Non-Enzymatic Synthesis of Duplex Nucleic Acid

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On prebiotic Earth, environments existed at the interface between land and water characterized by small aqueous pools undergoing evaporation and refilling at elevated temperatures, known as hydrothermal fields. Previous reports have shown that by simulating prebiotic environmental conditions in thermal fields with cyclic dry and wet periods, ampiphilic molecules in the mixture could form fluid lamellar matrices and encapsulate other small molecules [1]. Subsequent report showed that linear charged polymers resulted from these experiments [2]. The lipid matrices work as organizing agents for the condensation of monomers into polymers. The goal for the present study is to evaluate whether the simulated prebiotic environment and the chemical potential made available by cycles of hydration and dehydration is sufficient to drive the synthesis of oligomers resembling DNA, and to demonstrate whether the linear polymers form duplex structures. In order to do so, we expose a mixture containing deoxynucleoside monophosphates and an oligomer template in a lipid suspension to the already established conditions of hydration-dehydration cycles, and analyze using a biological nanopore detector, as well as more conventional tools such as gel electrophoresis.

[1] Deamer D (2012) *Chemical Society Review* 41:5375-5379.
[2] DeGuzman V, Vercoutere W, Hossein S, and Deamer D (2014) *Journal of Molecular Evolution* 78: 251-262.