

DNA Extraction

Required Equipment:

- Ziploc (freezer) bag
- Strawberries
- Dishwashing soap
- Salt
- Funnel
- Coffee filter
- Large vial/test tube (~50 mL)
- Cold ethanol
- Popsicle stick

Pre-Lab Lecture Key Points:

- *DNA* = a substance that carries genetic information in the cells of plants and animals
- All living things such as plants, animals, and humans have DNA, which comprises our genes, which in turn determines growth, development, and reproduction characteristics
- Students should be familiar with the double helix structure of DNA
- All DNA is composed of the same four bases: adenine (A), cytosine (C), guanine (G), and thymine (T)
- In its double helix structure, DNA forms chromosomes; fruit flies, humans, elephants, and dogs have 8, 46, 56, and 78 chromosomes, respectively
- In the experiment, salt and soap are added to break apart strawberry cell walls (known as agitation), which allows the DNA to be extracted
- Once extracted, DNA can be purified and sequenced; this procedure allows us to study viruses, diseases, and evolution

Student Lab Procedure:

1. Place 2 strawberries into a freezer bag. Close the bag and using your fingers, mash the strawberries into a slurry for about 1 minute.

2. Add 2 teaspoons of water, 1 teaspoon of dishwashing soap, and 1 pinch of salt into the freezer bag. Mash the mixture together for 1 minute.

*If students are using large freezer bags, make sure the soap and salt are added to the strawberry mash and don't get stuck on the sides of the bags

3. Place the coffee filter inside the funnel and place the funnel over your vial/test tube. The apparatus should be set up such that when the mixture is placed on the coffee filter, the filtered liquid will run down the funnel into the vial/test tube.
4. Slowly pour the mixture into the coffee filter. Wait for 5 minutes as the liquid is filtered and drips into the vial/test tube.

*A spoon or popsicle stick can also be used to press the mixture through the funnel to help it filter faster, just be sure not to break the coffee filter

5. Now add about 10 mL of cold ethanol into your vial/test tube. Record what happens on your worksheet!

*Colder ethanol is better since it will cause the DNA to be more insoluble

6. By sticking a popsicle stick into the vial/test tube, you should be able to scoop out the isolated strawberry DNA from the water-ethanol interface. Record the texture of the DNA on your worksheet.

*Students are welcome to take the water-ethanol-DNA mixture home with them (just be sure they know not to drink or touch the mixture)

Wrap-Up:

- The point of the salt and dishwashing soap is to break open the strawberry cell walls, which allows the DNA to be extracted
- When ethanol is added, it makes the DNA less hydrophilic, causing it to drop out of solution; it should appear gooey and stringy
- Colder ethanol is better since it will make the DNA more hydrophilic, and therefore more insoluble
- This procedure does in fact work with other fruit and even humans (cheek cells, for example)