5. Gel electrophoresis

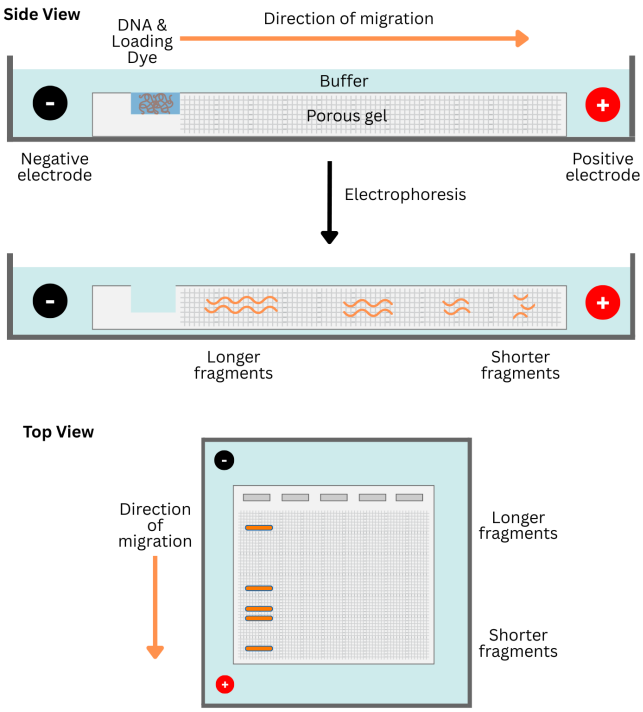
Overview

You will use **gel electrophoresis** to visualize the results of your restriction digest. Using a micropipette, you will load your restriction digest sample into an **agarose gel**, a transparent, gelatin-like matrix. The gel is bathed in a **running buffer**, a solution that conducts electricity. When you apply an electric charge to the gel, your DNA samples will travel through the gel at different speeds depending on their size. By analyzing the pattern your DNA makes, you can figure out whether you are a PTC strong taster, weak taster, or nontaster, as these patterns reflect your genetic makeup.

How it works

Agarose is made from algae. When mixed with liquid and melted, agarose can be molded into a gel, with partial holes at one end called **wells**. DNA samples can be mixed with **loading dye—**a colored solution containing **glycerol**—which helps the sample to sink to the bottom of the well.

An agarose gel has tiny pores, like a sponge. DNA is negatively charged. A gel electrophoresis rig has a negatively charged electrode at the end next to the loading wells, a positively charged electrode at the opposite end, and chambers for running buffer. Negatively charged objects are attracted to positively charged ones, so the DNA travels, or **migrates**, through the gel towards the positively charged electrode.



As your sample migrates, the DNA fragments will separate into distinct bands based on their sizes. Smaller fragments move through a gel more easily, so they travel faster and move farther than larger fragments.

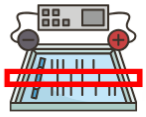
What you will explore today

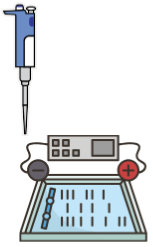
You have already tasted PTC paper, so you have an idea of your taster phenotype. By extracting your own DNA and using PCR to make numerous copies of part of the TAS2R38 bitter taste gene, now you can test to see if your genotype matches your phenotype.

The lab technician has stained your DNA with a fluorescent dye that you can see when the finished gel is illuminated. Strong tasters will have two DNA bands. Nontasters should have a single band. Weak tasters will have three bands. Can you figure out what your bitter tasting genotype is? What does that tell you about the possible genotypes of your biological parents?

PROCEDURE

Set up your gel apparatus. The gel wells should be towards the anode (–). There should be enough buffer to completely submerge the gel.
1

Your technician will assign you one lane into which to load your sample.

2

Using a new pipette tip, load 10 µL of your restriction enzyme (RE) digest into your lane.

3

Your technician will determine how long and at what voltage to run the gel.

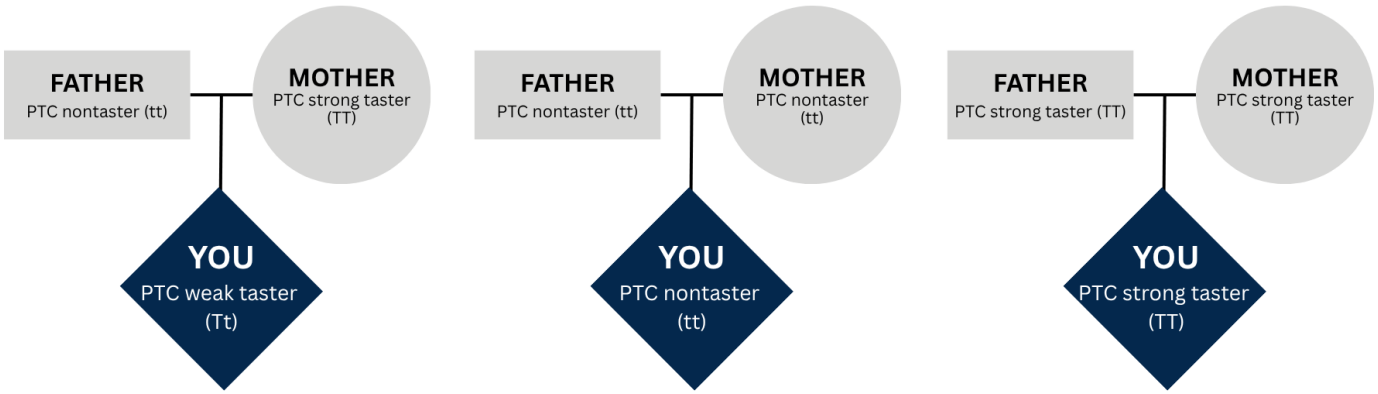
4

Once your gel is on the transilluminator, you will be able to see the DNA bands in your sample. How many do you see?
5

Does your taster phenotype match your genotype?

6

WHAT IS YOUR TASTER GENOTYPE?



You are a weak taster.

240 bp
196 bp
44 bp

HaeIII cuts **half** of your amplified TAS2R38 DNA.

You are a nontaster.

240 bp

HaeIII does **not** cut your amplified TAS2R38 DNA.

You are a strong taster.

196 bp
44 bp

HaeIII cuts **all** of your amplified TAS2R38 DNA.

Note: Either parent could have any bitter taster genotype. This example is a simplification.