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1 | Notes

1.0.1 | Overview

- Organisms turn genes on and off which is called Gene Expression
  - This can be done in response to external and internal signals
    - These signals are based off of environmental factors
  - This is also be done in order to specialize cells
    - Certain cells need certain genes to preform their specific role

Differential Gene Expression - Human Cells can express about 20% of it's protein coded genes at any given time - Most cells contain the same genome - Each cell type must use specific parts of this genome - This is called Differential gene expression - Exception would be cells of the immune system - Due to the importance of gene expression when it has issues it can affect the organism significantly - Process of Gene expression in a Eukaryotic cell - Chromatin (DNA unpacking) –> - RNA processing –> - Transport to cytoplasm –> - Translation –> - Protein processing –> - Transport to cellular destination–> - This process can often be equated to transcription for Prokaryote cells

1.0.2 | Regulation of Chromatin Structure

- The chromatin structure itself allows for the regulation of gene expression
  - This is partially due to the location of the promoter
- Chemical modifications to the histone proteins can affect the structure
  - This in turn can affect gene expression
  - Histone proteins are the proteins in which the DNA is wrapped
  - There are many types of modifications that can take place
    - Histone acetylation can tend to promote transcriptions by opening up the chromatin
    - Additional methyl groups tend to close up the chromatin and decrease transcription
  - DNA methylation occurs in most plants and animals as well as fungi
  - Methylated DNA will stay methalated through cell divisions
    - This accounts for genomic imprinting
    - These epigenetic markers can be inherited
      - There is continually more evidence for the importance of epigentics in gene expression ### Regulation of Transcription
- Chromatin changes are not permanent and can be reversed
- The next step of gene expression regulation is in the transcription factors
  - These either allow for or inhibit transcription
- These factors usually bind to proteins, but some of them bind to DNA

- High levels of transcription factors created for specific genes are associated with another protein thought creatively of as specific transcription factors
- Gene expression is dramatically increased or decreased by the binding of specific transcription factors
  - These are either activators or repressors
- There are many transcription factors
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