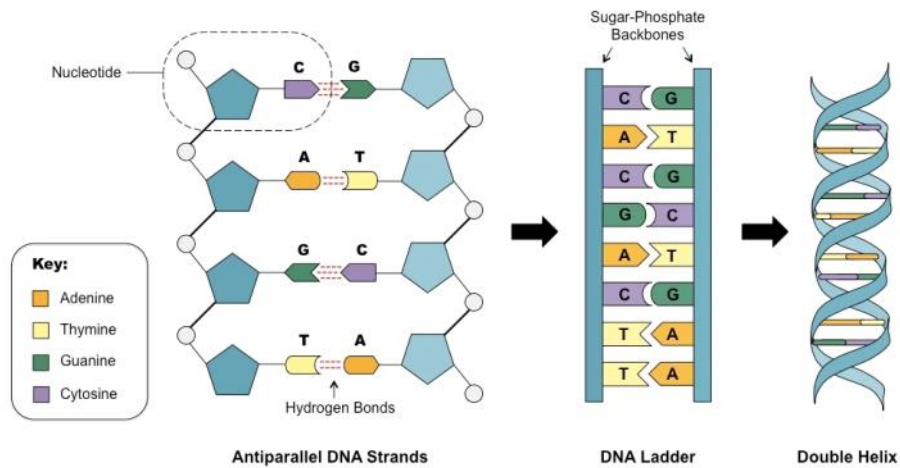


DNA Review

April-15-18 6:32 PM

1. Name the four bases in DNA and draw and describe the structure of DNA.

adenine, thymine, guanine, cytosine (ATGC)



2. List the three functions of DNA. What is the biological significance of each one?

A) Store information

- Carries all hereditary material
- Codes for RNA & Proteins

B) Replicates itself

C) Can Mutate

- Allows species to evolve and adapt to changing environments

3. Describe DNA replication in three steps.

A) DNA Helicase unwinds/unzips the DNA

B) DNA Polymerase reads one strand and attaches complementary bases to it (it checks for errors as it goes)

C) DNA Ligase makes sure that everything is attached and

fixes any gaps in the sugar-phosphate backbone

4. Define recombinant DNA.

Genetic Engineering

When you take DNA from one organism and insert it into the DNA of another organism (recombining their genetics)

5. List the pros and cons of recombinant DNA research.

PROS +

Used to make medicine such as insulin

Helps improve food production

Resist pests

Longer shelf-lives

Higher nutrition (ex. Golden Rice)

CONS -

Safety of consuming *GMO* foods/medicines ?

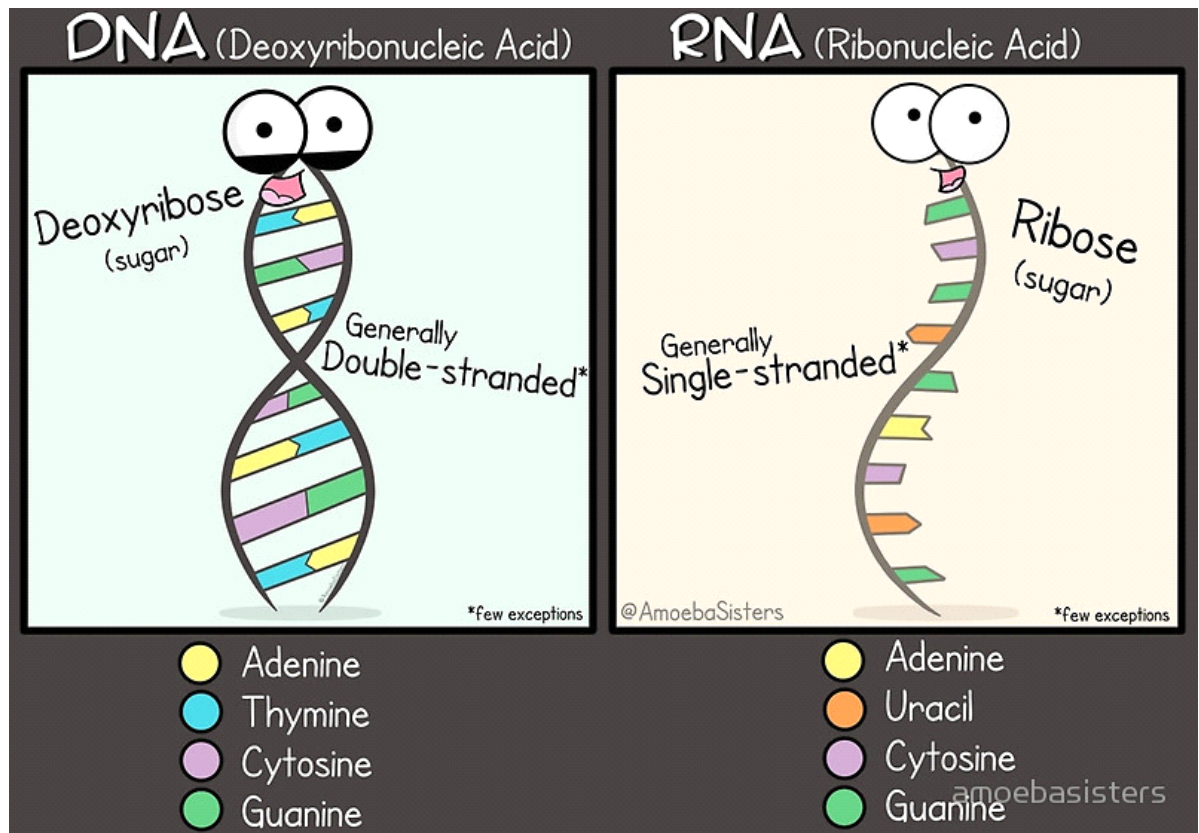
Risk of *GMOs* escaping into the wild

Ethics

Mistreatment of animals by some companies (e.g. livestock fed growth hormones)

Will humanity tamper with everything?

6. Make a chart comparing and contrasting the structure and function of DNA and RNA.



7. What are the three types of RNA and what are their specific functions?

mRNA

Is a message from the DNA to the ribosome on how to make a protein

tRNA

Transports amino acids to the ribosome to make a protein

rRNA

Is part of the ribosome

8. Describe the basic steps of protein synthesis using the terms DNA, mRNA, tRNA, ribosomes, codon, anticodon, transcription, and translation.

1. Transcription (inside the nucleus)

A. A segment of DNA is unwound and RNA Polymerase reads it and produces a complementary strand- the mRNA

- i. It uses Uracil nucleotides instead of Thymine nucleotides.
 - B. The DNA strands bind together again and the new mRNA leaves the nucleus
2. Translation (outside the nucleus)
- A. Initiation: mRNA enters the cytoplasm and binds with a ribosome using its start codon (AUG)
 - B. Elongation: the ribosome reads the mRNA and brings in the complementary tRNA (anticodon)
 - i. The amino acid is released from the tRNA and attached to the growing peptide chain that will become a protein
 - C. Termination: mRNA keeps being read until the ribosome reaches a STOP codon. Instead of tRNA, the ribosome brings in a release factor which frees the amino acid chain (now a protein) from the ribosome and the whole structure dissociates.

9. Determine the amino acid sequence coded for by this DNA sequence: AAC|CCA|TCG|CCA

mRNA UUG GGU AGC GGU
 AA's leu gly ser gly

10. Describe the effects on a protein that should be synthesized if a base deletion occurred in the DNA molecule. Repeat this question for base addition, then base substitution.

Deletion

A base is removed and everything in the code is shifted

one to the left, resulting in different amino acids / protein

Ex) DNA mutation = AAC CCA ~~TCG~~ CCA

mRNA= UUG GGU CGC CA...

arg his/glu

Addition

A base is inserted and everything in the code is shifted one to the right, amino acids and protein will be different

Substitution

One base is replaced by another, so only the codon where the swap happened is affected.

Could result in

- the same amino acid (CUU and CUA both = leucine)
- a different amino acid (CAC = histidine, while CAA = glutamine)
- a stop codon (GGA = glycine, but UGA = STOP)
 - Results in a nonfunctional protein

11. List two examples of environmental mutagens that cause mutations in humans.

- Smoking
- Charred food (BBQ meats, mushrooms, and veggies)
- Processed foods and preservatives
- UV (sunlight and tanning beds)
- X-rays
- Benzoyl (common ingredient in acne products)
- Certain viruses (e.g. HPV)
- Alcohol

12. A DNA sequence of nitrogenous bases is TACTTTCCCAAATC. What would the sequence of nitrogenous bases be on the corresponding mRNA? What would be the resulting amino acid chain? What would the corresponding bases be on the tRNA that brought the amino acids to the ribosome?

DNA TAC TTT CCC CAA ATC

mRNA AUG AAA GGG GUU UAG

Amino met lys gly val

tRNA UAC UUU CCC CAA AUC