

Biological Chemistry: Extraction of DNA

DNA is present in all living organisms. DNA can be extracted from cells using common household materials. In this activity you will extract DNA from frozen strawberries. Strawberries are a good test subject for DNA extraction because strawberries have a lot of DNA; they are polyploid, i.e., they have multiple copies of their genome in each cell. Strawberries have 56 chromosomes and are actually octoploid. They have 8 copies of each chromosome in every cell!!! Humans are diploid. We have 2 copies of each chromosome in every somatic cell.

Materials

Frozen strawberries

Plastic sandwich bags

DNA extraction buffer (15 gr NaCl, 900 mL water, 100 mL dishwashing liquid (Dawn) or shampoo without conditioner) - chill on ice

Ethanol (ice cold)

Funnel

Cheesecloth or coffee filter

Test tube

Beaker – 250 mL

Graduated cylinder – 25 or 50 mL

Test tube rack

Glass rod

Procedure

1. Add one strawberry (for best results pick a strawberry that is 2 cm long or larger) to the plastic sandwich bag. Remove the air from the bag and seal the bag.
2. Squeeze and mash the strawberry for 2 minutes. Do not tear the plastic bag.
3. Dispense 10 mL of cold DNA extraction buffer into the graduated cylinder.
4. Pour the extraction buffer into the sandwich bag. Remove the air from the bag. Seal the bag.
5. Mash and mix the buffer and strawberry for 1 minute.
6. Place the funnel on top of the 250 mL beaker.
7. Place the cheesecloth or coffee filter into the funnel. If using cheesecloth make sure you use at least 4-ply cheesecloth.
8. Pour the strawberry extract into the funnel. Do not worry if all of the extract does not pass through the funnel. You only need 2 mLs of strawberry extract. If you get more, all the better.
9. After 5 minutes, remove the funnel. If you have at least 2 mL of strawberry extract dispose of the filter and wash the funnel.
10. Pour the strawberry extract from the beaker into the graduated cylinder. How much extract do you have? _____ mLs
11. Pour the extract from the graduated cylinder into the test tube. Rinse the graduated cylinder.

12. Use the graduated cylinder to measure twice as much ice-cold ethanol as strawberry juice. (If you have 5 mL of strawberry extract, you will need 10 mL of ice-cold ethanol.)

13. Gently add the ice-cold ethanol to the test tube containing the strawberry extract. Do not stir the tube. DO NOT shake the tube. If you gently tip the tube back and forth more DNA will precipitate.

14. Place the tube in the test tube rack. The DNA will precipitate at the interface of the strawberry extract and ethanol. Small bubbles will be observed in the DNA giving it foamy appearance. Photograph your tube and copy the image here.

15. Slowly insert the glass rod at the alcohol-strawberry interface. Twirl the rod slowly. The DNA will stick to the glass rod. You can remove the glass rod from the test tube to better see the DNA.

Why are frozen strawberries used rather than fresh strawberries?

What is the function of the salt and detergent in the extraction buffer?

Why did you squeeze the air from the baggy before crushing and extracting the DNA?

What color was the DNA?