Contribution ID: **55** Type: **Poster**

Riboswitches as RNA-based Regulatory Switches: Molecular Mechanisms, Biological Roles, and Emerging Applications

Riboswitches are structured non-coding RNA elements that reside in the untranslated regions (UTRs) of mRNA and directly bind small molecule ligands to regulate gene expression. These RNA motifs represent a unique, protein-independent mechanism of genetic control, offering insights into the ancient evolutionary origins of gene regulation. This review comprehensively discusses the discovery, classification, and molecular mechanisms of riboswitches, emphasizing their biological significance in both prokaryotic and limited eukaryotic systems. We explore their structural dynamics, mechanisms of action, and the range of metabolites they sense. Moreover, we address the emerging applications of synthetic and natural riboswitches in biotechnology and medicine, particularly in synthetic biology circuits and antibiotic development. Despite extensive research, gaps remain in our understanding of riboswitch folding kinetics, their roles in eukaryotic systems, and their therapeutic potential. By identifying these limitations and proposing future directions, this review contributes to the ongoing academic conversation surrounding RNA-based regulation and its translational potential.
Keywords: Riboswitch, RNA regulation, gene expression, aptamer, synthetic biology, ligand binding

Author: T G, SONALIKA

Presenter: T G, SONALIKA

Track Classification: Biological Sciences