NOVA scienceNOW

Picky Eaters or Superior Tasters?

Can genetics explain our food choices? Not entirely, but genes can influence some choices we make. For example, do you avoid bitter foods, like broccoli, coffee, or dark chocolate? Maybe that's because you have the variation of a gene that makes you extra sensitive to bitter foods. In this activity, you will investigate the role of genetics in taste by testing your own ability to taste.

Procedure

1 Some people who taste paper laced with the chemical PTC say it tastes bitter. Others taste nothing. Why? These two groups have different forms of a particular gene. Based on how much you like bitter foods, predict whether you will be able to taste PTC.

_____ Yes, I will be able to taste PTC _____ No, I will not be able to taste PTC

2 Get a piece of PTC paper from your teacher. Place it on your tongue. Describe the taste. _____

3 As a class, categorize the taste responses, tally the results, and complete the table below. Then, calculate the percentage of the class that fits into each category. In the general population, about 75 percent of people can taste PTC. Do your class results reflect the general population?

	Strong Taster	Non-Taster
Number of students		
Percentage of the class		

4 Every person has two copies of the gene that codes for the bitter PTC taste receptor, one from each parent. These copies come in different forms, known as alleles. The two most common alleles of this gene are called the Taster allele and the Non-Taster allele.

The PTC receptor gene has 1,002 nucleic acids (i.e., adenosine, thymine, guanine, and cytosine). The difference between the Taster and Non-Taster alleles is only three out of those 1,002 nucleic acids! The table below shows those three differences. Determine which allele is dominant and label it. (Hint: Refer back to Step 3.) Based on your PTC test results, circle the allele(s) you have.

PTC taste allele	Short segments of the PTC receptor gene (which is 1,002 nucleotides long) showing the three differences between the Taster and Non-Taster alleles (differences underlined)		
Non-Taster	...AGGCAG<u>G</u>CACTGAG...	...TCCTGTG<u>T</u>TGCCTT...	...GCAGCC<u>A</u>TCCTGAT...
Taster	...AGGCAG<u>C</u>CACTGAG...	...TCCTGTG<u>C</u>TGCCTT...	...GCAGCC<u>G</u>TCCTGAT...

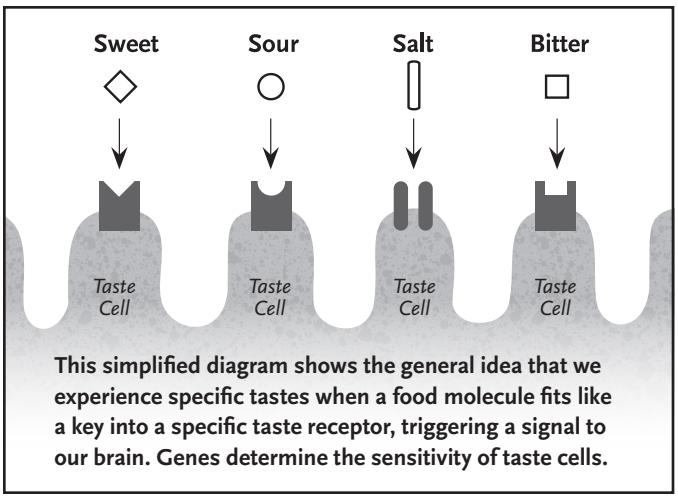
5 Get a sample of mint and food from your teacher. Taste the food sample in the following ways and try to identify what it is:

A) While holding the mint under your nose.

MY GUESS: _____

B) While pinching your nose closed.

MY GUESS: _____



This simplified diagram shows the general idea that we experience specific tastes when a food molecule fits like a key into a specific taste receptor, triggering a signal to our brain. Genes determine the sensitivity of taste cells.

6 After your teacher reveals the identity of the sample, tally the number of correct responses. As a class, write a statement that describes the difference between taste and flavor.

Questions

Write your answers on a separate sheet of paper.

1 The chart in Step 4 shows only the two most common alleles for the PTC receptor gene. There are also several rare alleles. Do you think that anyone in your class has the rare alleles? Why or why not?

2 List three reasons that can help explain why it is important to distinguish different tastes.

3 How did holding your nose and smelling the mint affect the flavor of the food sample?

4 Genes are only one factor that determine your food preferences. What else might affect food preferences?

MORE ON THE WEB!

NOVA scienceNOW's *Picky Eaters* (10 minutes)
pbs.org/wgbh/nova/sciencenow/0404/01.html
Learn how taste works and why we evolved the ability to detect bitter and sweet tastes.

NOVA's *The Sense of Taste* (4 minutes)
pbs.org/teachers/connect/resources/888/preview
Learn what happens when we lose our sense of taste and how smell affects our experience of food.

Howard Hughes Medical Institute's *Taste Lecture* (6 minutes)
hhmi.org/lectures/webcast/ondemand/97webcast1/taste.html
Learn how taste receptors function.