

Chapter 12 Nucleic Acids and Protein Synthesis

12.1 The Genetic Material

1. Early researchers knew that the genetic material must be:
 - a. able to *store information* used to control both the development and the metabolic activities of cells;
 - b. stable so it *can be replicated* accurately during cell division and be transmitted for generations; and,
 - c. able to *undergo mutations* providing the genetic variability required for evolution.

A. Transformation of Bacteria

1. Bacteriologist Frederick Griffith (1931) experimented with *Streptococcus pneumoniae* (a pneumococcus that causes pneumonia in mammals).
2. Mice were injected with two strains of pneumococcus: an encapsulated (S) strain and a non-encapsulated (R) strain.
 - a. The S strain is virulent (the mice died); it has a mucous capsule and forms "shiny" colonies.
 - b. The R strain is not virulent (the mice lived); it has no capsule and forms "dull" colonies.
3. In an effort to determine if the capsule alone was responsible for the virulence of the S strain, he injected mice with heat-killed S strain bacteria; the mice lived.
4. Finally, he injected mice with a mixture of heat-killed S strain and live R strain bacteria.
 - a. The mice died; living S strain pneumococcus was recovered from their bodies.
 - b. Griffith concluded that some substance necessary for synthesis of the capsule--and therefore for virulence--must pass from dead S strain bacteria to living R strain bacteria so the R strain were *transformed*.
 - c. This change in phenotype of the R strain must be due to a change in the bacterial genotype, suggesting that the transforming substance passed from S strain to R strain.

B. DNA: The Transforming Substance

1. Oswald Avery et al. (1944) reported that the transforming substance was DNA.
2. In the early twentieth century, it was shown that nucleic acids contain