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Director

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Citation (summary) on the outstanding research work on which award is claimed in about 250 words signed by the nominator.

Dr. Nair has made discoveries that provide fundamental insight regarding the activity of DNA polymerases that can become part of Molecular Biology textbooks and can aid the targeted engineering of these enzymes to develop better reagents for various biotechnology applications. Using time resolved crystallography, Dr. Nair has shown that hydrolysis of the pyrophosphate moiety is a critical and intrinsic step in the DNA synthesis reaction. This discovery answers a long outstanding question regarding the energetics of the DNA synthesis reaction. The study also proves that the DNA synthesis reaction is a stepwise dissociative SN2 reaction with a Penta covalent intermediate. The corresponding manuscript was published as "Breakthrough" article in the Nucleic Acids Research journal. Also, Dr. Nair has elucidated the mechanism utilized by DNA polymerases to prevent adventitious ribonucleotide incorporation during DNA synthesis and thus prevent genomic instability that can adversely affect the survival of the organism. Dr. Nair has detected the presence of a previously uncharacterized "polar filter" that prevents the stabilization of ribonucleotide triphosphates in the DNA polymerase active site in a conformation compatible with productive catalysis. Mutations in the polar filter residue of certain human DNA polymerases were observed in samples obtained from cancer patients and hence the discovery has biomedical implications also. In addition, Dr. Nair has shown that the proofreading activity in DNA polymerases is not only capable of removing mismatches but are also capable of inline dynamic error correction to remove mis incorporated ribonucleotides and oxidized nucleotides to maintain the integrity of the genome.

Yours sincerely,

(Dinakar M. Salunke)

Director