

CONCLUSION: Bacteria of the "S" (smooth) strain of *Streptococcus pneumoniae* are pathogenic because they have a capsule that protects them from an animal's defense system. Bacteria of the "R" (rough) strain lack a capsule and are nonpathogenic. Frederick Griffith injected mice with the two strains as shown below.

RESULTS: Mouse dies, Mouse healthy, Mouse healthy, Mouse dies.

CONCLUSION: Griffith concluded that the living R bacteria had been transformed into pathogenic S bacteria by an unknown, heritable substance from the dead S cells.



ENDURING UNDERSTANDING

IST-1 Heritable information provides for continuity of life.

6.1 DNA and RNA Structure

Normal Human Karyotype

Promoter to drive target gene expression
Target gene
Plasmid
Antibiotic resistance gene

IST-1.K Describe the structures involved in passing hereditary information from one generation to the next.

DNA, and in some cases RNA, is the primary source of heritable information.

DNA: Deoxyribose Sugar
RNA: Ribose Sugar

IST-1.K Describe the structures involved in passing hereditary information from one generation to the next.

Genetic information is transmitted from one generation to the next through DNA or RNA

Normal Human Karyotype

Autosomes: 1-22
Sex Chromosomes: XX (female) or XY (male)

IST-1.K Describe the structures involved in passing hereditary information from one generation to the next.

- Genetic information is stored in and passed to subsequent generations through DNA molecules and, in some cases, RNA molecules.

Interphase
Homologous chromosomes
Meiosis I
Meiosis II
Daughter nuclei
Daughter nuclei II

Frederick Griffith (1928)

- DNA Can Transform Bacteria
- Conducted experiments with *Streptococcus pneumoniae*
 - Injected mice with two strains: (S) strain and a (R) strain.
 - The S strain is virulent (mice died); it has a mucous capsule
 - The R strain is not virulent (mice lived); it has no capsule.

EXPERIMENT: Bacteria of the "S" (smooth) strain of *Streptococcus pneumoniae* are pathogenic because they have a capsule that protects them from an animal's defense system. Bacteria of the "R" (rough) strain lack a capsule and are nonpathogenic. Frederick Griffith injected mice with the two strains as shown below.

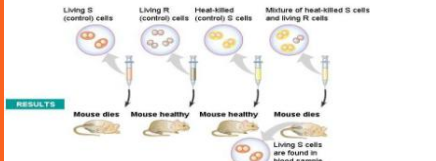
RESULTS: Mouse dies, Mouse healthy, Mouse healthy, Mouse dies.

CONCLUSION: Griffith concluded that the living R bacteria had been transformed into pathogenic S bacteria by an unknown, heritable substance from the dead S cells.

Frederick Griffith (1928)

- He injected mice with heat-killed S strain bacteria; the mice lived.
- He injected mice with a mixture of heat-killed S strain and live R strain bacteria; the mice died and living S strain pneumococcus were recovered from their bodies.
- Griffith concluded, some substance transformed the R strain.

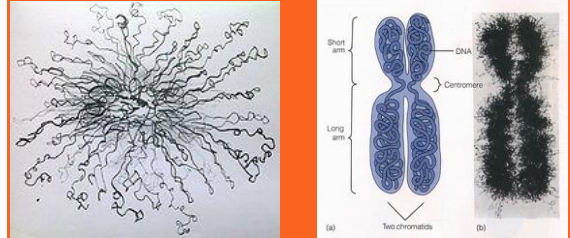
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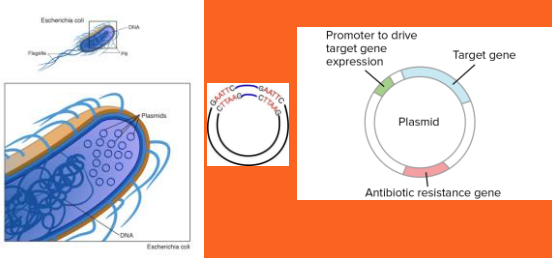
IST-1.K Describe the structures involved in passing hereditary information from one generation to the next.

- Prokaryotic organisms typically have circular chromosomes, while eukaryotic organisms typically have multiple linear chromosomes.



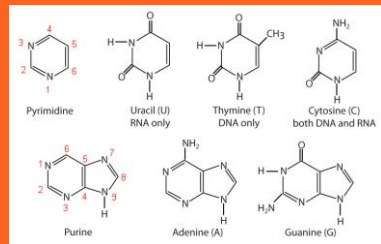
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- Prokaryotes and eukaryotes can contain plasmids, which are small extra-chromosomal, double-stranded, circular DNA molecules.



IST-1.K Describe the structures involved in passing hereditary information from one generation to the next.

- DNA, and sometimes RNA, exhibits specific nucleotide base pairing that is conserved through evolution: adenine pairs with thymine or uracil (A-T or A-U) and cytosine pairs with guanine (C-G)



Erwin Chargaff (1947)

- o Performed detailed analysis of base content of DNA.
- o Purine bases
 - double-ring structure
 - adenine (A) and guanine (G).
- o Pyrimidine bases
 - single-ring structure
 - Thymine (T) and cytosine (C)
- o **Chargaff's Rules:**
 - The amount of A, T, G, and C in DNA varies from species to species.
 - In each species, the amount of A=T and G=C.

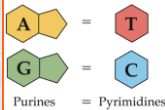


Table 13-1. Molar Percentages of Bases* in DNAs from Various Sources

Organism	Tissue	Adenine	Thymine	Guanine	Cytosine
<i>Salmonella</i>	cell (K12)	26.0	23.9	24.9	25.2
<i>Escherichia</i>	—	29.8	31.6	20.5	18.0
<i>Mycobacterium</i>	—	15.1	14.6	34.9	35.4
Yeast	—	31.3	32.9	18.7	17.1
Paramecium					
(sea slug)	Sperm	32.8	32.1	17.7	18.4
Human	Sperm	27.8	27.9	22.2	22.4
Man	Brain marrow	28.4	28.4	21.4	21.5
Human	Thymus	26.2	26.2	19.8	19.8
Human	Liver	26.2	26.2	19.5	19.7
Human	Sperm	29.2	29.2	19.5	19.8

* Data are in units of molar percentages per 100 μ moles phosphate in hydrolysis.
Source: E. Chargaff and J. Davidson, eds., *The Nucleic Acid Acceptor*, 1955, p. 106.