Note

A convenient procedure for formation of certain uracil and thymine anhydronucleosides

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Synthetic methods affording uracil and thymine anhydronucleosides in which O-2 of the pyrimidine ring is attached to a carbon atom of the carbohydrate ring have, with few exceptions¹⁻³, involved fairly harsh conditions⁴⁻⁸. A modification has now been found that allows convenient formation of this type of compound in good yield under mild conditions by utilizing 1,5-diazabicyclo[5.4.0]undec-5-ene (DBU). This reagent has been employed in the carbohydrate field for the formation of (a) 2-hydroxyglycals^{9,10}, and (b) unsaturated carbohydrates from methanesulfonates^{11,12}.

In the general procedure, a nucleoside having an appropriately situated leaving-group (in our examples, methylsulfonyloxy) is stirred at room temperature in dichloromethane with slightly more than one equivalent of DBU. After the reaction is complete, isolation of pure products is readily accomplished, either by filtration of precipitated products (8 and 10) or thick-layer chromatography (2, 4, and 6). For example, stirring of 2', 3'-O-isopropylidene-5'-O-(methylsulfonyl)uridine (1) with 1.1 equivalents of DBU in dichloromethane (dried over molecular sieves) for 4 h at room temperature, followed by thick-layer chromatography, provided the pure 2,5'- anhydronucleoside 2 in 85% yield. Other examples are given in Table I.



A comparison of the action of DBU with that of 1,5-diazabicyclo[4.3.0]non-5ene (DBN) in, for example, the $9 \rightarrow 10$ conversion, showed DBN to be less effective

	Yield (%)		33		75	
	Time (h)		0.5	2	4	
ANHYDRONUCLEOSIDE FORMATION DATA	Product	o-√	Msohac of Mso	CH ₃	MsoH ₂ C 0	0
	Starting material ^a		MsoH ₂ C		Mso0H2C 0	თ
	Yield (%)	85	76		69	
	Time (h)	4	20	ñ	30	
	Product	r S	Troths		Pro-	SO .
	Starting material ^a	H H	Trohge of N	E T	MsOH ₂ C Aco	G

⁴Abbreviations: Ac, acetyl; Ms, methylsulfonyl; and Tr, trityl.

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TABLE I

NOTE

than DBU, as it afforded only a 64% yield but took over twice as long. A similar superiority of DBU over DBN has been noted in certain dehydrobrominations¹³.

EXPERIMENTAL

The general procedure was that already described. All experiments were conducted at concentrations that were ~ 0.1 M in substrate and 0.11M in DBU. The products were characterized by identity of spectral and melting-point data with those in the literature: 2 (ref. 14), 4 (ref. 15), 6 (ref. 16), 8 (ref. 17), and 10 (ref. 16).

REFERENCES

- 1 I. L. DOERR, R. J. CUSHLEY, AND J. J. FOX, J. Org. Chem., 33 (1968) 1592-1599.
- 2 M. WADA AND O. MITSUNOBU, Tetrahedron Lett., (1972) 1279-1282.
- 3 S. SHIBUYA, A. KUNINAKA, AND H. YOSHINO, Chem. Pharm. Bull. (Tokyo), 22 (1974) 719-721.
- 4 S. TANG AND J. S. ROTH, Tetrahedron Lett., (1968) 2123-2125.
- 5 A. HAMPTON AND A. W. NICHOL, Biochemistry, 5 (1966) 2076-2082.
- 6 J. J. FOX AND I. WEMPEN, Tetrahedron Lett., (1965) 643-646.
- 7 N. C. YUNG AND J. J. FOX, J. Amer. Chem. Soc., 83 (1961) 3060-3066.
- 8 R. LETTERS AND A. M. MICHELSON, J. Chem. Soc., (1960) 1410-1412.
- 9 D. R. RAO AND L. M. LERNER, Carbohydr. Res., 19 (1971) 133-134.
- 10 D. R. RAO AND L. M. LERNER, Carbohydr. Res., 22 (1972) 345-350.
- 11 S. HANESSIAN AND N. R. PLESSAS, Chem. Commun., (1968) 706-708.
- 12 S. HANESSIAN AND A. P. A. STAUB, Carbohydr. Res., 16 (1971) 419-433.
- 13 H. OEDIGER AND F. MOLLER, Angew. Chem., Int. Ed. Engl., 6 (1967) 76.
- 14 D. M. BROWN, A. R. TODD, AND S. VARADARJAN, J. Chem. Soc., (1957) 868-872.
- 15 J. J. FOX AND N. C. MILLER, J. Org. Chem., 28 (1963) 936-941.
- 16 A. M. MICHELSON AND A. R. TODD, J. Chem. Soc., (1955) 816-823.
- 17 J. F. CODINGTON, R. FECHER, AND J. J. FOX, J. Amer. Chem. Soc., 82 (1960) 2794-2803.