How Gene Mutations Change Your Ability to Taste

Name: _____

Date: _____

Student worksheet

Directions: Follow the directions below for the taste test and to start your Investigations.

1. Before the Experiment

a. Performing the taste test.

i. When your teacher tells you to, hold one end of the first taste test strip and put the other end on your tongue. Describe the taste of the strip below.

ii. Next, repeat step i. with the second taste test strip. How does this test strip taste? Is the taste different from the first one? Describe the taste below.

b. Depending on your results from the taste test, your teacher will assign you to a **phenotype** ("taster," "non-taster," or "in between").

Which phenotype are you? _____

2. Experiment: Follow these steps.

a. You will receive two different gene sequences of the PTC (phenylthiocarbamide) receptor genes, which represents your **genotype**, from your teacher. Depending on your phenotype, or if you are a "taster," "non-taster," or "in between," these gene sequences might vary and can either be the "taster" gene with the "T" allele, or the "non-taster" gene with the "t" allele.

Which two alleles do you have? 1._____ 2._____

b. Walk around the classroom and find other students who belong to your group ("taster," "non-taster," or "in between"). Analyze your sequences to see if all the letters (or codons) are the same and compare and discuss your phenotypes, genotypes, and

How Gene Mutations

Name _____

Change Your Ability to Taste—Page 2

Directions: Follow the directions below to continue your investigations.

gene sequences with each other. Try to find out the following from your discussions:

i. Does every phenotype ("taster," "non-taster," and "in between") have the same genotype (sequence combination)?

ii. Is there a difference between the "taster" and "non-taster" alleles? If yes, how are they different?

c. Fill out following tables using the observations you make throughout your discussion with other students.

i. Enter all the observed genotypes for each phenotype in this table:

Phenotype	All observed genotypes
Taster	
Non-taster	
In between	

Table 1. For each phenotype, enter all the observed genotypes (Tt, tt, or TT)

ii. Enter all the differences you have found between the "taster" and "non-taster" sequence. Write down each codon (nucleotide triplet) that shows a mutation in one of the genes.

Codon number	Taster gene sequence	Non-taster gene sequence

Table 2. Write down each codon (nucleotide triplet) that shows mutations between the taster and non-taster gene.

How Gene Mutations

Name _____

Change Your Ability to Taste—Page 3

Directions: Follow the directions below to continue your investigations.

d. Translate each mutated codon into its respective amino acid using the genetic code chart and enter the results in the table below.

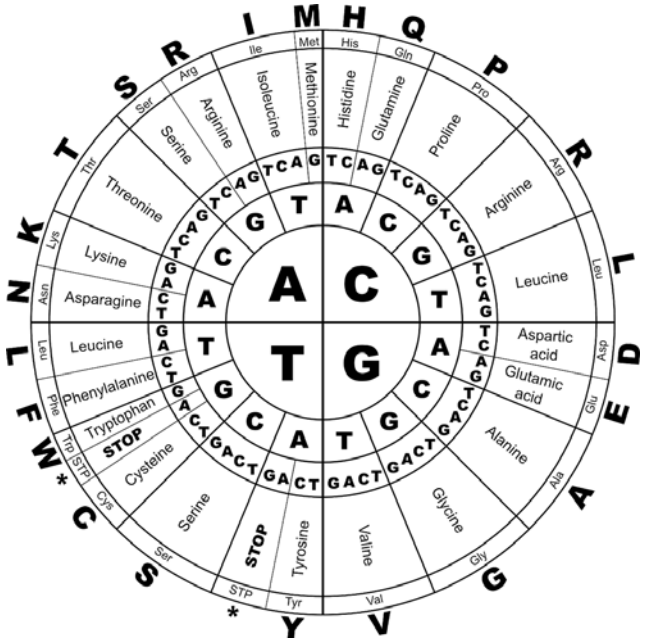


Figure 1. In the genetic code, every nucleotide triplet (codon) encodes for one amino acid.

Codon number	Taster Gene Codon	Encoded Amino Acid	Non-taster gene codon	Encoded Amino Acid	Change of Amino Acid (yes/no)

Table 3. Enter all the mutated codons and their respective encoded amino acids to see if the mutations result in an amino acid change.

How Gene Mutations Change Your Ability to Taste—Page 4

Name _____

Directions: Based on your observations, answer the questions below.

3. After the experiment.

a. Use your data and findings to discuss and answer the following questions with your class:

i. Did all the observed mutations change the amino acid in the PTC receptor protein? Why or why not?

ii. Based on your observations and findings above, present an explanation below for why "tasters" and "non-tasters" respond differently to the chemical PTC.

iii. Using your data, list some arguments for why the statement "All genetic mutations are bad" is correct or incorrect.

iv. Looking at your findings in Table 1, do you think the genetic ability to taste PTC is a **dominant** or **recessive** trait? Why?

How Gene Mutations

Name _____

Change Your Ability to Taste—Page 5

Directions: Based on your observations, answer the questions below.

v. Based on the two gene sequences you got from your teacher, are you a **homozygote** or a **heterozygote** with respect to the PTC tasting allele? Why?

b. Considering your genotype ("TT," "Tt," or "tt"), and the fact that you inherited one allele from each of your parents, what genotypes could your parents have? Use the **Punnett Squares** to figure out the possible genotypes of your parents depending on your genotype.

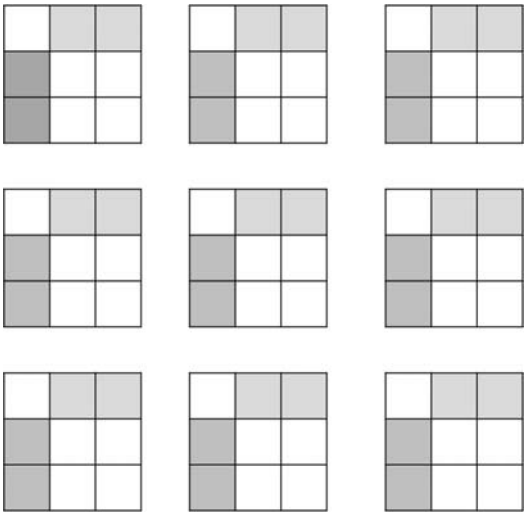


Figure 2. Use the Punnett Squares to figure out the possible genotypes of your parents depending on your genotype. Cells shaded in light grey represent the paternal genotype, and the dark grey shaded cells represent the maternal genotype.

c. Based on your findings, what would you say are the main factors that contribute to the genetic variation we see around us?