Aminocyclitols. IX. The Facile Synthesis of Streptamine

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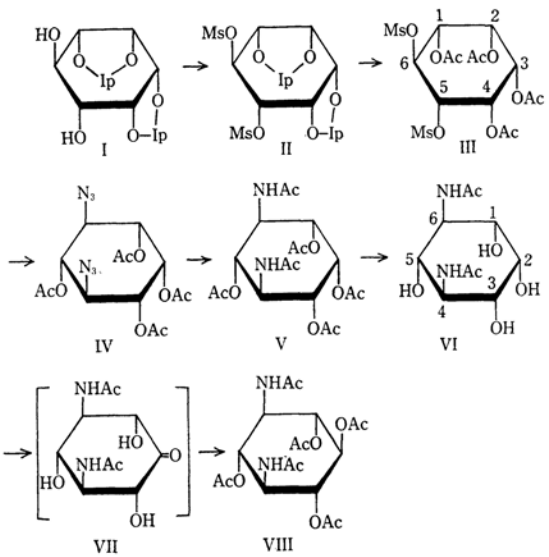
In connection with the previous studies of this series,[1] a new synthetic route to streptamine has been established in our laboratory.

Streptamine has been found to be a component of the antibiotic streptomycin,[2] and its structure has been shown to be *scyllo*-inosadiamine-1, 3.[3] This compound has been synthesized by Wolfrom et al.[3] from natural glucosamine and by Heyns et al.[4] from *myo*-inositol.

(±)-1 : 2-3 : 4-Di-*O*-isopropylidene-*epi*-inositol (I) has been prepared by the method of Angyal et al.[5] from *epi*-inositol[6] and used as the starting material in the present experiment. When I is treated with an excess amount of methanesulfonyl chloride in pyridine, di-*O*-mesyl derivative (II), m. p. 147.5—148.5°C, is formed. Then II is heated in 50% acetic acid solution on a boiling water bath for 2 hr. in order to remove the acetone, and the product is acetylated to give (±)-5, 6-di-*O*-mesyl-*epi*-inositol tetraacetate (III), m. p. 166.5—168.5°C). When III is treated with sodium azide in boiling aqueous 2-methoxyethanol for 40 hr. and subsequently acetylated, 4, 6-diazido-4, 6-dideoxy-*myo*-inositol tetraacetate (IV), m. p. 147—149°C, is obtained as the main product in 28% yield. The catalytic hydrogenation of IV in ethanol and the acetylation of the reduction product give hexaacetyl-*myo*-inosadiamine-4, 6 (V), m. p. 290—292°C. The NMR spectrum of V in deuteriochloroform exhibits a sharp signal at 8.07 τ for two equatorial acetamido groups, and three sharp signals of a 2 : 1 : 1 relative intensity at 7.98, 7.92 and 7.79 τ for three equatorial groups and an axial acetoxy group respectively.



Ac=CH_3CO- Ms=CH_3SO_2- Ip=isopropylidene

The selective deacetylation of V gives the di-*N*-acetyl derivative (VI). Now VI is expected to be oxidized at C-2 selectively, since there is only one axial hydroxyl group on C-2.[7] Therefore, VI is oxidized in the presence of platinum black in a stream of oxygen at 40°C for 24 hr.[8] Then the ketone (VII) is immediately reduced by sodium amalgam[9] in a slightly acidic solution. The reduction product is acetylated to give hexaacetyl-streptamine (VIII) in 12.5% yield. The transition point of VIII is 243—248°C. The infrared spectrum of VIII is superimposable on that of an authentic sample which has been prepared from streptomycin by the method of Peck et al.[2]

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