



## Workshop Activity 2

### DNA Extraction

#### BACKGROUND

DNA is present in the nucleus of all cells. It carries the genetic instructions that each person inherits from his/her parents. In forensic science, DNA contained in cells from body fluids, such as blood and saliva, can be used to establish the involvement of persons in a crime. Cells from fruit and vegetables also contain DNA, which can be extracted and analysed for genetic studies. This activity demonstrates how you can use basic household items to extract DNA from fruit and vegetables.

#### PROCEDURE

1. **Select your favourite fruit or vegetable.** Pick softer fruit or vegetables with a lot of pulp because they are easier to blend and break open the cells. We prefer tomatoes or bananas.
2. **Place in a blender:**
  - DNA source (1/2 cup diced fruit)
  - Large pinch table salt (1/8 teaspoon)
  - 2 tablespoons water
  - Few drops liquid soapBlend your mixture on high for 15 seconds.
3. **Strain the slurry.** Pour your soup through a strainer into another container (such as a measuring cup). This removes all the cells you have not opened yet.
4. **Add water and ethanol.** Pour 1/2 tablespoon of the slurry into a glass or tube and add an equal amount of cold water. Carefully add 4 tablespoons of cold ethanol (70-95% isopropyl or ethyl alcohol). The ethanol precipitates the DNA.
5. **Gently swirl to see DNA.** DNA is the snotty looking substance. You can use a toothpick or stick to draw the DNA out of the solution.

#### CONGRATULATIONS!

You are now a genetic engineer.

**DNA:** deoxyribonucleic acid; a nucleic acid that carries the genetic information in the cell. DNA consists of two long chains of nucleotides twisted into a double helix and joined by hydrogen bonds between the complementary bases adenine and thymine or cytosine and guanine.

#### RECIPE FOR DNA EXTRACTION:

The addition of **SALT** to the mixture mimics the cell's own environment, allowing the cell contents to spill out.

The liquid **SOAP** breaks open the membranes surrounding the cell and the nucleus (which contains DNA). These membranes are made of greasy fats and, just like liquid soap cuts through grease on your dishes, it breaks open the fats that surround the cell and the nucleus and the DNA spills out.

But first we **BLEND** the mixture to break open the cell wall that holds the cell in place.



## Workshop Activity 2 (cont.)

### DNA Extraction

#### FREQUENTLY ASKED QUESTIONS

##### 1. I can't see any DNA. What did I do wrong?

First, check one more time for DNA. Look very closely at the alcohol layer for tiny bubbles. Often, clumps of DNA are loosely attached to the bubbles.

If you still can't see DNA, start again with more DNA. Many food sources of DNA, such as grapes, also contain a lot of water. If the blended fruit soup is too watery, there won't be enough DNA to easily see. To fix this, go back to the first step and add less water. The cell soup should be opaque, meaning that you can't see through it.

2. **Why does the DNA clump together?** Single molecules of DNA are long and stringy. The human body contains about 100 trillion cells, each of which contains 180 cm of DNA. To fit the DNA into your cells, it needs to be packed efficiently. To solve this problem, DNA twists tightly and clumps together inside cells. Even when you extract DNA from cells, it still clumps together, though not as much as it would inside the cell.

3. **Isn't the white, stringy stuff actually a mix of DNA and RNA?** Yes! The procedure for DNA extraction is really a procedure for nucleic acid extraction. However, much of the RNA is cut by ribonucleases (enzymes that cut RNA) that are released when the cells are broken apart.

*RNA: ribonucleic acid; found in all living cells and many viruses, consisting of a long, usually single-stranded chain of alternating phosphate and ribose-base units. RNA structure and sequence determines protein synthesis and the transmission of genetic information.*

#### REFERENCES

[http://ucbiotech.org/movies/Veg\\_DNA/Veg\\_DNA.html](http://ucbiotech.org/movies/Veg_DNA/Veg_DNA.html)

<http://gsic.genetics.utah.edu/units/activities/extraction>