Regulome

The **regulome** refers to the complete set of regulatory elements that control gene expression within a cell or an organism. It encompasses **transcription factors, microRNAs, cis-regulatory elements (such as enhancers and promoters), epigenetic modifications**, and other mechanisms that determine when, where, and to what extent genes are expressed.

Components of the Regulome

1. **Transcription Factors (TFs)** – Proteins that bind to specific DNA sequences to activate or repress gene transcription.

2. **Cis-Regulatory Elements** – DNA sequences such as enhancers, promoters, and silencers that influence the transcription of nearby genes.

3. **Epigenetic Modifications** – Chemical changes to DNA or histones, such as DNA methylation and histone acetylation, that affect gene expression without altering the genetic sequence.

4. **Non-Coding RNAs** – Includes microRNAs (miRNAs) and long non-coding RNAs (lncRNAs) that regulate gene expression post-transcriptionally.

5. **Chromatin Structure and 3D Genome Organization** – The spatial arrangement of DNA within the nucleus can affect gene accessibility and regulation.

Significance of the Regulome

- Plays a crucial role in **development, differentiation, and cellular responses**.

- Involved in **disease mechanisms**, particularly in cancer, neurological disorders, and autoimmune diseases.

- Understanding the regulome is essential for **precision medicine** and the development of targeted therapies.