2. Cheek Cell DNA Extraction

Overview

Now that you have learned whether you can taste PTC (your phenotype), you will explore your own bitter taste gene DNA sequences (your genotype). To do this, you will start by extracting your own DNA from your cheek cells. You will get to put your newfound micropipetting skills into practice as well!

How it works

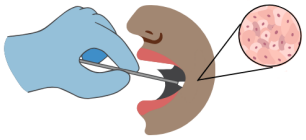
Every cell in your body (except for mature red blood cells) has a **nucleus**, the control center where the DNA is located. The cell nucleus contains your entire genetic code (your **genome**). If you want to study your DNA, you can extract it from any of your tissues. The easiest cell collection is dead skin cells from the inside of your cheek because it is painless and noninvasive. Imagine this—gently scraping the inside of your cheek collects hundreds or thousands of cells!

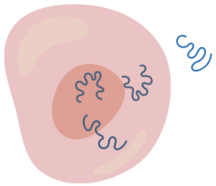
Once you have used a toothpick to loosen some cheek skin cells, you can boil them. Both cells and cell nuclei are surrounded by transparent, porous lipid **membranes** (like flexible plastic bags) that hold everything together. Boiling the cells breaks down these membranes, freeing up the DNA from the nucleus.

Cells contain lots of active proteins, or **enzymes**, to carry out tasks. One class of enzymes, called **DNases**, breaks down unwanted DNA. DNases need positively charged calcium and magnesium atoms called **cofactors** to function. When you break open your cheek cells, these DNases, plus the cofactors, have the chance to mix with your DNA. To prevent the DNases from degrading your DNA, you will combine your DNA with **Chelex**, a chemical that traps the cofactors so the DNases don't work. This will leave you with purified DNA.

DNA ISOLATION FROM CHEEK CELLS

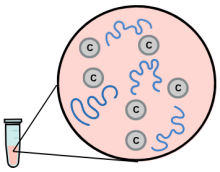
Cheek cells contain nuclear DNA, and are easily collected with a toothpick or swab.

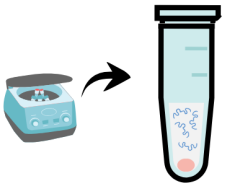




Heating the cells breaks them open, so the DNA in the nucleus is accessible.

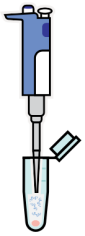
Cells contain some enzymes which can break down DNA. Chelex disables these enzymes so the DNA remains intact.





Centrifuging the DNA samples separates the heavy Chelex and cellular debris and compacts it into a pellet. The DNA, which remains in the liquid, floats on top of the pellet.

You can remove purified DNA from the tube using a micropipette. Now the DNA is ready for further exploration!



What you will explore today

You will use a toothpick to swab the insides of your cheeks (gently!). Then you will swirl your toothpick in a tube containing Chelex beads, followed by heating your sample just short of boiling (99°C). Lastly, you will place your tubes in a **microcentrifuge**, a tabletop-sized centrifuge that will spin, generating centripetal force to compact the Chelex beads in a pellet at the bottom of your tube. The liquid above the pellet (the **supernatant**) contains your purified DNA, now ready for further exploration!

CHEEK CELL EXTRACTION PROCEDURE