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Computational Models of the Transmission of Chirality: The Chemical Evolution of Homochirality, A Biosignature of Life

At the current point in time, there is still no complete understanding of how life formed on early Earth. One mystery is the evolution of homochirality; many biologically important molecules have two stereoisomers: L- and D-. For reasons we do not yet understand, all 20 amino acids, the building blocks of proteins, are L-amino acids. Using Kintecus™, we designed computational models of chemical systems to understand the transmission of chirality from a molecular template. In the model, we found conditions showing that with an exceedingly small excess of the L- form of precursors, there was a large production of L- molecules. We learned that the breaking of chiral symmetry to yield a homochiral environment might be expected from simple chemical systems. At specific temperatures, homochirality was achieved in favor of L- as desired. A model was made where if the concentration of L- was greater than D- by as few as 1.0E-14M, it would result in homochirality over a large temperature range. It is suggested this slight initial excess of L- resulted from the bombardment of meteorites on earth occurring at this time.