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Generation of information diversity and DNA mutation based on the Quantum mechanics rules (Review)

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Introduction: In this theory, which is based on the quantum tunneling of the proton (hydrogen atom) of the organic base, the energy to move the proton can sometimes be supplied by ultraviolet waves irradiated to the body, but even so, it has not reached the amount of kinetic energy allowed to overcome the potential barrier, because the proton must first free itself from the potential resulting from the covalent bond. Here the concept of quantum tunneling can help. During the experiments, the proton of the organic base was replaced by deuterium, and because the mass of deuterium is greater than the mass of a proton, its tunneling probability is less, as a result, the mutation occurred at a lower rate. In such a case, a proton moves between A and T, or a proton moves between C and G. In the connection between organic bases in DNA, a hydrogen bond is established, and this hydrogen bond can be considered individually as a symmetrical potential well, according to the Schrödinger equation, the wave function in such a potential well has an oscillating response and has an even or odd parity and the probability of the presence of the particle on the left and right sides are equal to each other. According to the laws of quantum mechanics, two situations can occur when we reflect the wave function in the origin, which this wave function is the answer to the Schrödinger equation in a symmetric potential well. If the value of the wave function after reflection is the same as the wave function before reflection has even parity. If the value of the wave function after reflection is the additive inverse of the wave function before reflection it has odd parity. However, the probability of the presence of the particle, which is the square of the wave function, is the same on both sides. However, due to the presence of two hydrogen bonds near each other and disrupting each other's potential, the shape of the potential becomes slightly different, in other words, the proton potential of one organic base affects the proton potential of another organic base. Solving the Schrödinger equation for such a potential form is difficult, but at least it is clear that the particle can tunnel from left to right or vice versa. In the first case, the protons of both the upper and lower bands move in the opposite direction simultaneously. In such a case, the shape of the potential before and after the movement of the proton does not change, but the potential of the upper and lower bond are reversed. Of course, it is also worth mentioning that normally, this proton transfer alone does not cause mutation, but after cell division and DNA replication, the mutation occurs because the shape of the organic bases has changed. In the second case, only one of the protons of the organic bases

tunnels. After tunneling, the potential changes, and both organic bases become charged. This charge exists due to the interchange of hydrogen, which can be justified by examining the Lewis rule for the structure of the compound.

Methods: A review of articles on quantum biology and proton tunneling in DNA

Results: Most people consider the cause of DNA mutation to be external factors. Considering the effect of quantum mechanics on DNA mutation, it can be concluded that mutation also occurs by chance.

Conclusion: As quantum phenomena can occur at elementary particles, atomic, and molecular scales, it is essential to investigate their effects in biology and genetics.

Keywords: Quantum; Proton tunneling in DNA; Quantum biology