

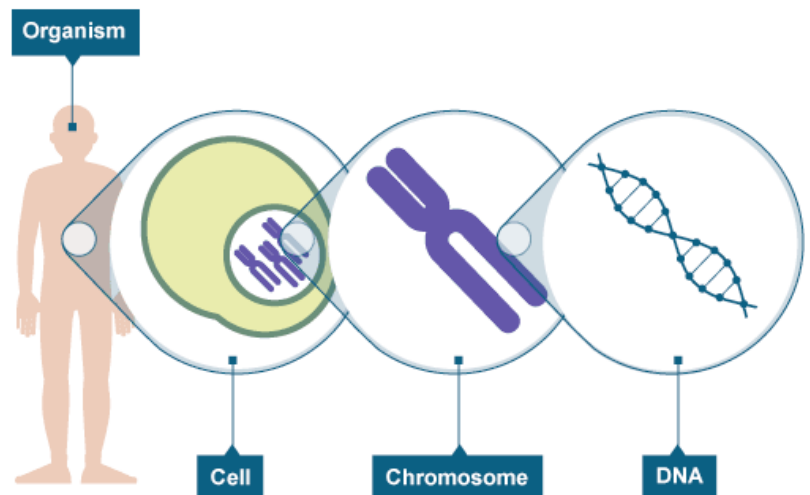
Genetics

Extracting DNA from Strawberries

Genetics is a field in biology that studies how the characteristics of living organisms are transmitted from one generation to the next.

DNA (deoxyribonucleic acid) is the material that carries the information about how a living organism will look and function.

In our activity today, we will be learning how to extract DNA from strawberries using common household items.



Materials

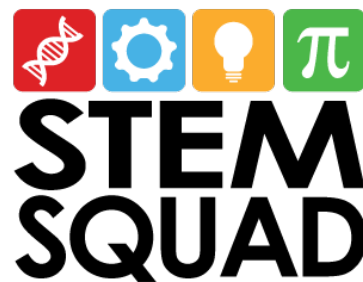
Be sure to have all group materials at your lab table before beginning your experiment.

Group Materials

- 1 set of goggles per person
- 1 pair of gloves per person
- 1 hand lens per person
- 1 centrifuge tube per person
- 5 test tubes
- 3 pipettes
- 1 sharpie
- 1 red plastic cup
- 1 clear plastic cup
- 1 funnel
- 1 plastic bag
- 1 cheesecloth
- 1 paperclip
- 1 strawberry

Class Materials

- Laundry detergent
- Isopropyl alcohol (in ice)
- Distilled water
- Salt



For more activities and information about genetics and DNA visit:

<https://estemestemsquad.weebly.com>

Procedure

Follow each step in the procedure carefully to extract the DNA from the strawberry.

- 1) Make sure everyone in the group has on their safety gear (goggles and gloves).
- 2) Label the five test tubes with: salt, detergent, extraction buffer, strawberry solution, and alcohol.
- 3) Label the three pipettes with: EB (extraction buffer), SS (strawberry solution), and A (alcohol).
- 4) Assign a group member to each of the following tasks:
 - a. Go to the salt station with the salt test tube. Add two teaspoons of salt to the test tube.
 - b. Go to the detergent station with the detergent test tube. Add 10 mL of detergent to the test tube.
 - c. Go to the water station with the red cup. Add 100 mL of water to the test tube.
- 5) To create the extraction buffer, add the salt and detergent to the water in the red cup. If there is detergent left over in the test tube, pipette a small amount of extraction buffer from the red cup back into the test tube to flush it out. Set aside the extraction buffer for later.
- 6) Remove any green leaves from the strawberry.
- 7) Put the strawberry in the plastic bag and gently squish the strawberry with your fingers for two minutes.

What does the squishing do to the strawberry?

Break apart large plant cells to allow the extraction buffer to work.

- 8) Using the extraction buffer (EB) pipette, add 10 mL of extraction buffer from the red cup to the extraction buffer test tube.
- 9) Pour the extraction buffer from the test tube into the plastic bag with the mashed strawberry.

What does the extraction buffer do to the strawberry?

The detergent dissolves the cell and nuclear membranes. Once the membranes are broken apart, the DNA is released from the cell.

The salt will neutralize the DNA so it has no charge. We'll see why this is important later...

- 10) Gently squeeze and squish the bag to mix the solution for one minute.
- 11) Place the funnel into the small clear plastic cup. Place the cheesecloth over the top of the funnel.
- 12) While one group member is holding the cheesecloth on the funnel, have another group member slowly pour the strawberry solution from the bag onto the cheesecloth.

Why do we need to filter it through the cheesecloth?

Separates large cell parts, broken cell wall and membranes from the proteins, carbohydrates, and DNA.

- 13) Using the strawberry solution (SS) pipette, add 4 mL of the filtered strawberry solution from the clear plastic cup to the strawberry solution test tube.
- 14) Send a group member to the alcohol station with the alcohol test tube. Add 5 mL of alcohol to the test tube.

- 15) Tilt the strawberry solution test tube to a slight angle. Using the alcohol (A) pipette, **slowly** transfer 4 mL of alcohol **down the side** of the strawberry solution test tube. There should now be two layers present.
- 16) As the solution sits for two minutes, use your hand lens to examine what is happening.

What happens when you add the alcohol?

Adding the alcohol activates the neutralization of the DNA by the salt, so the DNA has no charge. Because the DNA is now non-polar, it won't dissolve in the polar water/alcohol solution. Instead the DNA will precipitate (comes out of the solution, clumps together, which makes it visible).

- 17) Unfold the paperclip. Dip it into the strawberry solution test tube at the zone between the alcohol and strawberry layers. Slowly swirl the paperclip in a circle to spool the DNA around the paperclip.
- 18) Add the DNA to the centrifuge tubes with a small amount of water.