

DNA Extraction: Strawberries

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The purpose of this activity is to review various aspects of cell membrane structure, cellular organization, and to learn how to extract DNA from cells.

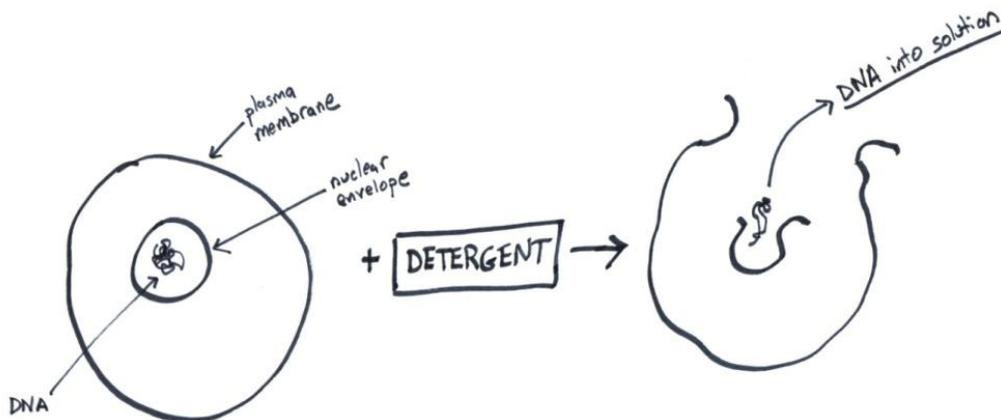
What does each step do?

Detergent

Detergent contains sodium laurel sulfate, which cleans dishes by removing fats and proteins. It acts the same way in a DNA extraction, **pulling apart the fats (lipids)** and proteins that make up the membranes surrounding the cell and nucleus. Once these membranes are broken apart, the DNA is released from the cell. DNA is a polar molecule thus it is hydrophilic and can dissolve in an aqueous solution. The salt (NaCl) helps to remove any proteins that are bound to the DNA and also helps keep those proteins dissolved in the aqueous solution so that they do not precipitate out with the alcohol along with the DNA.

Alcohol

The DNA released from the cell is dissolved in the water/detergent/berry solution and cannot be seen. **DNA precipitates** out of solution in alcohol, where it can be seen. Besides allowing us to see the DNA, the alcohol separates the DNA from the other cell components, which are left behind in the solution.



Materials:

- Strawberries
- Pint Ziplock bags (slider locks help prevent spillage)
- 95% Ethanol or 100% isopropanol
- Cheesecloth
- Plastic test tubes with caps
- Test tube rack(s)
- Dawn dish soap
- Salt
- Distilled water
- Wooden meat skewers
- Plastic medicine cups
- Plastic graduated cylinders (50 ml)
- Small plastic funnels

Methods: (prep work)

1. Cut cheesecloth into 3x3 inch squares (large enough to fit over the funnel head).
2. Pour 12 ml of alcohol into plastic test tubes in test tube rack. Cap and place in refrigerator (the process works faster when cold) for at least 30 minutes.
3. Mix up detergent/extraction solution-5% soap and 1.5% salt solution. To make 500ml, dissolve 7.5 grams NaCl (table salt) and 25ml of Dawn dish soap into 475 ml of distilled water.
4. Pour 10 ml of detergent solution into plastic medicine cups.
5. Put 2 (medium) strawberries (about golf ball sized all together) into each baggie (remove green leaves first).

Student Methods: (in pairs)

1. Hand out the baggies with strawberries and the detergent. Have the students pour the detergent into the bag and GENTLY smash the contents for about 3-4 minutes.
2. While they are smashing, hand out funnels, cheesecloth, and graduated cylinders.
3. Have one student hold the cheesecloth over the funnel, which is situated on top of the graduated cylinder, while the other student carefully slowly pours the mash onto the cheesecloth. They need to allow the juice to drip down into the funnel. They can squeeze the cloth to speed up this process if necessary.
4. Hand out the chilled alcohol and instruct the students to SLOWLY and CAREFULLY pour the alcohol down the side of the graduated cylinder (without the funnel). This is best done by holding the graduated cylinder at an angle while pouring the alcohol.
5. They need to set this aside and wait a few minutes for the DNA to float to the top. While they are waiting, have them put their cheesecloth into their baggie (have them keep it for now). Also collect the medicine cups, plastic test tubes (and caps), and the funnels.
6. Pass out the meat skewers to the students and have them twirl the DNA onto the skewer if they wish.
7. Have the students put the skewers into the baggie and throw them away.
8. Collect their graduated cylinders.
9. Clean the funnels, medicine cups, graduated cylinders, and plastic test tubes.