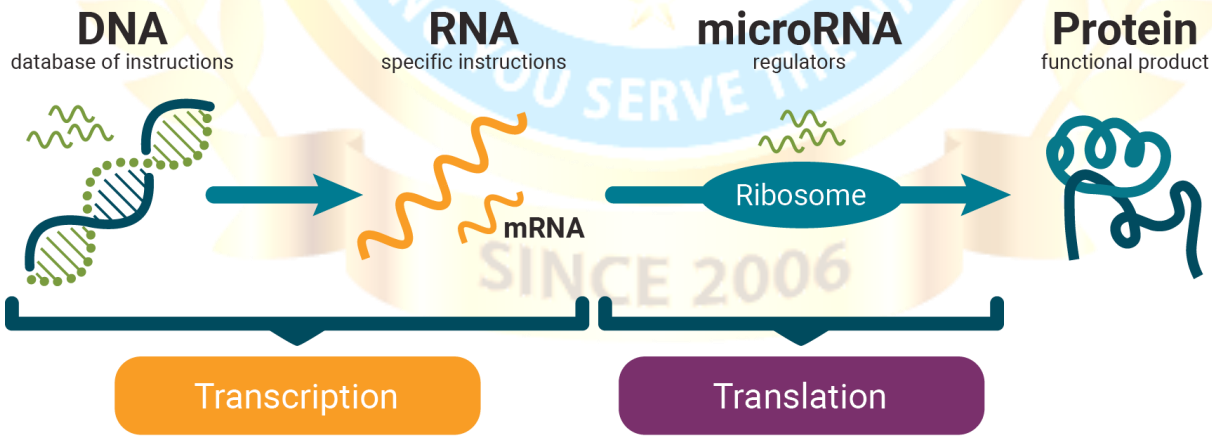
MICRO RNA – NOBEL PRIZE IN MEDICINE

News: The **Nobel Prize in Medicine** was awarded to two US scientists, **Victor Ambros and Gary Ruvkun**, for their groundbreaking discovery of **microRNA**—a previously **unknown type of genetic switch**. This discovery holds promise for developing new medical treatments, although none are currently available to patients.

WHAT'S IN THE NEWS?

What is microRNA?

- Each cell in the human body contains the same genetic instructions, known as **DNA**.
- However, different cells (like brain cells and muscle cells) interpret these instructions differently.
- This process is called **gene regulation**, where certain parts of the DNA are activated or deactivated.
- **Role of RNA**: Ribonucleic acid (RNA) typically acts as a messenger, conveying instructions from DNA to proteins, which are essential for building and maintaining cells.
    - An example of this is the **messenger RNA (mRNA)** used in COVID-19 vaccines, which instructs cells to produce proteins that fight the virus.
- **MicroRNA (miRNA)** is a **small, non-coding RNA molecule** that plays a key role in regulating gene expression.
- Unlike **messanger RNA (Mrna),** which carries instructions to make proteins, microRNA works by binding to specific mRNA molecules and preventing them from being translated into proteins or by degrading the mRNA altogether.



The Discovery of microRNA

- Ambros and Ruvkun discovered microRNA while studying the interactions of genes in a tiny roundworm known as *Caenorhabditis elegans* in the 1980s.

- Their research led to the identification of microRNA as a new type of gene regulator, distinct from traditional RNA.
- **Function of microRNA**:
    - Unlike messenger RNA, microRNA acts as a switch that can turn other genes on or off.
    - This adds a new layer of complexity to gene regulation, revealing that areas of DNA previously thought to be non-coding actually play significant roles in controlling gene expression.
    - There are more than 1,000 genes in the human body that respond to microRNA.

Potential Applications of microRNA

MicroRNA has the potential to revolutionize medical treatments, particularly in the following areas:

- **Cancer Treatment**: Some microRNAs function as tumor suppressors, helping to prevent cells from dividing uncontrollably, while others can promote cell division, potentially leading to cancer. Understanding these mechanisms could lead to new cancer therapies.
- **Antiviral Drugs**: Many viruses utilize microRNAs for their lifecycle, leading researchers to develop antiviral drugs targeting these interactions. Treatments for hepatitis C are among the ongoing developments.
- **Biomarkers**: Scientists hope to use microRNA as biomarkers to detect specific types of cancer, aiding in diagnosis and treatment strategies.
- MiRNAs are potential diagnostic and prognostic markers in cancer and are being explored for therapeutic interventions.

Therapeutic Potential

- MiRNAs are promising targets for drug development, with ongoing research into miRNA-based therapies.
- miRNA mimics and antimiRs (antisense oligonucleotides) are being developed to either restore or inhibit specific miRNAs, respectively, in disease contexts.

Technological Advances

- Advances in high-throughput sequencing and bioinformatics have facilitated the discovery and profiling of miRNAs.
- Researchers use techniques like miRNA microarrays, RNA sequencing, and quantitative PCR to study miRNA expression patterns.

Future Directions

- MiRNAs continue to be an active area of research with ongoing efforts to unravel their roles in various biological processes and diseases.

- Understanding miRNA biology holds the promise of uncovering new therapeutic targets and diagnostic markers.

Source: https://indianexpress.com/article/explained/explained-sci-tech/microrna-gene-regulation-what-2024-nobel-prize-for-medicine-was-awarded-for-9608888/