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Life supporting molecular dynamics under extreme thermal environments

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In the era of global warming, there has been a tremendous concern over as to how life can support itself under extreme temperature regimes. The most primitive bacteria could be used as an ideal model system to look into the molecular dynamics for understanding the biochemical basis of thermophily. The signature molecule of prokaryotes happens to be the DNA which can undergo dynamic change with change in the temperature conditions where bacteria could survive comfortably. The model of nucleotide diversity in psychrophilic, mesophilic and thermophilic bacteria and established that transformation of DNA base composition could enable these organisms to thrive best at their respective optimal growth temperatures, where the frequency of GC base pairs increased with increase in growth temperature from psychrophilic to thermophilic and the frequency of AT base pair decreased with decrease in growth temperature from thermophilic to psychrophilic and vice versa. The other macromolecular attribute, that could support life at high temperature, pertains to rapid turnover of molecules including enzymatic proteins which could serve as the basis for high temperature adaptation, in which macromolecular charged environment and ordered cellular organization contributed significantly for sustainability of life under diverse extreme temperature conditions.

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