Aminocyclitols. XII. A Convenient Synthesis of Actinamine

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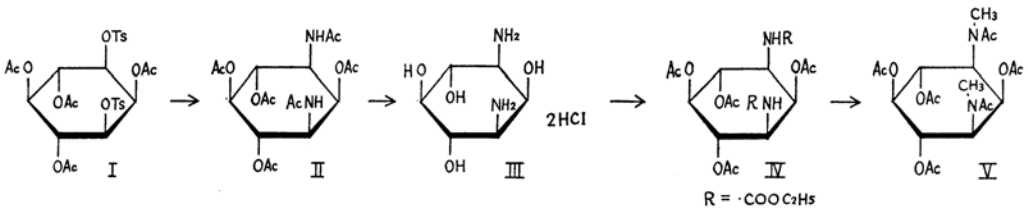
In connection with the previous paper of this series,[1] a facile synthesis of actinamine has been accomplished in our laboratory.

The antibiotic actinospectacin is produced by Streptomyces spectabilis[2] and flavopersicus,[3] and inhibits Gram positive and negative bacteria. From this antibiotic, actinamine is isolated by acid hydrolysis, and its structure has been established to be *N, N'*-dimethyl-*myo*-inosadiamine-1, 3.[4]

In the present study, actinamine has been prepared from 2, 4, 5, 6-tetra-*O*-acetyl-1, 3-di-*O*-*p*-toluenesulfonyl-*myo*-inositol (I)[5] in a fairly good yield.

When I was heated in boiling anhydrous hydrazine under a stream of nitrogen for 48 hr, and excess reagent was removed, a hydrazinolysis product was obtained, which was hydrogenated with Raney nickel in a hydrogen stream and subsequently acetylated to give hexaacetyl-*myo*-inosadiamine-1, 3 (II),[6] mp 283.5—284.5°C, in 35.2% yield and hexaacetyl-*muco*-inosadimaine-1, 4[7] in 2.4% yield. A selective de-*O*-acetylation of II gave di-*N*-acetyl-*myo*-inosadiamine-1, 3, mp 310—311°C (dec.) in 92.0% yield. The hydrolysis of II in boiling 6 N hydrochloric acid gave *myo*-inosadiamine-1, 3 dihydrochloride (III) in 98.7% yield.

Then III was treated with ethyl chloroformate in an alkaline solution, and the product was acetylated to give 2, 4, 5, 6-tetra-*O*-acetyl-*N, N'*-diethoxycarbonyl-*myo*-inosadiamine-1, 3 (IV), mp 189.5—190°C, in 85.0% yield. By reduction of IV with lithium aluminum hydride, hexaacetyl-actinamine (V)[4,6] was obtained in 44.5% yield, after subsequent acetylation.



1) T. Suami and S. Ogawa, This Bulletin, **38**, 2026 (1965); T. Suami, F. W. Lichtenthaler and S. Ogawa, *ibid.*, **39**, 170 (1966).

2) D. J. Mason, A. Dietz and R. M. Smith, *Antibiot. Chemotherapy*, **11**, 118 (1961).

3) T. J. Oliver, A. Goldstein, R. R. Bower, J. C. Holper and R. H. Otto, *Antimicrobial Agents and Chemotherapy*, 495, (1961).

4) P. F. Wiley, *J. Am. Chem. Soc.*, **84**, 1514 (1962); G. Slomp and F. A. MacKellar, *Tetrahedron Letters*, **1962**, 521 ; A. L. Johnson, R. H. Gourlay, D. S. Tarbell and R. L. Autrey, *J. Org. Chem.*, **28**, 300 (1963).

5) S. J. Angyal, P. T. Gilham and G. J. H. Melrose, *J. Chem. Soc.*, **1965**, 5252.

6) M. Nakajina, N. Kurihara, A. Hasegawa and T. Kurokawa, *Ann.*, **689**, 243 (1965).

7) T. Suami, F. W. Lichtenthaler and S. Ogawa, This Bulletin, in press.