LAB DNA Extraction from Wheat Germ

Last Name _____, First _____ per___

DNA was discovered in the 1950's but there is still a lot to learn about it. How does DNA determine the traits of a person? To learn more about DNA it first must be extracted from cells. The purpose of this lab is to learn how DNA can be taken out of cells and then be studied. Wheat germ is a good source because it is part of the seed of the wheat plant. It must be fresh. Toasted wheat germ will not work.

Materials:

2)50 ml test tubes
25 ml graduated cylinder, and 10ml graduated cylinder
600ml beaker, thermometer, and hot plate *(to heat water to 50-60°C)*
2 dropper pipettes *(to remove foam)*
wooden applicator stick *(for stirring)*
Raw wheat germ - 1 gram *(Raw wheat germ has living cells)*
20 ml warm water 50-60°C *(Heat softens the cell membranes)*
salt (*just a dash to add to the water. Salty DNA precipitates easier*)
meat tenderizer (*just a dash to add to the water. Enzymes in tenderizer cuts the proteins away from the DNA*)
liquid detergent - 1 ml *(Detergent cuts the lipids in the cell and nuclear membranes releasing the DNA)*
cold ethyl alcohol - 14 ml (*Keep the alcohol on ice, Alcohol causes DNA to precipitate from the water*)
paperclip hook (*for collecting the DNA*).
rinse bucket

Procedure

1. Heat 200ml of water in the beaker on a hot plate. Heat to (50-60 °C) *Do not use water hotter than 50-60° C. The water will cool during the extraction procedure, but this does not matter.*
2. Add a pinch of salt and a pinch of meat tenderizer to the hot water.
3. Place 1 gram of raw wheat germ in a 50 ml test tube.
4. Add 20 ml of warm (50-60 °C) water and mix constantly for 3 minutes.
5. Add 1 ml of detergent and mix gently every minute for 5 minutes. Try not to create foam. Use a dropper pipette to remove any foam from the top of the solution.
6. Let the wheat germ settle and then pour off the soapy liquid into a clean test tube.
7. Tilt the test tube at an angle. SLOWLY pour 14 ml of alcohol down the side so that it forms a layer on top of the water/wheat germ/detergent solution. Do not mix the two layers together. DNA precipitates at the boundary between the water and the alcohol). Therefore, it is crucial to pour the alcohol very slowly so that it forms a layer on top of the water solution. If the alcohol mixes with the water, it will become too dilute and the DNA will not precipitate.
8. Let the test tube sit for a few minutes. White, stringy, filmy DNA will begin to appear where the water and alcohol meet. You will usually see DNA precipitating from the solution at the water-alcohol interface as soon as you pour in the alcohol. If you let the preparation sit for 15 minutes or so, the DNA will float to the top of the alcohol.

Analysis and Conclusions

1. Were you successful in extracting DNA? _____ If so, what did it look like? _____
   _____

2. Why are biologists interested in learning about DNA? _____
   _____
   _____

3. Where in a cell would you find DNA? _____

4. Part of the cell membrane is made of large fat (lipid) molecules. What do you think the purpose of using dish soap was? _____
   _____

More Information

You can usually get more DNA to precipitate from the solution by using one of the DNA-collecting tools (such as a glass or paper clip hook) to gently lift the water solution up into the alcohol. This allows more DNA to come in contact with the alcohol and precipitate. You may find it helpful to pour the water/detergent solution into a clean test tube, leaving behind the wheat germ, before adding the alcohol.

Use a glass or paper clip hook or a wooden stick to collect the DNA.

Scientists often use a protocol, such as the instruction given in this activity, as a starting point for developing or improving techniques. Below are some ideas for things you might explore as you work to develop your own protocol.

DNA sources

Try using this protocol to extract DNA from other foods, such as oatmeal, seeds, yeast, etc.; the procedure may need to be modified (longer initial soak in hot water, etc.).

Detergents

Try using different detergents and soap products to extract DNA. Compare the amount of DNA extracted with these products.

To quantify the amount of DNA you extract:

Weigh pieces of filter paper.

Use a hook to place the DNA you extract on these pre-weighed filter paper pieces. Spread the DNA out as much as possible; it will dry more slowly if it is clumped.

Let the DNA sit for several days until you are sure it is absolutely dry.

Weigh the filter paper again with the DNA.

Calculate the DNA weight:

(Weight of filter paper + DNA) - (Weight of filter paper before DNA) = DNA weight.

Alcohols

Compare the amount of DNA obtained by using different alcohols. Use the procedure above (under Detergents) to measure the amount of DNA you extract.

Water temperature

Explore the effect of water temperature on DNA extraction by using different water temperatures with the protocol. Use the procedure above (under Detergents) to quantify the amount of DNA you extract.