-dideoxy-D-galactopyranoside we synthesized from α-methyl 2-deoxy-D-galactopyranoside by selective 6-tosylation followed by methylation and then $LiAlH_4$ reduction. In this way it was shown that olivomose is 4-O-methyl-2,6-dideoxy-D-lyxo-hexose (III).



III



IV

The third carbohydrate component of olivomycin, olivose $C_6H_{12}O_4$, is 2,6-dideoxy-D-hexose (1). Besides its α-glycoside, we were able to isolate β-methyl olivoside, $[\alpha]_D^{22}$ -85° (c 1, EtOH), m.p.84° (from EtOAc-C_6H_{14}). The change in $[M]_{436}$ of this substance in cuprammonium solution (ΔCu +2120°, i.e. a projected valency angle of +60°) indicates a diequatorial arrangement of the hydroxyls at C_3 and C_4 (conformation C1). Olivose is therefore 2,6-dideoxy-D-arabo-hexose (IV).

It is noteworthy that similar sugars have been found among the constituents of other antibiotics. Thus, the 4-O-isovaleryl derivative of mycarose (the C_3 epimer of olivomycose) is contained in the magnamycins (4,5), and chromose B, the acetyl derivative of olivomycose, has been revealed in chromomycin A_3 (6). Two other deoxy sugars have been iso-

lated from chromomycin A_3 which appear to be closely related to olivomose and olivose (6,7). Regrettably the insufficient characterization of these deoxy sugars and a certain divergence between their constants and those of our compounds do not allow of conclusive decision concerning the identity of these substances.

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