

# Episode 5



## Kitchen Chemistry

Any questions?  
Reach out  
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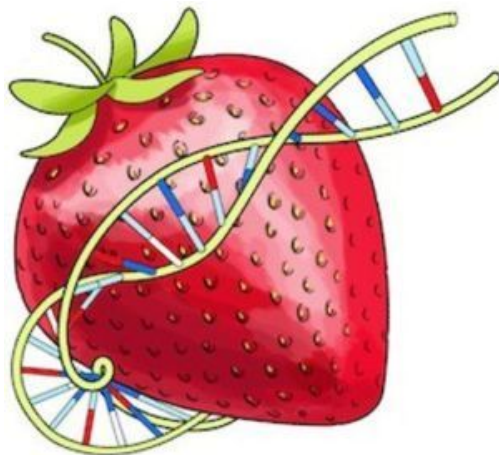
# DNA Extraction



**DNA** is the instruction manual for cells on how to grow and divide. DNA is a code made up of four **nucleotides**, adenine, guanine, cytosine, and thymine, which in different combinations create the unique instructions describing how to make an organism (be it a plant, an animal, a cell, or a person). Each of our cells contains two copies of our **genome** (i.e. all of our DNA), which allows us to grow and repair our tissues throughout our lives. All of the food that we eat also contains DNA, and it is largely similar to our own.

Humans are **diploid** organisms, which means that we have two copies of our genome in each of our cells that are organized into chromosomes. **Chromosomes** are bundles of DNA that can be selectively unraveled to so that our DNA can be accessed by cellular machinery when needed. Not all organisms are diploid, some are haploid (having only one copy) and some have even more copies! Strawberries are **octoploid**, which means that they have 8 copies of their genome of their cells. This is why strawberries are used for this experiment, as it would be harder to isolate the DNA from an organism that contained less DNA.

How are we able to extract the DNA from strawberries without any lab equipment? The three keys ingredients in this experiment (dish soap, salt, and isopropyl alcohol) break down the strawberry cells and separate the DNA from them. The dish soap breaks apart the lipid membrane of the strawberry cells, which releases their contents into the solution. The salt disrupts the proteins that hold DNA together in chromosomes, which releases the DNA into the solution. Finally, DNA is insoluble in isopropyl alcohol, especially when it is cold, so the DNA globs together when exposed to it.



# DNA Extraction

## Materials:

- Water
- Isopropyl alcohol (kept in the freezer until ready to use it)
- Dish soap
- Salt
- To mush up the strawberries, either
  - A mortar and pestle (or a bowl and a spoon)
  - A plastic bag to place the strawberries (then you just squish them with your hands from outside the bag)
  - A knife to chop them up
- A sieve
- A clear container (to hold the solution)
- Measuring spoons
- A wash bottle with a nozzle, or a baby syringe
- Strawberries (but you could also try this experiment with other fruit)



## Safety Considerations:

- Isopropyl alcohol looks like water, but is not safe to drink
- If you choose to chop up the strawberries, be careful with knives

# DNA Extraction



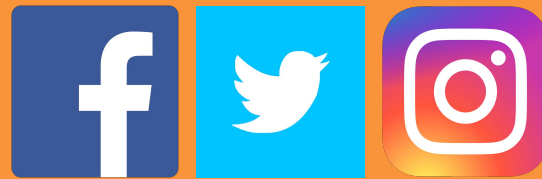
## Procedure

- 1) A couple hours before you want to do the experiment (preferably the night before) put your isopropyl alcohol in the freezer
- 2) Give your strawberries (3-4) a good rinse with water, then cut the tops off. Mash up the strawberries (using your chosen method) until the strawberries are a homogeneous mixture (kind of like a strawberry sauce)
- 3) Place your sieve on top of the clear container, then pour the strawberry mixture into the sieve. Allow the strawberry mixture fluid to drain into the clear container, leaving the solids in the sieve -- to speed up the process you can gently squish the strawberries with a spoon against the sieve to force to liquid out
  - a) After straining, you should have a couple of tablespoons of strawberries juice (if you don't, you can always smush some more strawberries)
- 4) Add one cup of water to the strawberry liquid, and give it a good stir
- 5) Add a tablespoon of dish soap to your strawberry liquid and stir it **gently** (otherwise the mixture will foam up and it will be difficult to see the DNA)
- 6) Add one tablespoon of salt to the mixture and give it a stir (again, gently)
- 7) This is the tricky bit -- quickly remove the isopropyl alcohol from the freezer and add it to the squeeze bottle/suck it up with the baby syringe. Carefully stream the alcohol down the side of the container (containing the strawberry mixture), the goal being to not disrupt the surface of the strawberry mixture -- the isopropyl alcohol (being less dense) should float in a layer on top
- 8) Continue to carefully add isopropyl alcohol to the container until you have a layer on top of the strawberry solution a few centimetres deep (for me, this was three teaspoons)
- 9) Allow the mixture to sit for 5-10 minutes -- you should slowly see little clear strings separate out of the mixture into the alcohol layer, this is the DNA from the strawberries!
- 10) If you want to, you can take the DNA globs out of the solution with tweezers or a toothpick to get a better look at them

#SVatHome

Want to share your  
project or results with us?

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Have a question?

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