IS THERE DNA IN MY FOOD???
The Making of a Smoothie

In this protocol students will extract DNA from bananas that have been blended with water. A portion of the banana mixture is then treated with shampoo and salt, mixed for 5-10 minutes, and then strained through a coffee filter. The filtrate is added to cold alcohol and the DNA from the banana solution precipitates (becomes visible). The remaining banana mixture is made into a delicious smoothie by adding another banana, orange juice, frozen strawberries, tofu (soft or firm), and blending.

MATERIALS:

2- 5 oz plastic cups
blender
plastic spoon for measuring and mixing
#2 cone coffee filter
20 ml of distilled water
clear-colored shampoo, such as Suave Daily Clarifying Shampoo
3- bananas
table salt, either iodized or non-iodized
1- plastic transfer pipette or medicine dropper
1- sealed test tube containing 95% ethanol (grain alcohol) or 91% isopropyl (rubbing) alcohol
1- 10 oz package of frozen strawberries, partially thawed
1- 12.3 oz package of tofu- either soft or firm
1- cup of orange juice
2- Tbs. of honey
1- container with ice for cold alcohol tubes
laboratory instructions

LAB INSTRUCTIONS
Extract the DNA

DNA is present in the cells of all living organisms. This procedure uses household equipment and store supplies to extract DNA from banana in sufficient quantity to be seen and spooled.

The process of extracting DNA from a cell is the first step for many laboratory procedures in biotechnology. The scientist must be able to separate DNA from the unwanted substances of the cell gently enough so that the DNA does not denature (break up.)

You will prepare a solution of banana treated with salt, distilled water, and shampoo (detergent). The salt allows the DNA to precipitate out of a cold alcohol solution. The detergent breaks down the cell membrane by dissolving the lipids (fatty molecules) and proteins of the cell and disrupting the bonds that hold the cell membrane together. The detergent then forms complexes with these lipids and proteins, allowing them to be filtered out of solution by the coffee filter while leaving the cells’ DNA in the filtrate.
Procedure

1. In a blender, mix a ratio of one banana per one cup (250ml) of distilled water. Blend for 15-20 seconds, until the solution is a mixture.

2. In one of the 5 oz cups, make a solution consisting of 1 teaspoon of shampoo and two pinches of table salt. Add 20 ml (4 teaspoons) of distilled water or until the cup is 1/3 full. Dissolve the salt and shampoo by stirring slowly with the plastic spoon to avoid foaming.

3. To the solution you made in step 2, add three heaping teaspoons of the banana mixture from step 1. Mix the solution with the spoon for 5-10 minutes. 

4. While one member of your group mixes the banana solution, another member will place a #2 cone coffee filter inside the second 5 oz plastic cup. Fold the coffee filter’s edge around the cup so that the filter does not touch the bottom of the cup.

5. Filter the mixture by pouring it into the filter and letting the solution drain for several minutes until there is approximately 5 ml (covers the bottom of the cup) of filtrate to test.

6. Obtain a test tube of cold alcohol. For best results, the alcohol should be as cold as possible.

7. Fill the plastic pipette with banana solution and add it to the alcohol.

8. Let the solution sit for 2 to 3 minutes without disturbing it. It is important not to shake the test tube. You can watch the white DNA precipitate out into the alcohol layer. When good results are obtained, there will be enough DNA to spool on to a glass rod. Or by using a pasteur pipette that has been heated at the tip to form a hook, you can retrieve some of the DNA. DNA has the appearance of white, stringy mucus.
Make a Smoothie

After the students start their extraction activity, follow the recipe below to make a banana strawberry smoothie.

9. To a blender, add the following ingredients and blend until smooth.

- Package of tofu (cut up into pieces)
- Package of frozen strawberries, partially thawed
- 1 ripe banana (cut up into pieces)
- 1 cup of orange juice (add more for a thinner consistency)
- 2 Tbs. of honey

10. Distribute the smoothie in 5 oz cups. This recipe makes enough for 10-5 oz cups.

11. Evaluate your DNA and smoothie.