Molecular-sieve Catalysed $N \rightarrow N$ Glycosyl Migration in the *v*-Triazolo[4,5-*d*]pyrimidine Ring System

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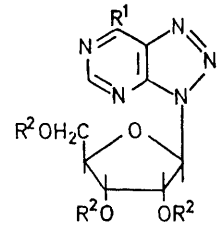
Summary Migration of the glycosyl group of 7-(methylthio)-2-(2,3,5-tri-*O*-acetyl-β-D-ribofuranosyl)-*v*-triazolo-[4, 5-*d*]pyrimidine from N-2 to N-3 has been observed; the migration was catalysed by molecular sieve and less effectively by mercury(II) bromide.

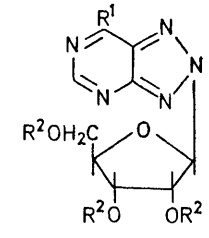
ALTHOUGH a number of $N \rightarrow N$ alkyl and glycosyl migrations have been observed in the purine ring system, these observations have been confined to migration from the pyrimidine to the imidazole ring of these compounds,[1,2] and no similar migrations have been reported in the *v*-triazolo[4,5-*d*]pyrimidine ring system.

The reaction of 7-(methylthio)-*v*-triazolo[4,5-*d*]pyrimidine[3] with 2,3,5-tri-*O*-acetyl-D-ribofuranosyl chloride[4] in benzene under reflux containing Linde AW-500 molecular sieve gave after 21 h an 89% yield of a 2:1 mixture of 7-(methylthio)-3- and -2-(2,3,5-tri-*O*-acetyl-β-D-ribofuranosyl)-*v*-triazolo[4,5-*d*]pyrimidine (**1** and **2**, respectively), as determined by ^{1}H n.m.r. spectroscopy.† These nucleosides were separated by preparative t.l.c. and identified by conversion with ammonia in ethanol at 68° into the known adenosine analogues, 7-amino-3- and -2-β-D-ribofuranosyl-*v*-triazolo[4,5-*d*]pyrimidine[5]‡ (**3** and **4**, respectively). A higher ratio of (**1**) to (**2**) (4:1) found in an earlier reaction suggested that (**2**) might rearrange to (**1**) with an increase in reaction time or temperature. A solution of (**1**) and (**2**) (2:1) in toluene containing molecular sieve was heated under reflux for four days to give a 6:1 mixture of (**1**) and (**2**). Substitution of xylene for toluene in this reaction did not increase the extent of rearrangement of (**2**) to (**1**), and



(1) R^1 = SMe, R^2 = Ac

(3) $R^1 = NH_2$, R^2 = H



(2) R^1 = SMe, R^2 = Ac

(4) $R^1 = NH_2$, R^2 = H

† A similar reaction with 7-nonanamido-*v*-triazolo[4,5-*d*]pyrimidine gave only the 3-isomer.[5]

‡ The β-configuration of (**3**) is established;[5] that of (**4**) is assumed on the basis of the *trans* rule[5,6] and other work on the preparation of nucleosides of *v*-triazolo[4,5-*d*]pyrimidines.[7]

no rearrangement of (**2**) occurred in the absence of molecular sieve.

Mercury(II) bromide, an acid catalyst which has been demonstrated by Shimizu *et al.*[1] to be effective in the rearrangement of 3-glycosylpurines to 7- and 9-glycosylpurines, was found to be considerably less effective than molecular sieve in the rearrangement of (**2**) to (**1**). When the mixture of (**1**) and (**2**) (2:1) was heated with mercury(II) bromide in xylene under reflux for four days or toluene for seven days, a 3:1 mixture of (**1**) and (**2**) was formed. No rearrangement occurred when the mixture of (**1**) and (**2**) (2:1) with mercury(II) bromide and dimethylacetamide in xylene was heated under reflux for 90 min. Furthermore, (**4**) only underwent rearrangement to (**3**) to a very slight degree when a solution of it in dimethylacetamide (necessary because of solubility) containing molecular sieve was heated at 110° for four days.

The conversion of (**2**) into (**1**) at elevated temperatures indicates that (**1**) is thermodynamically more stable than (**2**), a fact suggested by an examination of the bond arrangements of the two compounds. The difference in stability, however, is less than that observed in the purine series, since in those cases rearrangement was essentially complete.[1]

A similar utilization of molecular sieve as a substitute for acid catalysts in the synthesis of imines and enamines was recently described by Taguchi and Westheimer.[8]

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