Role of enzymes in molecular biology.

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Editorial Note

Enzymes catalyse nearly all of the chemical reactions that occur in biological systems. Enzymes are generally proteins but also include catalytic DNA and catalytic RNA [1,2]. As effective biological catalysts, enzymes work by lowering a reaction's activation energy barrier, thereby increases the rate and specificity of the reaction. Enzymes also help cells to communicate with each other, keeping cell growth, life and death under control.

Molecular biology enzymes and their role according to specificity

DNA polymerases

DNA polymerase is an enzyme that synthesizes DNA molecules from nucleoside triphosphates, the molecular precursors of DNA. These enzymes are essential for DNA replication and work in groups to create two identical DNA duplexes from a single original DNA duplex.

There are number of DNA polymerases and they have different role in different reaction, some of the examples are given below:

A) Bst DNA Polymerase, Exonuclease Minus - The enzyme has 5′→3′ polymerase activity and strand-displacement activity, but it lacks 3′→5′ exonuclease activity. It also has reverse transcription activity [1].

B) NxGen phi29 DNA Polymerase - NxGen phi29 DNA polymerase is a highly processive enzyme. The enzyme also contains a 3′→5′ exonuclease activity that enables proofreading capability.

EconoTaq DNA Polymerase, MasterAmp Taq DNA Polymerase, MasterAmp Tth DNA Polymerase are also has different role in molecular biology [1].

RNA polymerases

RNA polymerase is an enzyme that is responsible for copying a DNA sequence into an RNA sequence, during the process of transcription.

There are number of RNA polymerases and they have different role in different reaction, some of the examples are given below:

A) NxGen T7 RNA Polymerase - T7 RNA Polymerase catalyses the 5′→3′ RNA synthesis from the T7 promoter. It recognises the T7 promoter and terminator sequences with high specificity.[1] It is a DNA-dependent RNA polymerase cloned from the T7 bacteriophage [3].

B) T7 R&DNA Polymerase - This enzyme is a mutant form of T7 RNA polymerase (Y639F mutant). This mutant enzyme uses the same T7 transcription promoters as the wild-type T7 RNA polymerase [1].

MMLV High Performance Reverse Transcriptase, NxGen M-MuLV Reverse Transcriptase, EpiScript RNase H– Reverse Transcriptase [4] has important role in different reactions in molecular biology

Ligases

DNA ligase is an enzyme which can connect two strands of DNA together by forming a bond between the phosphate group of one strand and the deoxyribose group on another. It is used in cells to join together the Okazaki fragments which are formed on the lagging strand during DNA replication [1].

There are number of ligases and they have different role in different reaction. Some of the examples are given below:

A) T4 RNA Ligase 2 - T4 RNA Ligase 2, Deletion Mutant, T4Rnl2(1-249), ligates single-stranded, adenylated DNA or RNA (App-DNA or AppRNA) oligonucleotides to small RNAs [1].

B) CircLigase ssDNA Ligase - It is thermostable; it ligates the ends of ssDNA in the absence of a complementary sequence. It also has one of the form CircLigase II ssDNA Ligase which catalyses intramolecular ligation [5].

Many other enzymes have applications in molecular biology such as reverse transcriptase, DNA endonucleases, DNA exonucleases, RNA nucleases, and lysozyme.

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