

## Plant genetics: extract DNA and explore the challenge of gene sequencing

# DNA extraction infosheet

DNA is found in the nucleus of the cell, the nuclear membrane has a double layer, and plant cells have a tough cellulose cell wall. We use lysis buffer to get DNA out of the cells and then a precipitation solution to make it insoluble, so we can see it. This is a very similar process to the one that researchers use to extract DNA for sequencing.

What is happening at each stage?

1. During **preparation**, salt, water, and detergent (shampoo or washing-up liquid) are mixed together to make the lysis buffer. This solution is then added to the bag containing fruit.
2. During **lysis**, the cells that make up the fruit are burst open by the prepared lysis buffer, leading to the DNA being released into the liquid. Squashing the fruit speeds up the lysis process by physically breaking up the fruit tissue and exposing more cells to the lysis buffer.
3. During **precipitation**, alcohol is used to bring the DNA out of solution. Slowly pouring cold alcohol down the side of the cup leads to it forming a clear layer on top of the fruit solution because it has a different density. DNA is not soluble in alcohol, so it precipitates into the alcohol and appears as a gloopy solid, which can then be collected.

### Lysis buffer

- The solution of shampoo, water, and salt is great at breaking up fruit cells.
- The surfactant components of the detergent in the shampoo bursts the cells that make up the fruit (much like it cuts through grease when washing hair – washing-up liquid also works). Detergents work by [inserting into the lipid membrane](#) of the cell, breaking it apart, and releasing the contents.
- DNA is highly soluble in water. The salt helps to draw the DNA out of the solution because the sodium ions have a stronger positive charge than water and bond more strongly to the negative charges on the DNA backbone, which temporarily neutralises the DNA and makes it easy to draw out of the watery fruit solution.

### Addition of alcohol

- Alcohol is nonpolar. Once the DNA is bonded to sodium ions and dissociated from the water solution, it is forced to bond even more tightly by the nonpolar alcohol and precipitates out of the water-based solution and into the alcohol layer, where it is insoluble and can be collected.