TOPIC 7.1: DNA STRUCTURE

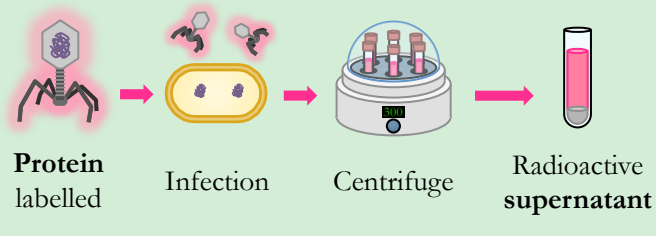
Genetic Material

Hershey and Chase conducted experiments in 1952 to determine if DNA or proteins were the genetic material of a cell

It was previously known that viruses insert their genetic material into cells and so radioactively labeled viruses were prepared

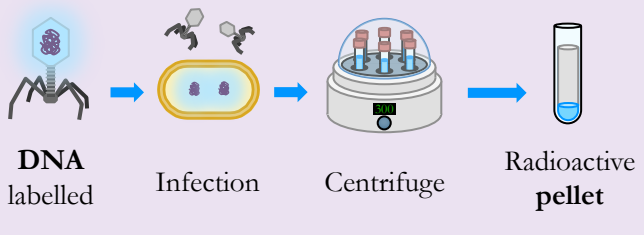
- Viruses grown in ^{35}S had radioactive proteins but did **not** transfer this radioactivity to bacterium (remained in supernatant)
- Viruses grown in ^{32}P had radioactive DNA and **did** transfer this radioactivity to infected bacterium (found in pellet)

Experiment 1: Testing Protein with ^{35}S



Conclusion: Proteins **not** genetic material

Experiment 2: Testing DNA with ^{32}P



Conclusion: DNA **is** the genetic material

X-ray Diffraction

Franklin and Wilkins used X-ray diffraction to elucidate DNA structure

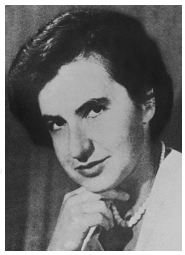
- X-rays will diffract when targeted at crystallised DNA molecules
- The scattering pattern created can be used to determine structure

From the patterns generated, the following properties were deduced:

- **Composition:** DNA is a double-stranded molecule
- **Orientation:** The bases face inwards and the phosphates face out
- **Shape:** DNA forms a double helix (10 bases per twist)


Wilkins


Diffraction

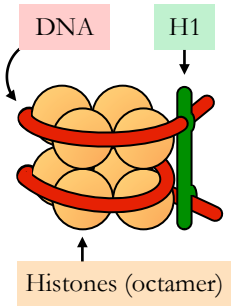

Franklin

Nucleosomes

In eukaryotes, DNA associates with eight histone proteins to form a **nucleosome**

Nucleosomes help to supercoil the DNA

- Makes DNA compact (better storage)
- Prevents DNA damage (less exposed)
- Assists in cell division (more mobility)
- Involved in transcriptional regulation



Non-Coding DNA

Some regions of DNA do not code for protein

- **S**atellite DNA (tandem repeats)
- **T**elomeres (chromosome ends)
- **I**ntrons (non-coding sequences)
- **N**on-coding RNA genes
- **G**ene regulatory sequences

Tandem repeats are used in DNA profiling

Eukaryotic Organisation of DNA

DNA is bound with histone proteins to form **nucleosomes** that are then linked together to form strings of **chromatosomes**

These coil to form **solenoids**, which condense into **30 nm fibres**, before being compressed and folded into **chromatin**