

Revisiting Rare Tautomeric Forms in DNA: A Theoretical Model for Predicting Genetic Mutations

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As already noted by Watson and Crick by 1953, the correct replication of DNA rests on the assumption that the original genetic sequence of the adenine-thymine (AT) and guanine-cytosine (GC) base pairs is fully preserved during the process [1]. However, protons along the interbase hydrogen-bond network are not static entities but they can be exchanged through proton transfer (PT) reactions. The resulting non-canonical A*T* and G*C* structures are the so-called rare tautomers. In Watson and Crick's words: "It would be of interest to know the precise difference in free energy between the various tautomeric forms under physiological conditions". Unfortunately, rare tautomeric forms are very difficult to detect [2], so no direct and accurate free energy measure has been discerned. In contrast, theoretical chemistry could provide an accurate quantification of PT reactions in DNA and their biological consequences [3]. In this talk, we overview the literature as well as part of our current work devoted to assess the importance of rare tautomers as promoters of mutations in DNA [4].

References

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