ENANTIOSELECTIVE SYNTHESIS OF OPTICALLY ACTIVE β-LACTAMS FROM D-GLYCERALDEHYDE ACETONIDE

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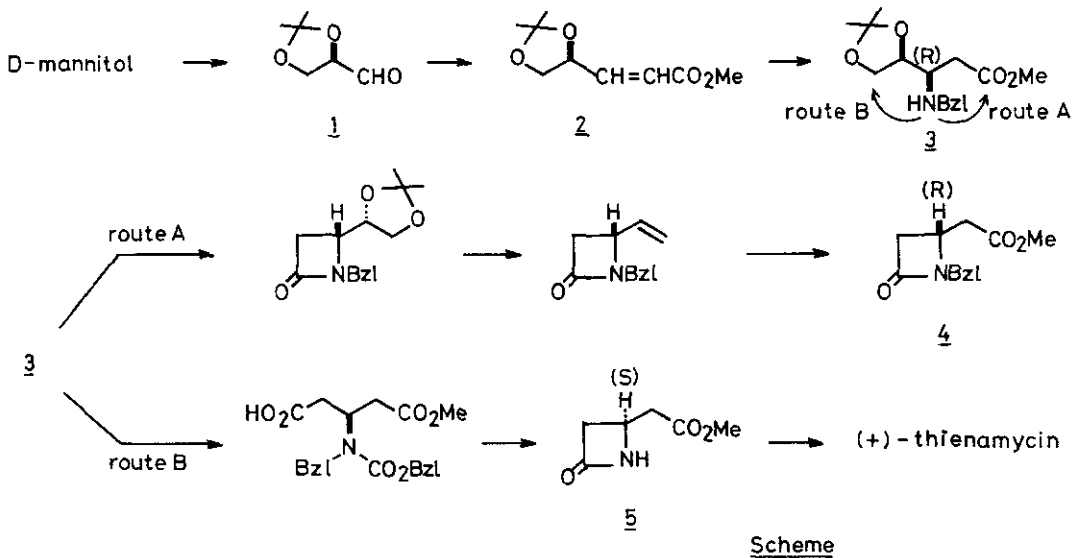
D-Glyceraldehyde acetonide (1) easily prepared from D-mannitol is known to be a useful and inexpensive starting material for the various optically active natural products. Here we have accomplished the enantioselective synthesis of optically active β-lactams, (R)-N-benzyl-4-[(methoxycarbonyl)methyl]-2-azetidinone (4) and (S)-4-[(methoxycarbonyl)methyl]-2-azetidinone (5), from 1.

The 1,4-addition reaction of the α,β-unsaturated ester 2, prepared from 1 by Wittig reaction, with benzylamine at -50°C gave highly stereoselectively (3R)-amino ester 3 *in 85% yield.* Two ways for β-lactam formation (route A and route B) from the resulting β-amino ester 3 provided the enantioselective synthesis of 4 and 5 as shown in Scheme. The β-lactam 4 can be transformed into unnatural series of carba-



Scheme

penem antibiotics, and the β-lactam 5 is a versatile intermediate for the synthesis of natural (+)-thienamycin.[1]

An alternative approach to the β-lactam 5 from 2, and the stereoselective Michael type addition of various amines to 2 will be also described.

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1) Formal total synthesis of (+)-thienamycin from D-mannitol has thus been accomplished.