

WELCOME

Assignment Presentation On

DNA FUNCTION: EXPRESSION EXCHANGE

OF GENETIC MATERIAL MUTATION

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PRINCIPLES OF BIOTECHNOLOGY (MBB 501)

DNA or deoxyribonucleic acid is genetic material that transform the genetic information from one organism to their off spring.

Located in nucleus and mitochondria.

The information of DNA is stored as code (made up of A,G,C,T).

99% of base are same. The order of bases determines the individually.

DNA:

Fig No. 1

Structure Of DNA

DNA Functions:

Genetic Information Storage: DNA stores genetic information in the form of nucleotide sequences

Transmission of Genetic Information: DNA passes genetic traits from parents to offspring during reproduction.

Replication: DNA replicates itself during cell division, ensuring that each new cell receives a complete set of genetic instructions.

Transcription: DNA serves as a template for the synthesis of RNA molecules, which carry genetic information from DNA to the ribosomes for protein synthesis.

Repair and Maintenance: DNA has mechanisms to repair and maintain its integrity, ensuring that genetic information is preserved and transmitted accurately.

DNA Expression:

Transcription:

Initiation: An enzyme called RNA polymerase binds to the DNA molecule at a specific region called the promoter.

Unwinding: The DNA double helix is unwound, and one of the strands serves as a template for transcription.

Synthesis: RNA polymerase reads the template strand and matches the incoming nucleotides to the base pairing rules (A-T and G-C).

Elongation: The RNA molecule grows as nucleotides are added to the chain.

Termination: Transcription is completed when the RNA polymerase reaches a specific termination sequence.

Translation

Initiation: The RNA molecule (now called messenger RNA or mRNA) is released from the DNA template and travels out of the nucleus.

Ribosome binding: The mRNA binds to a ribosome, which reads the sequence of nucleotides.

tRNA binding: Transfer RNA (tRNA) molecules, each carrying a specific amino acid, bind to the ribosome.

Peptide bond formation: The ribosome links the amino acids together forming a polypeptide chain.

Elongation: The polypeptide chain grows as more amino are added.

Termination: Translation is completed when the ribosome reaches an specific termination sequence. The final product of DNA expression is a functional protein that performs a specific role in the cell.

Fig No.2 Transcription And Translation.

Exchange Of Genetic Material:

The exchange of genetic material, also known as genetic recombination, is a fundamental process in biology that increases genetic diversity.

Types of Genetic Recombination:

Crossing Over: Exchange of genetic material between homologous chromosomes during meiosis (cell division that results in gametes).

Independent Assortment: Random separation of chromosomes during meiosis, resulting in unique combinations of genetic traits.

Mutation: Changes in the DNA sequence of an individual, resulting in new genetic traits.

Gene Conversion: Non-reciprocal exchange of genetic material between homologous chromosomes.

Mechanism Of Genetic Recombination.

Homologous Recombination.

Non-Homologous End Joining(NHEJ)

Microhomology-Mediated end Joining

Importance Of Genetic Recombination.

Increased Genetic Diversity

Evolution

Adaptation

Examples Of Genetic Recombination.

Meiosis

Bacterial Conjugation

Gene Editing

Fig No.3

Meiosis

Mutation:

Mutation is a change in the DNA sequence of an organism. It can occur spontaneously or be induced by environmental factors.

Types of Mutations

Point Mutation: A single nucleotide base is changed, inserted, or deleted.

Frameshift Mutation: A nucleotide base is inserted or deleted, changing the reading frame of the genetic code.

Chromosomal Mutation: A change in the number or structure of chromosomes.

Gene Mutation: A change in a single gene.

Causes of Mutations:

Spontaneous

Environmental Mutagens

Genetic Mutagens

Effect Of Mutation:

Neutral Mutation

Beneficial Mutation

Deleterious Mutation

Lethal Mutation

Examples Of Mutation:

Sickle Cell Anemia

Cystic Fibrosis

Down Syndrome

Fig No.4

Gene Mutation

Conclusion

The exchange of genetic material is a fundamental process in biology that increases genetic diversity and drives evolution. Through various mechanisms such as crossing over, independent assortment, mutation, and gene conversion, genetic recombination creates new combinations of genetic traits. This process is essential for adaptation, evolution, and the survival of species.

THANK YOU