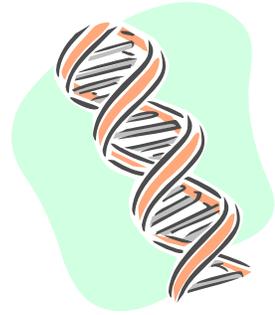


## How to see DNA with the naked eye



### Summary

DNA, or deoxyribonucleic acid, is contained in all living organisms and is the set of instructions that tell a cell how to build a protein. In the human body, DNA tells the body how to build proteins that makes up hair, skin, muscles, and every organ in your body.

DNA is stored in the nucleus of cells. It is an extremely thin molecule averaging about 2 nanometers in width. A nanometer is one-billionth of a meter. To put this in perspective, a human hair is approximately 80,000 nanometers wide.

In this activity, you will extract DNA from green split peas. To do this, you will go through a series of steps that include breaking the cell apart, releasing the DNA from the nucleus, and protecting the DNA from enzymes that will shear or break it down.

As you perform this activity, think about why you are performing each of the steps. Finally, explain how you will be able to see DNA when it is 40,000 times smaller than a human hair.

### In this activity we will:

- Extract DNA from green split peas and observe with the naked eye
- Analyze the steps taken to extract the DNA

### Materials



- 1/2 cup green split peas (not pictured)
- measuring cup
- pinch of table salt
- dish detergent
- meat tenderizer
- blender
- small clear glass
- strainer
- medium sized bowl
- 1 cup water
- cold 90% or higher isopropyl alcohol
- tablespoon

### **Safety**

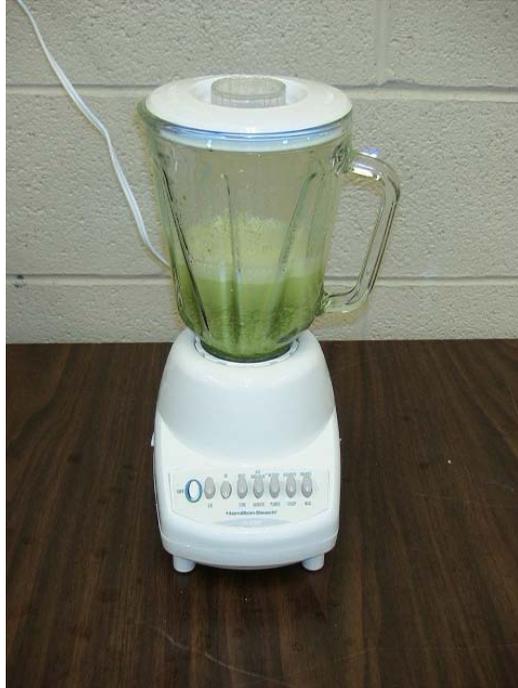
This activity requires the use of a blender with sharp blades. Use caution when using a blender. Never reach into the blender and place a lid on the blender when blending. Ask an adult to help you if necessary.

### **Preparation**

- Place isopropyl alcohol in refrigerator or freezer about 1 hour prior to performing activity.
- Gather all other materials.

### **Activity**

- Place 1/2 cup of green split peas, 1 cup of water and pinch of table salt into blender.
- Blend on high for approximately 20 seconds.



- Pour the liquid portion of the mixture through the strainer into a medium sized bowl. Do not dump chunks of unblended green split peas into the bowl.
- Add 2 tablespoons of dish detergent to the bowl and stir gently for 2 minutes.
- Let mixture set for approximately 5 minutes.
- Dump part of this solution into a small clear glass only filling the glass half full.
- Add a pinch of meat tenderizer to the liquid in the small clear glass and stir for 15 seconds.
- Remove as many bubbles from the solution as possible with a paper towel. The less bubbles in the cup the better the DNA will be seen.
- Slowly pour cold isopropyl alcohol into the small clear glass until the glass is nearly full. Pour alcohol as gently as possible trying not to disturb the mixture that is already in the small clear glass.
- Observe the white, stringy, frothy mixture in the glass- that is your DNA! You may need to let the solution set for several minutes before the DNA becomes visible.



### **Extension Activity**

- Research enzymes to discover why the meat tenderizer is a necessary ingredient when extracting DNA.
- Try extracting DNA from other fruits or vegetables.

### **Wrap-up**

After this activity, you should know the steps needed to extract DNA from green split peas. You should also understand the point of each step. The blending breaks the cell open, the soap and salt release the DNA from the nucleus, the meat tenderizer prevents enzymes from breaking down the DNA, and the DNA is not soluble in alcohol so it precipitates out at the water and alcohol boundary. You may also try extracting DNA from other fruits or vegetables. You will see that certain fruits and vegetables will yield more or less DNA. Finally, you should understand that the DNA you are seeing is not individual strands but a tangled mass of all the DNA that is present in a cell's nucleus.

### **Resources**

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

[http://www.accessexcellence.org/AE/AEC/CC/DNA\\_extractions.html](http://www.accessexcellence.org/AE/AEC/CC/DNA_extractions.html)