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Prebiotic Organic Reactions in Water

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Most organic compounds are not water-soluble, but they still can react in water by different mechanisms.

One prominent mechanism is the "on-water", in which the water-insoluble organic compounds are driven towards each other when placed in water by the hydrophobic effects. A proximity of the organic molecules may help orbital alignment of the reactants. As a result, these reactions not only occur but are often faster than those in which the organic materials are soluble in water. In addition, a better stereospecificity is often obtained under the "on-water" conditions [1,2]. Salts, such as amino acids, can modulate the reaction rate [3], which is of prebiotic importance, since amino acids and various inorganic salts were presumably present in the prebiotic soup. If water-insoluble organic compounds are placed in supercritical water, they dissolve, since such water behaves as acetone, which is an excellent solvent for organic compounds. Supercritical water also has acid-base catalytic properties which allows for a variety of otherwise inaccessible reaction pathways [4,5]. Many prebiotic reactions which may occur "on-water" and in supercritical water are also common organic reactions. Many of these were studied as "green" chemical reactions (environmentally friendly, since they occur in water) [5].

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