BT 642 ALTERNATIVE SPLICING AND DISEASES (3-0-0-6)

Preamble:

As we have entered in an era of exon-resolution biology, “exonomics”, in which every major biological study involving multi-exon genes will take into account the functions and properties of different splice variants produced from a gene, hence the course structure is to provide an insight of the splicing process.

The aim of this core course is to provide a detailed insight of the importance of alternative splicing as a fundamental biological phenomenon and its physiological mechanisms which impacts human health. In addition, it will provide molecular mechanisms of splice site regulations to generate protein isoforms with often distinct functions from a common precursor mRNA. Altogether, this course offers the understanding of a key cellular process along with a sense of its complex regulatory networks.

Course contents:

Nuclear Organization and Spliceosome Assembly: Splicing and the nucleus, Compartmentalization of Splicing and Splicing factors, Introduction to the Spliceosome, Composition and Structure, In vitro Spliceosome Assembly, Insights from In vivo Analysis of Spliceosome Assembly, Commitment to particular splice sites, Dynamics of spliceosomal RNA-RNA rearrangements, Coordinated action of RNA and Proteins for recognition of splice sites.

Alternative splice site selection: What is alternative splicing? The players that regulate splicing (SR family of proteins and hnRNP family of proteins), Exon skipping, cryptic splice site activation, Intron retention, Pseudo exon inclusion, The generation of aberrant transcripts, The Global view towards a splicing code.

Annexure-130/10(c) contd…..

Genome-wide studies and functional insights of splicing in the Brain: Microarray-based methods for discovery and characterization of AS, Non Microarray-based Methods, Intersection between cancer cells and neurons, Benefits of splicing regulation in the Brain, Understanding the nature of Protein-RNA interactions, An RNA Map for RBP-dependent splicing regulation, Relating RNA Map to Mechanism of Splicing Regulation.

Alternative Splicing in Diseases: Cancer and misregulated splicing, Tauopathies: Mutation in the MAPT Gene, Myotonic Dystrophy, Facioscapulohumeral Muscular Dystrophy (FSHD), Prader-Willi Syndrome (PWS), Therapeutic approaches to correct splicing pattern.

Texts/References:

1. S. Stamm, C. Smith and R. Luehrmann, *Alternative pre-mRNA Splicing: Theory and Protocols*, 1st Edn., Wiley Bl1ackwell, 2012.
2. B. J. Blencowe and B. R. Graveley, *Alternative Splicing in the Postgenomic Era*, in Advances in Experimental Medicine and Biology, Vol 623. 1st Edn., Springer, 2007.
3. S. Krawetz, *Bioinformatics for systems Biology*, Humana Press, 2009.
4. J. Wu, *Posttranscriptional gene Regulations*, 1st Edn., Wiley Blackwell, 2013.
5. B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts and P. Walter, *Molecular Biology of the Cell*, 6th Edn., Garland Publishing, 2015.