Contribution ID: **87** Type: **Poster**

Enhancer RNAs Explained: New Players in Gene Regulation, Brain Function, and Cancer

Enhancer RNAs, or eRNAs, are a newly appreciated type of non-coding RNA produced from regions of our DNA called enhancers—special control panels that help switch genes on or off. For years, these RNAs were thought to be meaningless background noise. Today, scientists recognize that eRNAs are powerful molecules that help fine-tune how and when our genes are activated, especially in complex biological processes like brain development, cancer, and early growth in embryos.

Although eRNAs don't make proteins like traditional messenger RNAs (mRNAs), they are far from useless. These short, quickly degraded RNAs are produced exactly when and where certain genes need to be expressed. They assist in opening tightly packed DNA, making it easier for other molecules to access the gene. eRNAs also help bring distant parts of the DNA together, forming loops so that enhancers can directly contact gene promoters (the "on switch"areas of genes). This physical looping is essential for turning genes on at the right time.

Additionally, eRNAs help recruit RNA Polymerase II—the enzyme responsible for making RNA from DNA —and help it move smoothly along the gene so that the full message is copied correctly. Some eRNAs also interact with helper proteins that modify DNA-packaging proteins (called histones), keeping the chromatin in an "open"state that promotes gene activity.

In cancer, eRNAs have been found to boost the activity of genes that make cells grow uncontrollably. In the brain, eRNAs are quickly made in response to nerve signals and help activate genes needed for learning and memory. During development, eRNAs help guide the correct timing and pattern of gene activity so that cells grow into the right tissues and organs.

This Paper brings together all these insights to show how these small, overlooked RNAs are central to the big picture of gene control. We also discuss how modern technologies like CRISPR and RNA-targeting drugs might allow us to use eRNAs as future tools for diagnosing or treating disease.

Authors: Mr YOUSOUF, Mahamat (Student); T G, SONALIKA; Mr SINGH, Vikrama aditya (Student)

Co-authors: Ms BS, Chaitra (Proffesor); Ms VH, Jayshree (Proffesor); Mr ANANTHARAMAN, Sheshadri (Proffesor)

Presenters: Mr YOUSOUF, Mahamat (Student); T G, SONALIKA; Mr SINGH, Vikrama aditya (Student)

Track Classification: Biological Sciences