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Mixtures of Hygroscopic Salts and Urea as Prebiotic Media for the Condensation of Amino Acids

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In origin-of-life research, the ‘compartmentation problem’ entails how the first living systems were able to sequester or protect themselves from their environment and control the volume and moisture content of their enclosures [1]. Here, we describe a model in which mixtures of simple salts and urea are able to absorb limited amounts water from the atmosphere and serve as media to host reactions of prospective importance to the origin of life on Earth. We have quantified the extent of hydration of various mixtures of salts to form highly saline aqueous solutions as a function of temperature, relative humidity, and composition of the mixture (e.g., identity of the cations and anions present, as well as the concentration of urea). We also present preliminary studies in which a selection of these mixtures are used as alternative environments for the oligomerization of amino acids, which we evaluate by measuring the kinetics of hydrolysis and condensation reactions.

[1] J. W. Szostak, D. P. Bartel, and P. L. Luisi (2001) *Nature* 409, 387-390

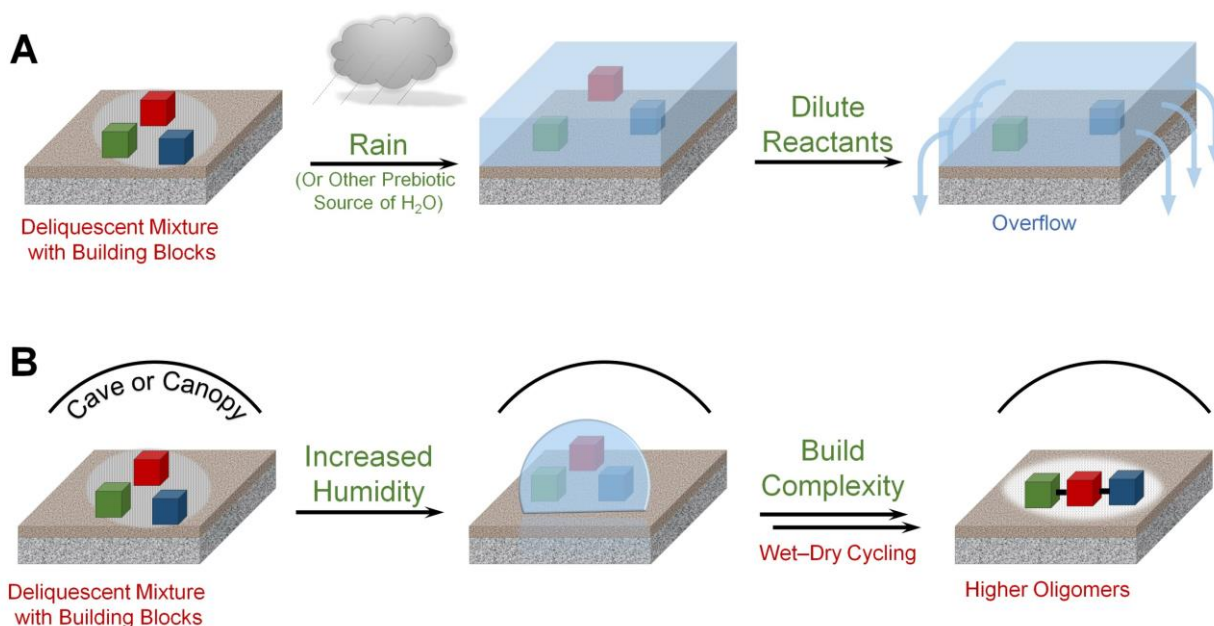


Figure 1 – Typical prebiotic sources of water, such as rain or tides, pose the risk of ‘overwatering’ a chemical system and limiting reactions such as oligomerization (A). In the proposed system (B) deliquescent mixtures regulate the volume of water in the system and prevent dilution.