

Introduction

This course encompasses the functional interaction between DNA, RNA, protein synthesis, and their regulation.

Objectives

1. To understand the detail mechanism of transcription.
2. To understand the participation of various proteins like general transcription factors, activators, mediators, enhancers, and inhibitors in the assembly of RNA polymerase on the promoter for the initiation of transcription both in prokaryotes and eukaryotes.
3. To understand the post-transcriptional modification for the safe exit of newly synthesized mRNA from nucleus into the cytoplasm in eukaryotes.
4. To understand the significance of chromatin structure and its effects on the activity of transcription, nucleosome positioning and remodeling
5. To understand the detailed mechanism of protein synthesis both in prokaryotes and eukaryotes.
6. To understand the post translational modification of the newly synthesized polypeptide chain for the proper functioning of the protein.

- To understand how the genes are regulated at the level of transcription and translation
- To understand the role of miRNA in posttranscriptional gene regulation
- To understand the function of RNAi in silencing or deactivating gene at the stage of translation by degrading specific mRNAs and blocking its translation into protein.

Theory

Transcription: The detailed mechanism, types of Promoters and RNA Polymerases of Prokaryotes and Eukaryotes; General Transcription factors, Activators and Enhancers in Eukaryotes; Chromatin structure and its effects on transcription, Post-transcriptional events (Splicing, Capping and Polyadenylation); Other RNAs, tRNA and rRNA processing, miRNA and RNAi. Protein synthesis: the detailed mechanism of Initiation, Elongation and Termination in Prokaryotes and Eukaryotes. Post-translational modifications. Gene Regulation: *Lac* operon and *Trp* operon.

Text Book

- Weaver, R., 2007. *Molecular Biology* 4th Ed. McGraw-Hill.

Additional Reading Material

- Kornberg, A., 2005. *DNA Replication*, 2 Ed. University Science Books.
- Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R., 2007. *Molecular Biology of the Gene* (6th Ed.)
- Lewin, B.C., 2007. *Genes IX*. 9 Ed. Jones and Barlett Publication.
- Krebs, J.E., Goldstein, E.S., and Kilpatrick, S.T., 2008. *Lewin's Genes X*.

UZO-542 Molecular biology II (Lab)

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Introduction

The field of Molecular Biology arose by the convergence of works of Geneticists, Biochemists and Physicists on a common goal of nature of inheritance. It refers to the study of structure and function of macromolecules essential to life such as nucleic acids and proteins.

Objectives

- To make copies of DNA by PCR.
- To learn quantification of DNA, RNA and proteins.
- To analyze DNA, RNA and proteins by gel electrophoresis
- To separate DNA, RNA and proteins from various samples.

Practicals

Amplification of DNA fragments by PCR technique
 Quantitative estimation of DNA, by UV spectrophotometer
 Separation of different sized DNA and agarose gel electrophoresis.
 Extraction of RNA from eukaryotic /prokaryotic samples
 Quantitative estimation of, RNA by UV spectrophotometer
 Separation of RNA fragments on agarose gel
 Extraction of protein from tissue.
 Quantitative estimation of Protein by UV spectrophotometer
 Separation of protein by SDS- PAGE.

Text Book

- Weaver, R., 2007. *Molecular Biology* 4th Ed. McGraw-Hill.

Additional Reading Material

- Brown, T. A., 2010. *Gene cloning and DNA analysis: an introduction*. (6th Ed.)
- Green and Sambrook, 2012. *Molecular Cloning, A Laboratory Manual*, 4th Edition. CSH Press Publication.
- Sean, R. and Emily, A. 2008. *Current Protocols Essential Laboratory Techniques*. John Wiley & Sons Publication.