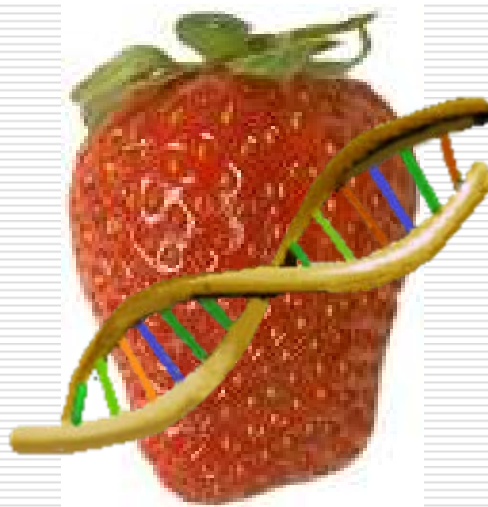


DNA Extraction from Strawberry



Objectives

Students should be able to:

- Follow a scientific protocol
- Describe where DNA can be found
- Understand basic chemical nature of DNA
- Understand why DNA precipitates with salt/ethanol
- Describe appearance of DNA

Standards Addressed

■ Life Science

- The cell - DNA is located in the cell nuclei of all living organisms
- Molecular basis of heredity - DNA molecule directs the synthesis of every protein and contains all the genetic information that is passed on to new cells.

■ Physical Science

- Chemical reactions - structure of cell membrane

■ Science as Inquiry

- Design and conduct scientific investigations
- Formulate and revise scientific explanations and models using logic and evidence



onion



strawberry



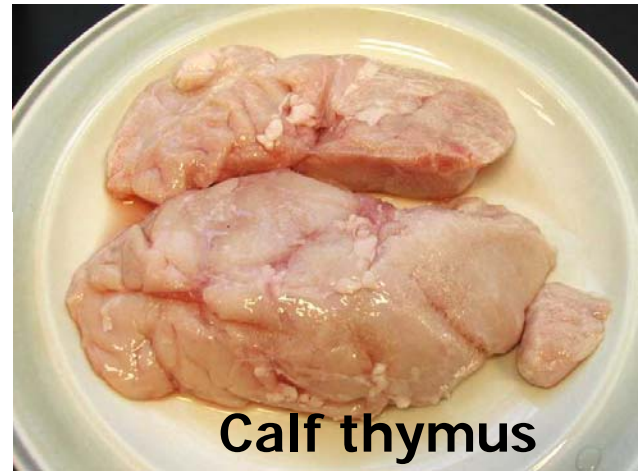
banana



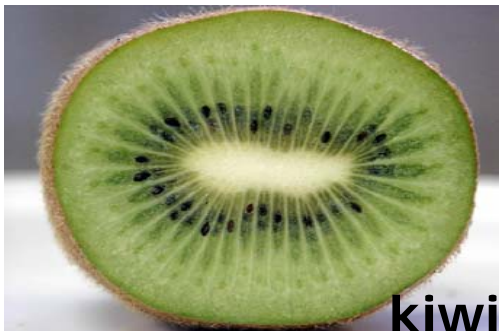
broccoli



peas



Calf thymus



kiwi



Wheat germ

Three Main Steps in Any Extraction

- Break apart cells
- Release DNA from nucleus
- precipitation of the DNA

Protocol

1. Place one strawberry in a zip lock baggie.
2. Smash strawberry with fist for 1-2 minutes.
3. Add 5 ml extraction buffer to the bag.
4. Mash again for one minute.
5. Filter through cheesecloth in a funnel into tube (1/4 full)
6. Slowly pour the ice-cold alcohol into the tube until the tube is half full.
7. At the interface, you will see the DNA precipitate out of solution and float to the top.
8. Spool DNA on your glass rod or pipette tip.

Teacher Prep: DNA extraction buffer

DNA extraction buffer

- 100ml of shampoo (without conditioner)
- 15g NaCl
- 900ml water



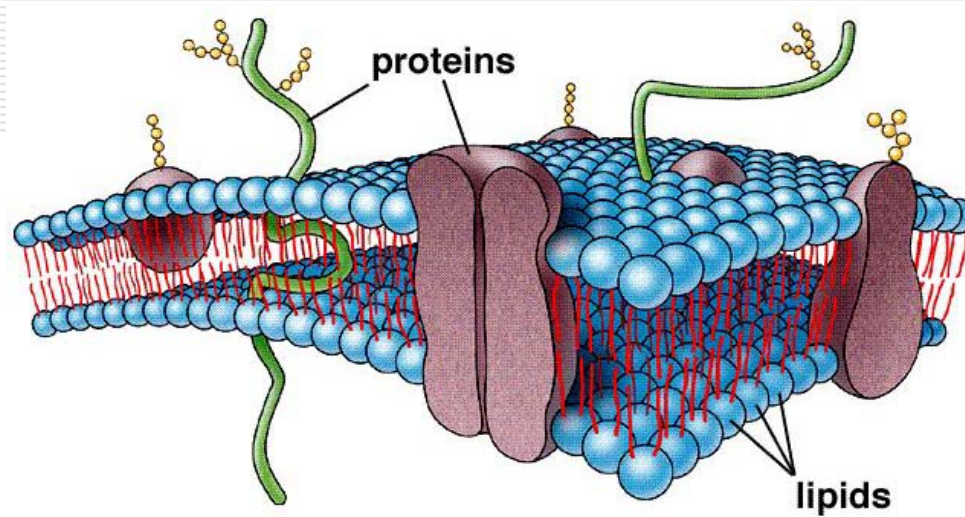
Alternatively

- 50ml dishwashing detergent
- 15g NaCl
- 950ml water

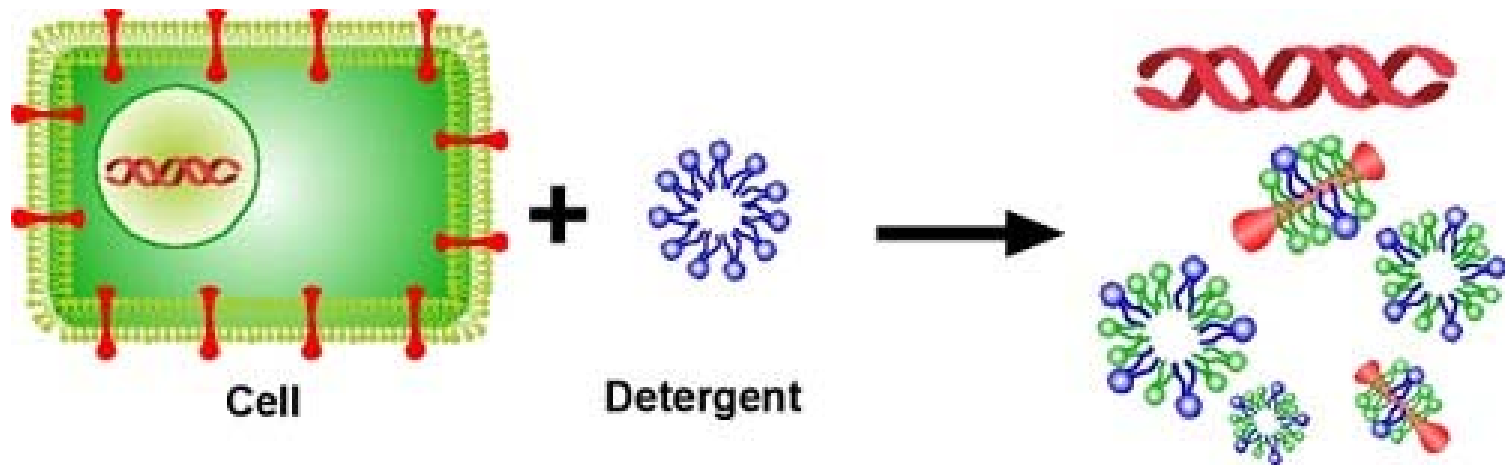


Why Detergent?

- Detergent dissolves the lipids in the cell membranes and nuclear envelope
- Soap molecules and the lipids (fats) in cell membranes are made of two parts:
 - hydrophilic heads
 - hydrophobic tails
- When detergent comes close to the cell, it captures the lipids and proteins (due to their similar structures)



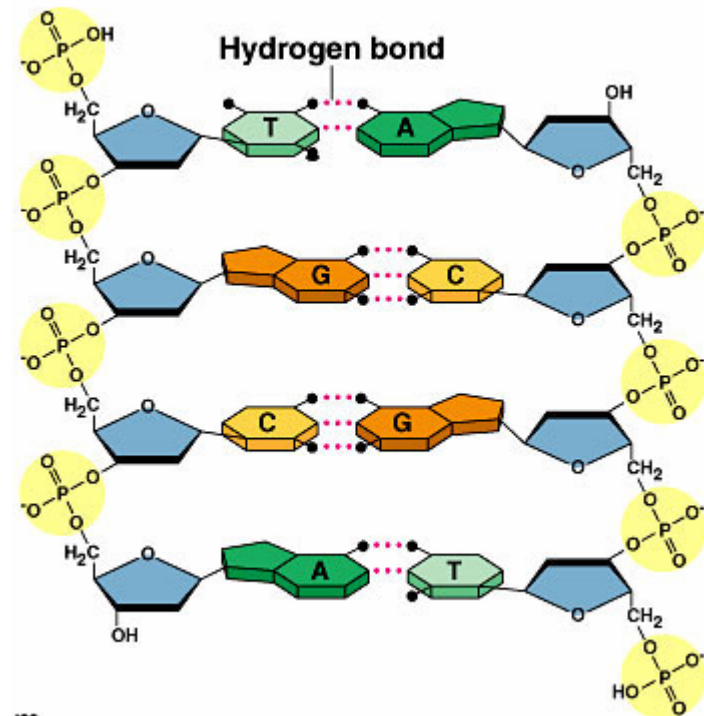
Plant cell membrane- phospholipid bilayer



How detergent disrupts the plant cell membrane

Why Salt?

Salt stabilizes the negatively charged phosphate groups and allows the DNA strands to clump together.



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Why Alcohol?

- The addition of the cold alcohol precipitates the DNA since it is insoluble in high salt and alcohol.
- Since water is soluble in ethanol, the water becomes dissolved into the comparatively large volume of ethanol, which effectively removes the water from around the DNA—causing the DNA to precipitate.

Protocol

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Discussion Questions

- Where can DNA be found in the cell?
- What is DNA?
- What are the three basic steps in any DNA extraction?
- What is the purpose of the detergent? Of the sodium chloride? Of the alcohol?
- Describe the appearance of your final product. Is this a pure DNA sample?
- List some practical applications where extracting DNA is necessary.