

DNA – the heredity material

- Very early it was discovered chromosomes are composed of proteins and DNA. But it took several experiments to conclusively determine specifically which substance made up genes.

Griffith Experiment

Documented movement of genes from one organism to another (transformation 1928).

– Avery Experiment (1944)

- Removed almost all protein from bacteria, and found no reduction in transforming activity.

– Hershey-Chase (1952)

- Used radioactive isotopes to label DNA and protein. Found genes used to specify new generations of viruses were made of DNA.

DNA - genetic material

■ Eukaryotes

- DNA located in the nucleus
membrane bound
organelle

■ Prokaryotes

- DNA located in the nucleoid. No membrane surrounded organelle

Discovering DNA Structure

■ DNA made up of nucleotides.

- Central sugar, phosphate group, and an organic base.
 - Purines - Large bases
 - Adenine and Guanine
 - Pyrimidines - Small bases
 - Cytosine and Thymine

Nucleotide Base

DNA – 4 nucleotide bases

4 base nucleotides

Chargaff's Rule

A =T and G=C

Discovering DNA Structure

- Watson and Crick 1953
&(Wilkins) deduced structure of DNA as a double helix.

Base pairs linked

Double Helix structure

- two stands of nucleotides
- Outer part of the ladder is the sugar-phosphate backbone
- Anti-parallel allows for H-bonds between complementary base pairs

H- bonds between base pairs

3 H-bonds

Packaging DNA in the nucleus

DNA Replication

- Weak hydrogen bonds between base pairs hold DNA strands together.
- Each chain in the helix is a complimentary mirror image of the other.
 - Double helix unzips and undergoes semi-conservative replication.
 - Confirmed by Meselson-Stahl Experiment.

Bi-directional replication

Proofreading by DNA polymerase III

Genes to Proteins

- Producing proteins from genes is known as gene expression
 - DNA - RNA - Protein
 - Gene Expression - Use of information in DNA to direct production of particular proteins.
 - **Transcription** - mRNA molecule is

- synthesized from gene within DNA.
- **Translation** - mRNA used to direct protein production.

DNA vs RNA

Transcription

- The RNA copy of a gene used to produce a protein is called messenger RNA (mRNA).

Is all of the DNA expressed?

Codons – triplet code

Translation – mRNA >> polypeptide

Translation – the ribosome

Translation – the ribosome

Overview of translation