

Specific Phosphorylation of the 2'- and 3'- Positions in Ribonucleosides

By A. W. SCHWARTZ

(Department of Exobiology, University of Nijmegen, Nijmegen, Netherlands)

Summary Adenosine is phosphorylated in alkaline solution by sodium trimetaphosphate to yield exclusively the 2'- and 3'-monophosphates.

THE reagent sodium trimetaphosphate has been reported to phosphorylate alcohols and carbohydrates in alkaline solutions.¹ During the course of an investigation into the phosphorylation of nucleosides by a variety of condensed phosphates in aqueous solution,² sodium trimetaphosphate was found to react specifically with the 2'- and 3'- hydroxy-groups of a ribonucleoside.

Sodium trimetaphosphate was synthesized by annealing a long-chain sodium polyphosphate preparation (Graham's salt) at 520° for 12 hr. The product was chromatographically homogeneous,³ and was resistant to the action of *E. coli* alkaline phosphatase, indicating the absence of end-groups. The Table shows the results of the reaction of adenosine (0.1M) with sodium trimetaphosphate (0.33M-Na₃P₃O₉) in NaOH (0.5M). The solution was heated under

reflux for 4.5 hr., and then fractionated on a column of Dowex 1 × 2 (formate) in 0.2M formic acid. The proportion of 3'- to 2'- isomers is reminiscent of that obtained from the hydrolysis of a 2', 3'- cyclic phosphate, which is a reasonable intermediate.

Nucleoside	Relative yields of mono-phosphate isomers (%)			Total conversion of nucleoside (%)
	5'	2'	3'	
Adenosine	0	42	58	31
Deoxyadenosine	37	—	63	2

Only 2% conversion of deoxyadenosine into nucleotide was observed, suggesting that a specific interaction of the trimetaphosphate ion with the *cis-vicinal* configuration of the ribonucleoside is involved.¹ In the absence of base, no reaction with adenosine could be detected.

(Received, October 6th, 1969; Com. 1509.)

¹ W. Feldmann, *Chem. Ber.*, 1967, **100**, 3850.

² A. Schwartz and C. Ponnampuruma, *Nature*, 1968, **218**, 443.

³ J. Aurenge, M. Degeorges, and J. Normand, *Bull. Soc. chim. France*, 1964, **31**, 508.