

DNA Extraction

Introduction

DNA (deoxyribonucleic acid) is found in all living organisms and functions as the genetic blueprint for a cell. Scientists can study DNA for many different reasons:

- They can figure out how the instructions stored in DNA help your body to function properly
- They can use the DNA sequence to genetically modify organisms or make new medications
- They can compare DNA sequences to solve criminal investigations or confirm paternity
- They can even use DNA samples from ancient fossils to reconstruct evolutionary histories

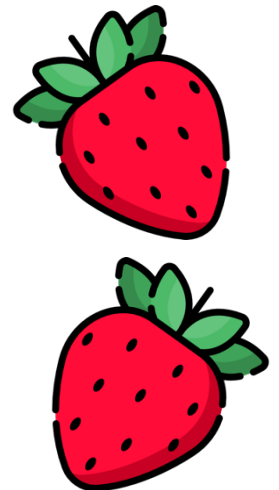
In order to undertake these investigations, scientists need to isolate the DNA from the rest of the cellular contents. This process is called DNA extraction. The purpose of this experiment is to extract the DNA from a strawberry. As strawberry plants are eukaryotes, the DNA is contained within a membrane-bound nucleus and bound to histone proteins to form linear chromosomes.

Materials

- 1 × fresh strawberry
- 1 × Zip lock plastic bag
- 1 × large test tube
- 1 × filter funnel
- 1 × filter paper
- 1 × wooden skewer
- 1 × transfer pipette
- 3ml ice-cold ethanol
- 10ml extraction buffer
 - 1ml detergent
 - 0.15g salt
 - 9ml water

Method

1. Remove sepals (leaves) from a strawberry and place it in a Zip lock bag.
2. Add 10ml of extraction buffer and seal the bag, removing any air pockets.
3. Crush the strawberry with your fingers until a smooth paste is produced.
4. Pour the strawberry paste into a large test tube, using a funnel lined with filter paper to remove any solid pulp. Discard the filter paper and the pulp.
5. Slowly add 3ml of ice-cold ethanol to the test tube using a plastic transfer pipette. A clear layer of ethanol should form above the strawberry solution.
6. The DNA should appear as a white, thread-like structure at the interface of the ethanol and strawberry solution (do not shake the tube will this occurs).
7. Use a skewer to spool the DNA around the rod and observe its appearance.



Results

1. Explain the role of the detergent in the DNA extraction buffer

The salt in the extraction buffer makes the DNA molecules stick together and separates them from the histone proteins. The DNA associates with the positively charged cations within a salt solution.

2. What specific component of a DNA nucleotide associates with the cations?

The presence of salt also reduces the solubility of DNA in the presence of alcohol (ethanol). This causes the DNA to form the whitish, gooey precipitate that can then be observed and collected.

3. Outline the process by which scientists separate the DNA from the remainder of the solution.



Hint: It involves spinning!

4. Contrast the structure and location of DNA in prokaryotic versus eukaryotic cells.

5. Draw the structure of a labelled DNA molecule (the diagram must include at least eight nucleotides).