Syllabus for RNA Biology Course (JBL 305)
Aug-Dec 2024

Unit 1- RNA and RNA-binding Proteins

Types of RNA; RNA editing and modifications; RNA structure; RNA folding; RBPs structure and function; RNA-RNA and RNA-RBP interactions; Principles of liquid-liquid phase separation; Dynamics of RNP granules formation and disassembly.

Unit 2- RNA synthesis and Processing

Mechanisms and dynamics of transcription initiation, elongation, and termination; Role of eRNA in transcription; Regulation of 5' capping, 3' end processing and polyadenylation; Splicing-spliceosome assembly, splicing mechanism, and alternative splicing; Co-transcriptional modifications.

Unit 3- RNA Transport and Localization

Mechanism and dynamics of nuclear RNA export; Role of nuclear pore; Modes of cytoplasmic RNA localization: selective entrapment, targeted decay and active transport.

Unit 4- Translation, Co-Translational Quality Control and RNA surveillance mechanisms

Mechanism and dynamics of translation; Co-translational localization of RNA; Ribosome-associated quality control; Nonsense-mediated decay; Non-stop decay; No-Go decay; Modes of translational repression.

Unit 5- RNA Degradation

Nuclear and cytoplasmic degradation of mRNA; Deadenylation, Uridylation and readenylation; Decapping; Co-translational degradation; Targeted RNA decay; Lysosome-mediated RNA decay.

Unit 6- RNA Homeostasis in Disease and RNA therapeutics

Dysregulation of RNA homeostasis and its implications in diseases (cancer, neurodegenerative diseases), RNA-based therapeutic approaches and future directions.