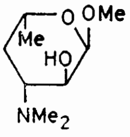
Simple Synthesis of Methyl DL-Desosaminide

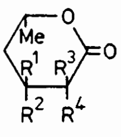
By Takamasa Kinoshita,* Youichi Kawashima, Koji Hayashi, and Toshio Miwa
(*Faculty of Science, Osaka City University, Osaka* 558, *Japan*)

Summary A short route to DL-desosamine from the product of the condensation of 4-nitrobutan-2-ol with sodium glyoxylate is described.

Several groups[1–4] have reported the synthesis of desosamine, 3,4,6-trideoxy-3-dimethylamino-*xylo*-hexose, which is the carbohydrate component of a number of antibiotics. We report a simple synthesis of methyl DL-desosaminide (**1**) from the condensation product, 2-hydroxy-3-nitro-5-methyl-δ-valerolactone (**2a**),† of 4-nitrobutan-2-ol with sodium glyoxylate in the presence of sodium hydrogen carbonate in water at 25 °C.

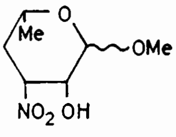
Because of its poor solubility in toluene, the lactone (**2a**) was converted into the corresponding tetrahydropyranyl


(1)


(2)

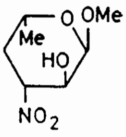
a; $R^1 = R^3 = H$, $R^2 = NO_2$, $R^4 = OH$

b; $R^2 = R^4 = H$, $R^1 = NO_2$, $R^3 = OH$


(3)

a; β-anomer

b; α-anomer


(4)

---

† Two condensation products (**2a**), m.p. 155—156 °C, 32% yield, and (**2b**), m.p. 140—140·5 °C, 10% yield, were isolated upon repeated recrystalization from ethyl acetate. Their structures were deduced from spectroscopic evidence (^{1}H and ^{13}C n.m.r. and i.r.).

ether.‡ This was reduced with di-isobutylaluminium hydride in toluene at −70 °C, followed by condensation with methanolic hydrogen chloride, to give the corresponding methyl glycoside, methyl 3,4,6-trideoxy-3-nitro-β-DL-*lyxo*-hexopyranoside (**3a**) (87·5%) and the α-anomer (**3b**) (12·5%) total yield 80% from (**2a**). Treatment of (**3a**) with sodium hydrogen carbonate in aqueous methanol at 50 °C gave an equilibrated mixture *via* retro-aldol condensation,[5] from which methyl 3,4,6-trideoxy-3-nitro-β-DL-*xylo*-hexopyranoside (**4**) having the desired relative configuration was isolated by preparative t.l.c.§ Catalytic hydrogenation of (**4**) on PtO_2 in methanol followed by Eschweiler–Clarke methylation led to the oily methyl DL-desosaminide (**1**) which was identified by comparison of its ^1H n.m.r. spectrum with that reported.[2]

(*Received*, 10*th May* 1979; *Com.* 493.)

---

‡ The tetrahydropyranyl ether of (**2a**) was prepared in the presence of pyridinium toluene-*p*-sulphonate in CH_2Cl_2; m.p. 140·5–141 °C.

§ The ^1H n.m.r. spectrum of (**4**) was in full agreement with that reported (ref. 2). The equilibrated mixture was composed of (**3a**), (**4**), and an unknown product in a ratio of 1 : 2 : 1.

[1] A. C. Richardson, *Proc. Chem. Soc.*, 1963, 131.
[2] H. H. Baer and C-W. Chiu, *Canad. J. Chem.*, 1974, **52**, 122.
[3] F. Korte, A. Bilow, and R. Heinz, *Tetrahedron*, 1962, **18**, 657.
[4] H. Newman, *J. Org. Chem.*, 1964, **29**, 1461.
[5] J. Kovar, K. Capec, and H. H. Baer, *Canad. J. Chem.*, 1971, **49**, 3960.