**DNA Extraction Techniques**

**Procedure 1: Extraction from Strawberry**

****\*Strawberries are octoploid, which means they have eight sets of chromosomes. The procedure for extracting DNA from a strawberry is simple, and the results are usually obvious, it is easy to see the white strands of DNA within the pink solution of strawberry juice. In this procedure you will crush a strawberry and add detergent and salt to break down the cell walls to release the DNA within the nucleus. The DNA will then precipitate into a cold alcohol layer in a test tube.

***DNA Extraction Buffer*** *(can be prepared in advance)*

900 ml of deonized water, 50 ml of clear dishwashing detergent, 2 teaspoons of salt

1. Add a strawberry (or half a strawberry) to a ziploc storage back and use your hands to smash the strawberry, taking care to not break the bag.

2. Add 10 ml of the DNA extraction buffer.

3. Smush the strawberry and buffer for one minute.

4. Use a funnel and cheesecloth (or coffee filters) to filter the strawberry juice into a single test tube or beaker.

5. Slowly pour cold ethanol or 91% isopropyl alcohol over the top of the strawberry mixture. It may be best to use a pipette to add it. You want a single layer of clear ethanol on top of the strawberry mixture. COLD ethanol will work best.

6. White strands will form in the ethanol layer, use an innoculating loop or stirring rod to spool the strands.

**Procedure 2: DNA Extraction from Cheek Cells**

Materials: Water, Clear Dish Soap, Table Salt, Isopropyl Alcohol (70%) or Ethanol, Food Coloring

1. To 200 Ml drinking water add two teaspoons of salt

2. Gargle the salt water for 1 minute.

3. Spit the gargled water into a beaker (or new cup). Now your cheek cells are suspended in the salt water.

4. Gently stir the salt water with one drop of soap (try to avoid air bubbles) or use 10 ml of the buffer solution you used in the strawberry extraction.

5. In a separate beaker (or cup), mix 20 ml isopropyl alcohol and 1-3 drops of food coloring. *(Food coloring is optional, you can also just pour a layer of the alcohol on top of the cheek cell sample as you did with the strawberries)*

6. Optional: You may want to transfer the gargled salt water/soap solution to a test tube to make it easier to see the DNA.

7. Gently pour the colored alcohol over the top of the gargled water so that it forms a layer on top.

8. Wait about 2.5 minutes until you see white clumps and strings forming - THIS IS DNA!

9. Use a stirring rod or straw to spool the clumps of DNA out of the solution.

**Procedure 3: Onion Extraction**

**Detergent/Salt Solution**

Add 20 ml of detergent to 20 g non-iodized salt and 180 ml of distilled water.

*The detergent salt solution is used to break down the fat and proteins that make up the cell membrane. The salt causs the phosphate ends of the DNA to come closer together which will make it easier to precipitate out of solution.*

**Meat Tenderizer Solution**

Add 5 g of meat tenderizer to 95 ml of distilled water.

*Enzymes in the meat tenderizer will break down proteins*

**Ethanol Solution**

Add 5 ml of distilled water to 95 ml of ethanol (alcohol).
Rubbing alcohol can be substituted. Place this solution on ice, the colder the better.

*Alcohol is used to precipitate the DNA. Because DNA is soluble in water, alcohol (ethanol) causes the DNA to precipitate and come out of the solution. DNA will rise into the alcohol layer.*

**Procedure**

1. Cut the onion(s) and remove the center portions. Chop into small pieces and place in blender.

2. Add 100 ml of the detergent/salt solution

3. Blend on high for 1 minute

4. Strain the mixture into a beaker using a strainer and coffee filter

5. Add 20 ml meat tenderizer solution to the mix

6. Place 6 ml of the filtrate into a test tube.

7. Pour 6 ml of ice cold ethanol down the side of the test tube to form a layer on top.

8. Let the mixture sit for 2-3 minutes.

9. Use a stirring rod or wooden stick as a hook to spool and draw the DNA into the alcohol

### Discussion Questions

1. What does DNA look like?

2. Why is it important for scientists to be able to remove DNA from cells?

3. What is the role of detergent, ethanol, and salt in the extraction process?

4. Is there DNA in your food? How do you know? Why are you not harmed (or altered) by injesting the DNA of another organism? What implication does this have for farmers who would use GM (genetically modified) plants?