The Preparation of Bis(2-acetamido-6-acetylthio-O-acetyl-glucopyranosyl)sulfides

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In 1959 M. Černý and J. Pacák[1] reported that 2, 3, 4, 6-tetra-*O*-acetyl-1-thio-β-D-glucopyranose condensed with alkyl halides, giving alkylthioglucopyranosides. The present work describes the application of this procedure to 2-acetamido-3, 4-di-*O*-acetyl-6-*S*-acetyl-2, 6-dideoxy-1, 6-dithio-β-D-glucopyranose (I)[2,3] for the preparation of bis (2-acetamido-6-acetylthio-*O*-acetyl-glucopyranosyl) sulfides.

The treatment of compound I with ethylene dibromide in acetone containing potassium carbonate afforded bis-(2, 2′-diacetamido-3, 4, 3′, 4′-tetra-*O*-acetyl-2, 6, 2′, 6′-tetra-deoxy-6, 6′-di-*S*-acetyl-6, 6′-dithio-β, β′-D-glucopyranosyl) ethylene disulfide (II) in an 80% yield. It showed $[\alpha]_D^{22}$ −23° in chloroform. Bis(2, 3, 4, 6, 2′, 3′, 4′, 6′-octa-*O*-acetyl-β, β′-D-glucopyranosyl) ethylene disulfide was reported[1] to have $[\alpha]_D$ −38.5° in chloroform.

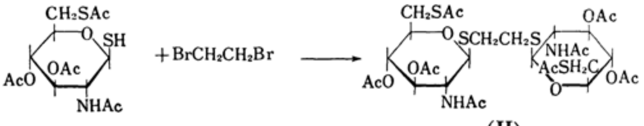
By a similar procedure, bis(2, 2′-di-acetamido-3, 4, 3′, 4′-tetra-*O*-acetyl-2, 6, 2′ 6′-tetra-deoxy-6, 6′-di-*S*-acetyl-6,6′-dithio-β, β′-D-glucopyranosyl) pentamethylene disulfide (III) was prepared from compound I and pentamethylene dibromide.

When compound I was treated with 2-acetamido-3, 4-di-*O*-acetyl-2, 6-dideoxy-6-*S*-acetyl-6-thio-D-glucopyranosyl chloride[3] (V) in acetone containing potassium hydroxide, bis (2, 2′-diacetamido-3, 4, 3′, 4′-tetra-*O*-acetyl-2, 6, 2′, 6′-tetra-deoxy-6, 6′-di-*S*-acetyl-6, 6′-dithio-β, β′-D-glucopyranosyl) sulfide (IV) was formed. The β, β′ configuration has been suggested for compound IV on the basis of a comparison of rotation ($[\alpha]_D^{21}$ −16° in chloroform) with that of bis (2, 2′, 3, 3′, 4, 4′, 6, 6′-octa-*O*-acetyl-β, β′-D-glucopyranosyl) sulfide ($[\alpha]_D^{18}$ −38° in chloroform).[4]

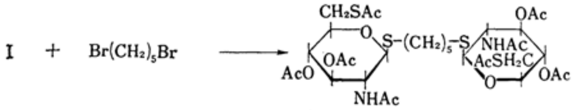
Experimental

Melting points are uncorrected.

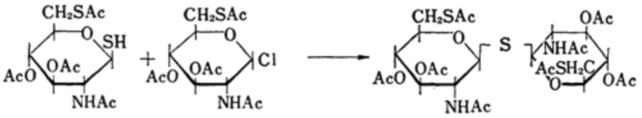
Bis(2, 2′-di-acetamido-3, 4, 3′, 4′-tetra-*O*-acetyl-2, 6, 2′, 6′-tetradeoxy-6, 6′-di-*S*-acetyl-6, 6′-dithio-β,β′-D-glucopyranosyl) Ethylene Disulfide (II).—Into a solution of 2-acetamido-3, 4-di-*O*-acetyl-6-*S*-acetyl-2, 6-di-deoxy-1, 6-dithio-β-D-glucopyranose (I) (1 g.) and ethylene dibromide (0.25 g.) in dry acetone (7.5 ml.), a solution of potassium carbonate (0.35 g.) in a small amount of water was added. After the solution had been stirred for 30 min. at room temperature, the solution was poured on ice water. The precipitates were filtered, washed with water



(I) (II)



(III)



(V) (IV)

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[1] M. Černý and J. Pacak, *Collection Czechoslov. Chem. Communs.*, **24**, 2566 (1959).

[2] T. Ito, *Agr. Biol. Chem.*, **26**, 831 (1962).

[3] T. Ito and T. Ishii, *Agr. Biol. Chem.*, **27**, 423 (1963).

[4] M. Akagi, S. Tejima, M. Haga and M. Sakata, *Chem. Pharm. Bull.*, **11**, 1081 (1962).

and ether, and recrystallized from ethyl alcohol to give 0.83 g. (80%) of colorless crystals; m. p. 257∼258°C, $[\alpha]_D^{22}$ $-23°$ (*c* 0.5, chloroform).

Found: C, 45.52; H, 5.57; N, 3.72; S, 16.42. Calcd. for $C_{30}H_{44}N_2O_{14}S_4$: C, 45.90; H, 5.65; N, 3.57; S, 16.34.%

Bis(2, 2′-di-acetamido-3, 4, 3′, 4′-tetra-*O*-acetyl-2, 6, 2′, 6′-tetradeoxy-6, 6′-di-*S*-acetyl-6, 6′-dithio-*β*,*β*′-D-glucopyranosyl) Pentamethylene Disulfide (III).—This material was prepared in a manner analogous to that used for II above. Yield, 78, m. p. 227∼228°C, $[\alpha]_D^{25}$ $-6°$ (*c* 0.1, chloroform).

Found: C, 47.41; H, 6.06; N, 3.21; S, 16.10. Calcd. for $C_{33}H_{50}N_2O_{14}S_4$: C, 47.93; H, 6.09; N, 3.39; S, 15.51%.

Bis(2, 2′-di-acetamido-3, 4, 3′, 4′-tetra-*O*-acetyl-2, 6, 2′, 6′-tetradeoxy-6, 6′-di-*S*-cetyl-6, 6′-dithio-*β*, *β*′-D-glucopyranosyl) Sulfide (IV).—To a solution of 2-acetamido-3, 4-di-*O*-acetyl-2, 6-dideoxy-6-*S*-acetyl-6-thio-D-glucopyranosyl chloride (V) (0.64 g.) in acetone (10 ml.), a solution of compound I (0.63 g.) in 1% ethanolic potassium hydroxide (10 ml.) was added. After 24 hr. at room temperature, the inorganic precipitate was filtered out.

This filtrate was then evaporated to 12 ml., diluted with chloroform and poured into cold water. The chloroform layer was separated and then dried and evaporated in vacuo to give the crystalline product, which was washed with dry ether. The yield was 0.93 g. (78%). M. p. 281∼282°C. $[\alpha]_D^{21}$ $-16°$ (*c* 0.5, chloroform).

Found: C, 46.42; H, 5.43; N, 3.74; S, 13.49. Calcd. for $C_{28}H_{40}N_2O_{14}S_3$: C, 46.40; H, 5.56; N, 3.86; S, 13.27%.

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