

THE RNA WORLD: APPROACHES TO THE PREBIOTIC SYNTHESIS OF RNA

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It has been proposed that the main biopolymers in the first life on earth was composed of RNA and that the protein-DNA world evolved from it. The concept of the RNA world is based on the observations that RNA can store information and can catalyze chemical reactions. In vitro evolution studies have demonstrated that RNA can catalyze a number of chemical reactions. It remains to be demonstrated that RNA can be formed from monomers that may have been present on the primitive earth and that these RNAs possess catalytic activity.

Experimental studies directed towards the prebiotic synthesis of RNA will be described. Plausible and not so plausible steps in the currently proposed prebiotic pathways will be identified.¹ Possible steps in the process will be presented including the formation of pyrimidine and purine bases and ribose or ribose analogs. Experiments describing the formation of nucleotides will then be outlined followed by approaches to the activation of their phosphate groupings. Progress made in the mineral-catalyzed polymerization of activated nucleotides will be outlined. Speculation will be presented suggesting how these polymers may have initiated the RNA world.

1. Some of the successes and difficulties with the prebiotic synthesis of RNA are outlined in Ferris, J. P.: 1987 Cold Spring Harbor Symposia on Quantitative Biology, "Prebiotic Synthesis: Problems and Challenges" 52, 29-35 (1987).