

Bacterial Genetics and DNA Technology

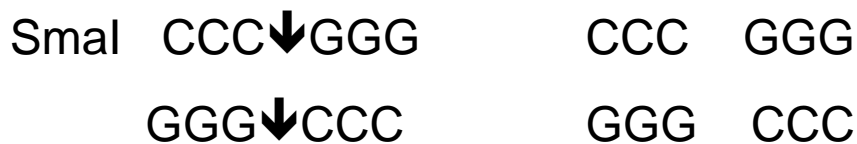
I. Bacterial Genetics

- A. Circular DNA molecule without histone proteins; found in nucleoid region
- B. DNA replication (pg. 340)
 - 1. One origin of replication
 - 2. Proceeds in both directions
- C. Plasmids
 - 1. Circular, small piece of DNA
 - 2. Separate from bacterial chromosome – “extra-chromosomal”
 - 3. Contains several traits, i.e. antibiotic resistance
- D. Bacterial transformation
 - 1. Uptake of foreign DNA, often via a plasmid
 - 2. Cells must be “competent”
 - 3. Evidenced by a new trait

II. Restriction enzymes (endonucleases) pg. 377

- A. Make genetic engineering possible
- B. Found in bacteria
- C. Cut up foreign DNA at specific base pair combinations (restriction sites)

1. Blunt ends



2. Sticky ends



III. Cloning (pg. 378)

- A. Making copies of genes, cells, or organisms
- B. Extract a bacterial plasmid
- C. Insert “gene of interest” into plasmid using restriction enzymes
- D. Return plasmid to bacteria
- E. Bacteria reproduces, making numerous copies of plasmid containing “gene of interest”

IV. Recombinant DNA

- A. Combining DNA from 2 organisms
- B. Carry foreign DNA into cell by:
 - 1. Plasmids
 - 2. Viral vectors

V. Polymerase chain reaction (PCR) pg. 382

- A. Method to make multiple copies of DNA from a very small sample very quickly
- B. Amplifies the amount of DNA

VI. Gel Electrophoresis

- A. Using electric current passed through a gel matrix to separate macromolecules, like DNA or proteins
- B. DNA fragments separate out according to size; agarose gel acts like a sieve
- C. Phosphate groups of DNA are negative; attracted to positive end of electric field

VII. DNA sequencing

- A. Human genome project complete – entire base sequence of human genome determined
- B. How accomplished
 - 1. Cut DNA at specific nucleotides using restriction enzymes
 - 2. Used electrophoresis and radioisotopes to detect distinct patterns and analyze
 - a. Radioisotopes allow us to visualize the pieces of cut DNA (or protein) run in a gel