



Extracting DNA from fruit

(Adapted from a method written by Katie Howe <https://thenode.biologists.com/outreach-activity-extracting-dna-from-kiwi-fruit/resources/>)

DNA (or **Deoxyribonucleic Acid**) is a long molecule that can be found in all living organisms. It is the instruction manual that tells each of the cells in your body what to do. DNA determines the colour of your eyes, or the straightness of your hair for example. Here's a simple experiment to extract and visualise the DNA from fruit.

Children should be supervised!

1. Prepare your equipment

You will need:

- Fruit; e.g. 2 Kiwi fruit, or 6-8 Strawberries
- 80ml Tap Water
- ½ teaspoon Table Salt
- 2 teaspoons Washing Up Liquid
- 20ml pineapple juice or contact lens cleaning solution
- 100ml cold alcohol such as surgical spirit; put in the freezer an hour before you start the experiment and leave until ready to use. (Apparently strong rum also works well).



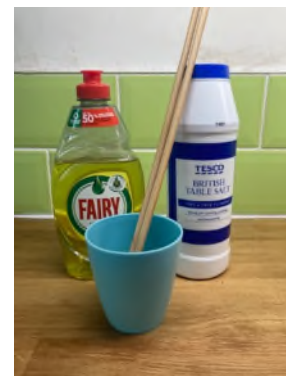
Equipment

- Chopping board
- Sharp Knife
- Fork
- Teaspoon
- Stirrer (e.g. chop stick)
- Measuring jug
- Two small beakers or cups (can be plastic or glass)
- Sieve
- Bowl
- Kitchen Roll
- Tall glass or empty jam jar (**must be glass**), for steps 6-8.

2. Make the extraction solution

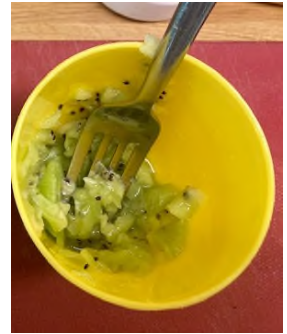
DNA is tightly packaged inside the nucleus of cells. The membranes of the cell and nucleus are rich in fats so we can break them down using a detergent (washing up liquid in this case). The salt helps to breakdown and remove the proteins that package the DNA tightly inside the nucleus.

- In one of the beakers, add the water and salt and stir until the salt is dissolved.
- Add the washing up liquid and stir briefly and gently, trying to avoid making bubbles.



3. Prepare a fruit mush

DNA can be extracted from any living thing, from bacteria to humans. Kiwi fruit and strawberries work really well for this experiment, but you could also investigate other fruit. Make sure you remove any outer skin before starting for fruits such as kiwi, as they are mostly dead and do not contain DNA. The fruit needs to be broken up so the extraction solution can reach the cells.



- Peel the fruit and chop into small pieces.
- Add the chopped fruit to a second beaker and mash with a fork.

4. Add the extraction solution to the fruit mush

In this step, the detergent breaks down the cell membranes so the DNA can be released. The salt removes the proteins that are bound to the DNA.

- Add the extraction solution to the fruit mush. Give a brief gentle stir.
- Leave at room temperature for about **20 minutes**.



5. Filter the solution

Filtering removes fruit pulp and seeds and should leave a solution of DNA.

- Put the sieve over a bowl and line with a couple of pieces of kitchen roll paper.
- Carefully add the fruit mush, trying not to rip the kitchen roll paper.
- Use a fork to gently push any liquid through the sieve.
- The pulp and seeds should be left in the sieve and 'fruit liquid' should be in the bowl.
- Transfer the fruit liquid to a **tall glass or glass jam jar**.



6. Purify the DNA

To get make the DNA solution purer, we need to remove any last remaining proteins. Pineapple juice contains an enzyme that breaks down proteins – or alternatively, contact lens cleaning solution can be used.

- Add pineapple juice to the fruit liquid at a ratio of 1ml pineapple juice to 5ml fruit liquid. (This should be approximately 20ml of pineapple juice). Give a brief gentle stir.
- Leave at room temperature for **5 minutes**.



7. Precipitate the DNA.

DNA dissolves in water and so cannot be seen in the solution we currently have. However, DNA does not dissolve in alcohol and so we can use alcohol to precipitate the DNA from the solution, so that it can be seen as a white mass that will collect at the top of the tall glass or jam jar.

- Remove the alcohol from the freezer.
- Pour the alcohol carefully down the side of the glass. **Do not stir.**
- You need to add an equal volume of alcohol to fruit solution. This should be approximately 100ml.
- Leave for **10 minutes.**



8. Visualise the DNA sample.

After about 10 minutes you should be able to see a mass of white stringy stuff at the top of the glass. This is the fruit DNA! If you want to keep the DNA for a bit longer, you can use a spoon to gently remove the DNA, place it on paper and leave it to dry.

