

PTC Genetics Lab

Background

In 1931, a chemist named Arthur Fox started to measure some powdered phenylthiocarbamide (PTC). Pouring hastily, Fox accidentally caused some of the chemical to blow into the surrounding air. Fox's lab mates nearby complained of the bitter taste in the air due to the chemical. Yet, Fox was perplexed- he tasted nothing. Since that day, PTC has been used to show genetic variation in tasting abilities. When people sample PTC, **some people taste a strong bitterness, others taste a slightly bitter taste, and others taste nothing at all.** Using genetics, we can try to understand why some people can taste this chemical and others can't.

Taste and Genetics

The sensation of taste can be categorized into five basic types: **sweet, sour, salty, bitter,** and **umami** (the taste of monosodium glutamate). These five tastes serve to classify compounds into potentially nutritive and beneficial (sweet, salty, umami) or potentially harmful or toxic (bitter, sour). The ability to taste is due to the presence of chemically sensitive, **specialized taste receptor cells** on the surface of the tongue and throat. Different types of taste receptors are activated by different chemicals, and the nerve impulses they send to the brain are interpreted as different tastes.

Prelab

1. Are you a PTC taster? If so, what does PTC taste like?
2. How many people in your group are tasters? How many people in your group are non-tasters?
3. What are chromosomes and how many copies do you have in each of your cells? Who did they come from?

Scenario

Jillian is a student at Cactus High School in Peoria. Her class learned about PTC tasting when her class learned about inherited genetic traits. As it turned out, she was not a taster. Jillian

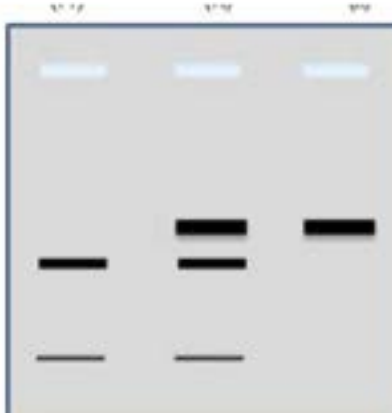
decided to get some PTC paper and have her family do the taste test, and draw a family tree based on the tasting data. Surprisingly, everyone in her family is a taster, her mother, her father, both her brothers, and even her grandparents, aunts and uncles. Jillian was quite perplexed. How is it possible that Jillian cannot taste PTC when everyone else in her family can taste?

Hypothesis

Based on what you know about genetics come up with a hypothesis and how you could test this hypothesis.

The following chart summarizes the genotypes and phenotypes associated with the ability to taste PTC.

<i>Genotype</i>	<i>Phenotype</i>	<i>DNA Pattern on Gel</i>
TT Homozygous dominant	Can taste	2 bands
Tt Heterozygous	Can taste	3 bands
tt Homozygous recessive	Can't taste (Non-taster)	1 band



This diagram illustrates the different patterns possible after electrophoretic separation on a 2% agarose gel. As you can see, a homozygous taster will have two bands, a heterozygous taster will have three bands, and a homozygous non-taster will only have one band.

Part II: Results

What does your gel look like? Record images of the gel. Include labels for your DNA samples.



Part III: Analyze Your Data

1. How many DNA bands do you see in Jillian's sample? What is her genotype?

Name _____

2. How many bands of DNA do you see in Jillian's mom and dad samples? Jillian's mom and dad are tasters, what are their genotypes?

3. Compare Jillian's Mom's and Dad's PTC genes to Jillian's. Based on the data, is your hypothesis supported or refuted as to why Jillian is not a PTC taster and Jillian's parents are PTC tasters? Draw a Punnett square to explain your results.