**DNA Extraction Lab**

**Introduction**

DNA is the fundamental building block for life. It resides in the nucleus of cells and consists of thousands of *genes* that contain the instructions for building the different parts of the cell. DNA is what makes us who we are. It determines what physical characteristics we have, such as hair and eye color, as well as some of the diseases we may develop. DNA is a very long molecule, so in order to fit inside the cell, the DNA is highly coiled and twisted into *chromosomes*.

A cell is a complex living unit that contains many biological molecules and organelles, each performing a specific function within the cell. In order to analyze the DNA found at a crime scene, the DNA needs to first be extracted from the cells. This means that it must be separated from all of the other chemicals and materials inside the cell.

**Procedure**

In this lab you will isolate DNA from animal cells. In order to extract DNA from cells, scientists take advantage of the unique chemical properties of the DNA. Plant cell walls are made of cellulose, which is a tough, insoluble material that makes plants sturdy. It can be broken through physical actions. In this lab you will mash the strawberries in order to break open the cell walls. Cell membranes and nuclear membranes are made up of fats. Detergents wash away these fats, just like they would grease in a pan. In this lab you will treat the mashed strawberry cells with detergent to dissolve the cell membranes and nuclear membranes to release the DNA. Once the cells are broken open, the DNA and cell debris are all mixed together. Because the DNA is in solution, you can separate the components by filtering the mixture through cheesecloth. Finally, you can separate the DNA from solution with alcohol, since DNA does not dissolve in alcohol. It is very important that you follow the procedure carefully. Otherwise, your DNA sample will be contaminated with proteins and other cell components. Remember to follow all the safety instructions provided by your teacher.

*DNA Isolation from Saliva*

Scientists can use a procedure similar to the one found below to extract DNA from the cells of victims or potential suspects, either in saliva or other bodily fluids. They must be very precise as they work to prevent contamination of the final sample.

 1. Gather the following materials from your teacher. Many items may be located at your station.

* + 95% Alcohol (kept ice cold)
  + Paper or plastic cup containing salt solution
  + 15 mL screw-cap conical bottom plastic centrifuge tube containing detergent solution
  + Plastic transfer pipette
  + Glass stirring rod or wooden popsicle stick

2. Rinse your mouth for one minute with the salt solution. Make sure to use your teeth to scrape the inside of your cheeks. This will release the cells into the solution. Spit the salt solution containing your cheek cells back into your cup.

3. Pour the salt solution with saliva/cheek cells into the tube containing the detergent solution. Gently rock the mixture back and forth for 2 minutes.

4. Hold the 15 mL conical tube at an angle. Using a transfer pipet, carefully and slowly add 3 mL of cold 95% ethanol down the side of the tube. The mixture will sink to the bottom of the tube and alcohol will sit on top. Do NOT mix. Allow the tube to sit undisturbed for two or three minutes.

5. Watch closely as the DNA will appear as a clear-to-whitish, stringy clump where the ethanol layer meets the cheek cell extract layer. Tiny bubbles in the ethanol layer will appear where the DNA precipitates.

6. Dip the glass stirring rod or wooden popsicle stick into the tube and twirl it around gently to collect some DNA. Stir the DNA gently at the interface between the ethanol and strawberry extract layer to extract more fibers.

7. Carefully remove the stirring rod or popsicle stick from the tube and observe the DNA. Record all observations in your laboratory journal.

8. Clean up your lab station and wash your hands.

9. Answer the Conclusion questions.

**Conclusion**

1. Why did the DNA isolation protocol differ for the plant and animal cells?
2. What physical evidence obtained from the crime scene could be used to obtain DNA?
3. Describe one of the main challenges in extracting DNA from cells found at a crime scene.