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Week 2 + 3 – Lectures 3 - 5
Gene Regulation in Eukaryotes

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1. Chromatin Structure

Chromatin Types Are Based on Histone Modifications

- Chromatin distinguishes eukaryotes from bacteria

1. Heterochromatin

- DNA wrapped up + tightly packed
- inaccessible
- 'inactive' – repressed gene expression
- "off"

a) Constitutive Heterochromatin

- DNA wrapped up all the time ∴ never accessible
- repetitive elements – transposons, centromeres, telomeres that we don't want expressed
- H3K9me3

b) Facultative Heterochromatin

- DNA can be opened up into euchromatin by a series of molecular events + enzymes ∴ can be closed back down into heterochromatin. This process is reversible.
- Developmental / cell type specific genes
- H3K27me3
- PcG & Trx Complexes
- Cellular memory –eg. polycomb

2. <u>Euchromatin</u>

- DNA more loosely compacted
- Open + accessible
- "on"
- 'active' - active gene expression
- constitutive + inducible genes
- active developmental / cell type specific genes
- H3K9Ac
- H3K4me

GEN3030
Week 12
Lecture 22 – Genetic Control of Circadian Rhythms

Clock Differences Between Flies & Mammals

Mammalian + fly clock system are **very well conserved**, but there are some differences:

In humans:

- Circadian rhythm in humans / mammals has the environmental input to tell our SCN that there is light or dark that is coming through our eyes
- Retinal ganglion cells containing pigment called melanopsin are the cells that detect light
- Once the retinal ganglion cells are activated, they signal to the hypothalamus that there is light coming in and ∴ it's day time ∴ allowing synchronization
- ∴ SCN cells generate a signal to tell other parts of the brain what time of the day it is
- → in humans, light enters via the SCN

In flies:

- Light enters directly and is directly received
- SCN neurons are called pacemaker neurons
- In Drosophila - the circadian pacemaker neurons are clustered in one area of the brain - the environmental input acts on these cells directly, via cryptochrome