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Note

A novel imidazole derivative from 2-acetamido-2-deoxy-*N*-*p*-tolyl-β-D-glucopyranosylamine

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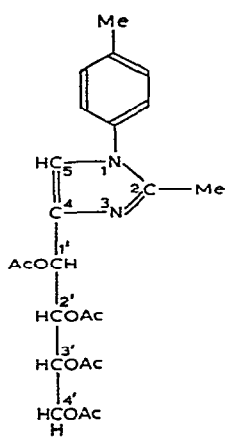
N-Acetyl-*p*-toluidine[1] was isolated in up to 92% yield under acetolyzing conditions from *N*-*p*-tolyl-β-D-glycosylamines of hexopyranoses. In contrast, less than 1.8% of this product was obtained upon similar treatment of the 2-acetamido-2-deoxy-*N*-*p*-tolyl-β-D-glycosylamines having the *galacto*, *gluco*, and *manno* configurations.

We now report the isolation and structure determination of a novel imidazole derivative produced from 2-acetamido-2-deoxy-*N*-*p*-tolyl-β-D-glucopyranosylamine under acetolyzing conditions.

This product was isolated in 12% yield and was determined to be 2-methyl-4-(D-*arabino*-1,2,3,4-tetraacetoxybutyl)-1-*p*-tolylimidazole (**1**). Compound **1** does not show amide absorption at 1650 cm^{-1}, but 2-acetamido-3,4,6-tri-*O*-acetyl-2-deoxy-*N*-*p*-tolyl-β-D-glucopyranosylamine[2] does. Its n.m.r. spectrum shows a one-proton singlet at low field assigned to the methine proton (H-5) of the imidazole ring. It also shows four acetate-methyl signals. Compound **1** gives a positive Ehrlich diazo reaction for imidazoles[3].



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Formation of the imidazole is considered to occur by 1,2-enolization and sugar dehydration reactions[4] in the molecule during the acetolysis of 2-acetamido-2-deoxy-glycosylamines. This could also explain the low yield of *N*-acetyl-*p*-toluidine in the previous reactions[1], and the present procedure constitutes an interesting imidazole synthesis from 2-amino-2-deoxy sugars.

EXPERIMENTAL

General methods. — Melting points were measured with a Yangimoto melting-point apparatus (SP-2) and are uncorrected. N.m.r. spectra were recorded at 60 MHz with a Hitachi NMR spectrometer (R-24) on solutions in $CDCl_3$ with tetramethylsilane as an internal standard; i.r. spectra were recorded with a Hitachi grating spectrometer (215), u.v. absorptions with a Hitachi spectrometer (124), and specific rotations with a Yanagimoto direct-reading polarimeter (OR-50). Descending paper chromatography was performed on Whatman No. 1 paper, using 1-butanol–acetic acid–water–ethanol (50:12:25:5, v/v) and detection of the spots with alkaline silver nitrate. Thin-layer chromatography (t.l.c.) was performed with Silica Gel G (Merck) with benzene–methanol (17:3, v/v); spots were detected by u.v. light and then by spraying the plates with conc. sulfuric acid followed by heating at ~120°. Column chromatography was performed with silica gel (Wakogel C-200, Wako).
2-Acetamido-2-deoxy-*N*-*p*-tolyl-β-D-glucopyranosylamine and its peracetate were prepared by the conventional method[2].

2-Methyl-4-(D-arabino-*1,2,3,4-tetraacetoxybutyl*)-*1*-p-*tolylimidazole* (**1**) — 2-Acetamido-2-deoxy-*N*-*p*-tolyl-β-D-glucopyranosylamine (1.0 g) was added with stirring at 5° to a mixture of acetic anhydride (10 ml), acetic acid (10 ml), and conc. sulfuric acid (1.0 ml). The mixture was kept for 3 h at this temperature and then for 48 h at room temperature. The resulting, colored solution was poured into ~100 ml of ice–water with stirring, and the products were extracted with chloroform (50 ml, 3 times). The combined extracts were washed with cold water (50 ml, twice), dried with anhydrous Na_2SO_4 and concentrated *in vacuo* into a syrup. T.l.c. indicated the presence of one major product (R_F 0.71) and at least five minor products [R_F 0.77, 0.43 (identified as *N*-acetyl-*p*-toluidine[1]), 0.22 (identified as 2-acetamido-3,4,6-tri-*O*-acetyl-2-deoxy-D-glucose[1]), 0.11, and 0.05]. The major product (R_F 0.77) was separated from the other products by chromatography on a column (1.5 × 30 cm) of silica gel, eluted with benzene–methanol (99:1, v/v); yield 174 mg (12%). After rechromatography on the same column, it was crystallized and recrystallized from ethanol–ether to afford **1**, m.p. 164.5–165.5°, $[\alpha]_D^{21}$ +3° (*c* 1.0, chloroform); $\lambda_{max}^{methanol}$ 240 nm; ν_{max}^{KBr} 1750, 1230 (C=O in OAc), 1050 (C–O–C), 830 cm^{-1} (*p*-substituted Ph), neither absorption of C=O in NAc at 1650 cm^{-1} nor absorption of NH at 3000–3500 and 1580–1540 cm^{-1}; n.m.r. δ 7.12 (m, 4 protons, Ph-1), 6.86 (s, 1 proton, H-5), 5.86 (d, 1 proton, H-1′, $J_{1',2'}$ ~0 Hz), 5.84 (q, 1 proton, H-2′, $J_{2',3'}$ 1.5 Hz), 5.10 (o, 1 proton, H-3′, $J_{3',4'}$ $J_{3',4''}$ 5.0 Hz), 4.25 (q, 1 proton, H-4′, $J_{4,4''}$ 10.0 Hz), 3.97 (q, 1 proton, H-4″), 2.35 (s, 3 protons, Me-Ph-1), 2.22 (s, 3 protons, Me-2), 2.05, 2.00, 1.98, and 1.95 (s, 3 protons each, OAc-Me).

Anal. Calc. for $C_{23}H_{28}N_2O_8$: C, 59.99; H, 6.13; N, 6.08; O, 27.80. Found: C, 59.68; H, 6.04; N, 5.93; O, 27.80.

REFERENCES

1 S. HIRANO AND R. YAMASAKI, *Nippon Nogei Kagaku Kaishi*, 39 (1975) 995–998.
2 Y. INOUE, K. ONODERA, AND S. KITAOKA, *J. Agr. Chem. Soc.* (Tokyo), 29 (1955) 139–143.
3 F. FEIGL, *Spot Tests in Organic Analysis*, Elsevier Publishing Company, Amsterdam, 1956, pp. 137–138.
4 D. HORTON, in R. W. JEANLOZ (Ed.), *The Amino Sugars*, Vol. 1A, Academic Press, New York and London, 1969, pp. 114–119.