

11 — DNA structure and replication

I. Overview

- A. DNA is a polymer of **nucleotides** (=nucleic acid)
 1. **Genes** are segments of DNA which code for proteins
 2. **Chromosomes** are molecules of DNA
 - a. contain many genes
 - b. prokaryotic chromosome is circular
 - c. eukaryotic chromosomes
 - 1) multiple, linear chromosomes
 - 2) proteins associated with DNA
- B. Sequence of information:
 1. DNA can copy itself by **replication**
 2. RNA made from DNA by **transcription**
 3. Proteins made from RNA intermediate by **translation**
 4. pathway
 - a. DNA replication is in nucleus
 - b. **transcription** of DNA makes RNA **in nucleus**
 - c. RNA exits nucleus through nuclear pores
 - d. RNA is **translated** into proteins at ribosomes on rough ER **in cytoplasm**

II. DNA is a polymer of nucleotides

- A. Nucleotides contain:
 1. 5-carbon sugar
 - a. ribose if RNA (thus ribonucleic acid)
 - b. deoxyribose if DNA (thus deoxyribonucleic acid)
(no O on carbon 2 of sugar)
 2. phosphates attached to carbon 5 of sugar (5' carbon)
 3. a nitrogen-containing base
 - a. for DNA: G, A, T, C
 - b. for RNA: U replaces T
- B. DNA structure deduced by Watson & Crick in 1953 (*Time*, Feb. 17, 2003, pp. 49–61)
- C. How nucleotides are hooked together
 1. nucleotides are hooked together by connecting
 - a. phosphate of one nucleotide (on 5' carbon of sugar)
 - b. to the –OH (hydroxyl) on carbon 3 of the next sugar (3' carbon)
 2. so get backbone of sugar-phosphate-sugar-phosphate-sugar-phosphate, *etc.*
 3. bases hang off of backbone
 4. DNA is double stranded
 - a. 2 strands associate due to “base pairing”
 - b. A pairs with T; G pairs with C