



**Changes in  
DNA**

# Analogy

- We will be using a sentence as an analogy representing a strand of DNA.
- Our sentence is:  
The fat cat ate the wee rat.
- If this sentence represents a strand of DNA, what does each word represent?
- What does each letter represent?

# Mutations?!?

- Now, we're going to look at mutations in the DNA.
- When you hear about mutations, you may think about some teenage turtles or growing an extra arm, but the word mutate **just means change**. And they are not always bad. Let's look at what happens when we change the sentence/DNA.

# Substitution

The fat cat ate the wee rat.

The fat cat ate the wet rat.

- What changed?
- What does this represent?
  - Substitution mutation (one base change)
- How would this type of change affect the protein?
  - Only one amino acid is affected (maybe!)

# Deletion

The fat cat ate the wee rat.

The fat cat att hew eer at.

- What changed?
- What does this represent?
  - Deletion mutation (one base removed)
- How would this type of change affect the protein?
  - Every amino acid including and after the mutation is affected

# Insertion

The fat cat ate the wee rat.

The fab**b** tca tat eth ewe era t.

- What changed?
- How would this type of change affect the protein?
  - Every amino acid including and after the mutation is affected

# Point Mutations vs. Frameshift Mutations

- The substitution example was a point mutation.
- The last two examples of deletion and insertion were frameshift mutations.
- What's the difference between a point mutation and frameshift mutation?
  - One codon versus the remaining codons is changed.
- Which has the most significant impact on the protein?
  - Frameshift! Why? Many amino acids are affected.

# Synonymous (“Silent”) Point Mutations

- What do you think a synonymous (“silent”) point mutation is?
  - These do not cause a change in the amino acid sequence
  - The new codon still codes for the same amino acid as the original codon
- Examples:
  - TAT changed to TAG—both still code for Isoleucine
  - CTC changed to CTT—both still code for Glutamate



# Mutation Impact

- The impact of a mutation on an individual also depends on where and when it occurs.
- If there was a mutation in the DNA of an egg or sperm, the offspring will get it and continue to pass it on.
- How might a mutation in a skin cell affect an individual?