Tetrahedron Letters No.22, pp. 1795-1797, 1969. Pergamon Press. Printed in Great Britain.

AMINOCYCLITOLS. XXI.
A SYNTHESIS OF DL-HYOSAMINE

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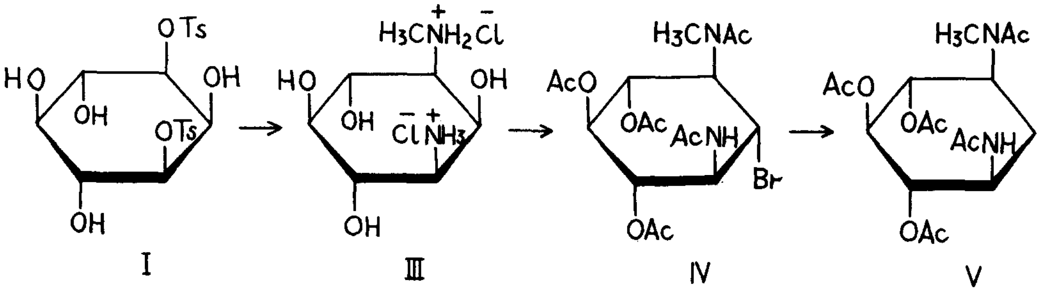
(Received in Japan 20 March 1969; received in UK for publication 8 April 1969)

In the previous paper of this series, it was described that hydrazinolysis of 2,4,5,6-tetra-O-acetyl-1,3-di-O-p-toluenesulfonyl-myo-inositol, followed by catalytic hydrogenation afforded 1,3-diamino-1,3-dideoxy-myo-inositol via an intermediary 6,7-diazabicyclo[3.2.1]octane-2,3,4,8-tetrol.1)

In the present communication, we wish to report a convenient synthesis of DL-N-methyl-1,3-diamino-1,3-dideoxy-myo-inositol by hydrazinolysis of 1,3-di-O-p-toluenesulfonyl-myo-inositol (I)2) in N-methylhydrazine, from which DL-pentaacetyl-hyosamine (V) is readily obtained by a two-step-reaction. Hyosamine was first discovered in the antibiotic hygromycin B3) and later in destomycin A4) as their components, and its structure has been established to be N-methyl-2-deoxy-streptamine.3) Also the synthesis has been described by Nakajima and his co-workers.5)



Treatment of I with a mixture of N-methylhydrazine and 2-methoxyethanol under reflux for 19 hours afforded an oily product. The product was hydrogenated with Raney nickel in water under 3.4 kg/cm^2 of hydrogen stream for 22 hours at 40 - 50^o. The hydrogenated product was acetylated with acetic anhydride in pyridine giving DL-hexaacetyl-N-methyl-myo-inosadiamine-1,3 (II) in 43% yield as fine crystals of m.p. 229 - 230^o. Calcd. for $C_{19}H_{28}N_2O_{10}$: C, 51.34; H, 6.35; N, 6.30. Found: C, 51.39; H, 6.85; N, 6.17%.

Hydrolysis of II in 6 N hydrochloric acid at 100^o for two hours gave DL-N-methyl-myo-inosadiamine-1,3 dihydrochloride (III) in 97% yield.

III was heated in a mixture of acetyl bromide and acetic anhydride (1:2) in a sealed tube at 130 - 135^o for 13 hours. The product was acylated with acetic anhydride in pyridine yielding DL-pentaacetyl-2-bromo-2-deoxy-N-methyl-scyllo-inosadiamine-1,3 (IV) in a yield of 21%. M.p. 179 - 183^o (decompose). Calcd. for $C_{17}H_{25}N_2O_8Br$: C, 43.88; H, 5.42; N, 6.02; Br, 17.18. Found: C, 44.19; H, 5.52; N, 6.03; Br, 16.76%.

A catalytic hydrogenolysis of IV with Raney nickel and Amberlite IR-4B in 50% aqueous ethanol under 3.4 kg/cm^2 of hydrogen stream for 20 hours afforded DL-pentaacetyl-hyosamine (V) of m.p. 202 - 203^o in 87% yield. The identity of this compound was established by melting point, IR spectrum and a comparison of the NMR spectrum with that of an authentic sample which was prepared from destomycin A.[4)]

Acknowledgement: This work has been supported financially in part by the grant of the Japanese Ministry of Education. We would like to thank Professor Sumio Umezawa for his helpful advices and Mr. Saburo Nakada for performing elementary analyses. Also we thank Mr. Naoyuki Kato for his tecnnical assistances.

References

1) T. Suami, S. Ogawa, S. Naito and H. Sano, J. Org. Chem., 33, 2831 (1968).

2) T. Suami, F. W. Lichtenthaler and S. Ogawa, Bull. Chem. Soc. Japan, 40, 1488 (1967).

3) P. Wiley, M. V. Sigal, Jr. and O. Weaver, J. Org. Chem., 27, 2793 (1962).

4) S. Kondo, M. Sezaki, M. Koike and E. Akita, J. Antibiotics, A18, 192 (1965).

5) M. Nakajima, A. Hasegawa and N. Kurihara, Ann. Chem., 689, 235 (1965).