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ADENINE DERIVATIVES AS PHOSPHATE ACTIVATING GROUPS FOR PREBIOTIC RNA SYNTHESIS

K. JOSEPH PRABAHAR and JAMES P. FERRIS
Department of Chemistry, Rensselaer Polytechnic Institute
Troy, NY 12180-3590, U. S. A.

The effect of activating groups on the oligomerization of 5'-AMP on montmorillonite was investigated using heterocyclic bases such as 4-aminopyridine derivatives, 2-aminobenzimidazole, 1,2,4-triazole, pyrazole and morpholine and we concluded that a good activating group should possesses the following features (Prabahar *et al.*, 1994):

1. For efficient oligomerization at pH 8, the pKa value of the heterocyclic bases should be between 6 and 9.
2. The heterocyclic moiety of the activated nucleotide either could have a positive charge or could be protonated by montmorillonite.
3. The positive charge has to be stabilized by resonance interaction and solvation.

Based on the above concepts, we selected additional possible activating groups among the purine and pyrimidine heterocyclic bases. Purine and pyrimidine bases were chosen because if these bases were utilized in the prebiotic synthesis of RNA, they should also have been sufficiently abundant to have also served as phosphate activating groups.

Among the purine bases, 1-methyl, 2-methyl and 3-methyladenine derivatives of 5'-AMP were synthesized (Mukaiyama *et al.*, 1971; Ivanovskaya *et al.*, 1987) and oligomerization reactions were carried out on montmorillonite. 1-methyl and 3-methyladenine derivatives

of 5′-AMP react in the presence of montmorillonite to give oligomers containing up to 11 monomer units where as 2-methyladenine derivative of 5′-AMP on montmorillonite gives oligomers containing up to six monomer units.

The oligomers formed from the 1-methyl and 2-methyladenine derivatives of 5′-AMP were isolated and their oligomeric compositions were determined. The physico-chemical properties such as binding and hydrolysis of the methyladenine derivatives of 5′-AMP were studied in the presence and absence of montmorillonite and the results will be discussed.

References

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