

Regulators of transcription

- Nucleosomes
 - If DNA is wrapped around the histones it cannot be transcribed
 - A *methyl group* (CH_3) is an organic functional group that causes a section of DNA to wrap more tightly around histones
 - Prevents transcription of that particular allele
 - The gene becomes inactive, not expressed
 - The methylation patterns persist through cell division = keep on being methylated
 - Example: mammalian females have two X chromosomes, one become heavily methylated = inactive
 - Methylation may regulate the expression of either the maternal or paternal allele of a gene
 - Some methylation patterns are also associated to cancer
 - *Hypermethylation* and *hypomethylation*
 - Both due to carcinogens and toxic substances
 - Can be used to diagnose cancer
 - Sometimes methylation goes wrong and genes that were supposed to be active are inactive and vice versa
- Binding proteins
 - Proteins can regulate transcription by assisting or hindering the binding of RNA to the promoter
 - Transcription *activators* cause looping of DNA, which results in a shorter distance between the activator and the promoter region of the gene
 - Assist the binding of RNA polymerase
 - The *repressors* bind to segments of DNA called *silencers* preventing transcription of that segment
- The environment of the organism
 - Recent science has shown that the environment of the organism influences genes
 - The science is called *epigenetics*
 - Example: people in urban areas show expression of more respiratory genes than people from rural areas
 - Genes can be methylated or unmethylated