INTRODUCTION

Irrespective of different theories proposed\(^1\) for the origin of life, it is still far from understanding that which principles really ruled the transition of inanimate matter to animate matter. Starting with the first step of the process of origin of life, it is desired to find out the plausible prebiotic synthetic conditions for the generation of simple molecules like amino acids, nucleobases, lipids, sugars, nucleotides, etc. or their precursors\(^2\) which are primarily associated with the origin of life. This should be followed by the search for those conditions which led to the condensation of amino acids to form polypeptides and the condensation of nucleobases and sugars to form nucleosides.\(^3\) Sequentially, the above said two events were succeeded by the appearance and development of cellular membranes, made of internally synthesized lipids and other surfactant compounds, e.g., peptides or polycyclic aromatic hydrocarbons.\(^4\) These boundaries would allow the enclosed protocellular system to continuously grow and divide. After the cellular compartmentalization, another crucial step about the origin of life is to know investigation about the starting of the replication of the cellular materials.\(^5\)

![Chart 1](chart1.png)

For the creation of most of the biomolecules during the process of origin of life, a common chemical reaction was the formation of C – N bond. For instance, it is primarily the C – N bond formation which is responsible for the conversion of amino acids to peptides (peptide bond) and glycosylation of nucleobases – formation of...
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nucleosides (Chart 1). As per the prevalence of environmental conditions during that time, the prebiotic C – N bond formation is assumed to have taken place under the uncatalyzed aqueous / gas phase reaction conditions.

Focusing on this fundamental event, in the present work, we have tried to search for the most probable prebiotic conditions which were suitable for the C – N bond formation. Hence, the formation of nucleobases and peptide bond was demonstrated under the gas phase as well as solution phase reaction conditions. Also glycosylation of nucleobases was achieved under uncatalyzed aqueous phase conditions. Remarkably, these reactions were successfully carried out without using any catalyst. However, the role of H-bond during these reactions was realized. Another significant achievement of this research work was the development of an economical and environment friendly synthetic protocol for procuring small peptides.

For the ease of presentation, the research work is divided into five chapters:

Chapter 1: Review of literature
Chapter 2: Formation of adenine from CH₃COONH₄/NH₄HCO₃—the probable prebiotic route for adenine
Chapter 4: Transformation of gas phase amino acid clusters to dipeptides: A nice approach to demonstrate the formation of prebiotic peptides
Chapter 5: Peptide Bond Formation Without Using Coupling Reagent: Synthesis of Sequence Specific Tetra- and Penta-Peptides
References


