

Epigenetic Modifications

DNA Methylation

- Addition of methyl groups to cytosine
- CpG islands near promoters
- Gene silencing mechanism
- Maintained through cell division

Histone Modifications

- Acetylation: gene activation
- Methylation: activation or repression
- Phosphorylation: chromatin structure
- Histone code hypothesis

Chromatin States

- Euchromatin: transcriptionally active
- Heterochromatin: transcriptionally silent
- Dynamic transitions
- Cell type-specific patterns

Disease Implications

- Cancer: aberrant methylation
- Imprinting disorders
- X-chromosome inactivation
- Environmental influences