AT HOME ACTIVITY

ILLINOIS
Carl R. Woese Institute for Genomic Biology

Strawberry DNA Extraction Activity

Overview:

Use this activity to learn more about some of the basics about DNA, why strawberries (and other types of fruit) are effective for this experiment, and ultimately extract strawberry DNA! If you'd like, you can even keep the DNA in a vial or take some out to investigate.

**The DNA (shown in the photo to the left) should separate from the strawberry material and will look like wet cotton fibers, a spider web, or some people think it looks like boogers!*

Learning Objectives:

- Complete a strawberry DNA extraction and explain why strawberries are effective for this experiment
- Gain insight into molecular biology techniques, while gaining hands-on experience with DNA

Activity Materials:

- Fresh Strawberries
- 70% Rubbing Alcohol
- Liquid Dish Soap
- Salt
- Ziplock Bag
- Measuring Spoon (1 tablespoon)
- A small vial or craft necklace bottle
- Paper Towels
- Scissors
- Mixing Bowl
- Measuring Cup (½ cup)
- Ice

Optional materials:

- Toothpick or pipette *(if you would like to remove DNA from container)*
- Goggles
- Gloves
- Apron or Lab Coat

Parent Notes:

Please note, varying methods of strawberry DNA extraction experiments may be found. The following activity has been adapted for ease of use when working with a large number of students but may be adapted accordingly. For example, although we suggest mixing the lysis solution ahead of time, you may decide that it would be best to allow young scholars to mix this solution themselves.

1) **To create the lysis solution:** Mix ½ cup of dish soap, 1½ cup of water, and 2 tsp salt. Amount of lysis solution made should be dependent on the number of people participating. Multiply appropriately.

2) If you are having trouble extracting the DNA, use the following troubleshooting options: add more salt, and/or alcohol, keep water volume small, double check that strawberry is smashed very well.

3) If you would like to watch a version of this extraction process demonstrated, visit https://www.youtube.com/watch?v=67KXatgoNKs for more information.

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Background:

As you carry out this experiment, make sure to share basics about DNA (DNA is found in all living things, DNA is found inside every cell, DNA contains instructions on how to make proteins) and why strawberry DNA extraction produces especially positive results (i.e. strawberries have lots of DNA that is easy to both extract and see!)

1) Strawberries are soft and easy to pulverize or smash
2) Strawberries yield way more DNA than other fruits because they are octoploid, meaning that they have eight copies of each type of DNA chromosome. Other cells often contain one or two copies. Human cells for example are generally diploid, meaning they have two sets of chromosomes. Other fruits that work well are kiwi, banana, and peaches.

Procedure:

**Please note the extraction solution can already be mixed and available ahead of time*

1) Place ½ sheet of paper towel (folded in half)l into the Ziplock bag. This will act as your filter.
2) Place one strawberry in-between the paper towel in the Ziplock bag. The paper towel will help filter out the chunks of strawberry after it is smashed.
3) Carefully smash the strawberry until it is smashed into a pulp. Just make sure not to break the bag!
4) Add 2-3 tablespoons of the extraction solution into bag.
5) Massage/smash the strawberry mixture around in bag with the extraction solution for ~2-5 minutes.
6) Cut a small hole in the corner of the plastic bag with strawberry solution in it with your scissors.
7) Slowly squeeze a few drops of the mixture into the small vial. Make sure to only get the liquid out and prevent chunks of strawberry from going into the vial. Fill approximately ¼ of your vial, although this will depend on its size.
8) Carefully add rubbing alcohol to the vial without mixing the solutions (the rubbing alcohol should sit on top of the strawberry solution). Fill vial about ¾ full, leaving room for a stopper or cap so you can still close the vial.
9) Close the top and gently mix back and forth, inverting the vial until the solution is mixed. Do not shake to hard as you could cause soap suds to form which will make it difficult to see the DNA.
10) Hold the vial at eye level and watch and record what happens.
11) Observe the DNA strands suspended in the solution. You may choose to keep the DNA in the vial or to remove it with a toothpick.
    a) Please note, if you would like to touch the DNA it is safe, but touching DNA contaminates it and you would not be allowed to do this in a lab setting where DNA was being tested, modified, or was being used in a criminal case.
12) Dispose of the plastic bag with the squashed strawberry solution and the paper towel.

During/Follow-up Questions:

- Why are strawberries a good fruit to use for DNA extraction?
    - *Answer: not only are they easy to smash but they also are octoploid which means they have 8 copies of their DNA vs. humans, which have ¼ the amount of DNA in their cells*
- Why do you think we need to smash the strawberries up to extract the DNA?
    - *Answer: we need to break up the cell structure so our extraction solution can access cellular material and release the DNA*
- Why do you think we use soap and rubbing alcohol separates the DNA?
    - *Answer: the polarity of salt, detergent, and alcohol helps to separate the cell membrane and cell structures from the DNA material*