

# Energy From Waste

When you send your trash to the landfill, what happens to it? It may get buried under loads of landfill waste. If some of your waste is organic material like vegetables and fruit, this means that it will rot without oxygen. This is called anaerobic decomposition.

If you compost, you likely use the process of aerobic decomposition to help you a long. This process involves oxygen-loving microorganisms that help decompose the materials in the compost. You may even add air to the compost pile by turning it, thus helping it decompose.

Anaerobic means that there is no oxygen present. So how does food waste rot without oxygen? In anaerobic decomposition, bacteria that like this sort of environment work to break down the food waste. These bacteria have been around since long before plants existed!

When the bacteria break down the organic waste, the process releases methane and other gases such as carbon dioxide. These gasses are known as biogases, and can be harnessed as a source of energy.

In this experiment, you'll learn how to make biogas by creating an anaerobic environment and seeing how effective different types of fruits and vegetables are to creating methane.

## How much methane does different types of food scraps produce?

### Materials:

5 Mylar balloons	Permanent marker	Bleach
5 soda bottles	Pureed onion	Teaspoon
Duct tape	Pureed blueberries	Funnel
Funnel	Pureed lettuce	Kitchen scale
		Blender



### Procedure:

1. First, create purees. One by one, puree half a cup of blueberries and half an onion in a blender. Weigh them and make sure you have the same weight of blueberry and onion puree.
2. Now, puree an equivalent weight of lettuce leaves.
3. Finally, puree another half of an onion. Weigh it to make sure it is the same weight as the first half, and put all of your pureed fruits and vegetables aside.
4. Mark the different bottles with a permanent marker. Label one Control, one Bleach, one Blueberries, one Onions, and one Lettuce.
5. Place one batch of pureed onion with  $\frac{1}{2}$  teaspoon of bleach into one container and fill it to the top with water. Place a Mylar balloon over the top of the the bottle and seal it with duct tape.
6. Now, create the other containers. Use the funnel to place blueberries in one container, plain onion in another, and lettuce in another. Fill each container to the top with water and add a Mylar balloon to each. Leave the control container empty and tape a balloon to the top.
7. Watch the balloons and photograph them if possible. Watch what happens to the balloons over the next week, and use this time to make a hypothesis. What happens to the items in the bottles? Why?

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## Results

The balloons over the blueberries and onions will inflate the most. A few days after inflating, the balloons will begin to deflate.

## Why?

Certain fruits and vegetables release a lot more methane than others, and scientists are still trying to figure out why. Onions win out over most vegetables, and blueberries and bananas are high if you're looking for gas-rich fruits. The control bottle and the bottle with the bleach did not produce a larger balloon. This is because bleach kills anaerobic bacteria.

Why did the balloons shrink? If you use traditional balloons, they may shrink because the gases leak out through the pores, but even if you use Mylar, the balloons will shrink in a few days. How come? At first, the gas produced will be warm due to the processes going on inside the bottle. After a few days, the gases in the balloons will get cooler and shrink, so the balloons will get smaller.

If we were to simply release these gases into the atmosphere, they would contribute to climate change, since carbon dioxide and methane are both greenhouse gases. However, when harnessed, biogas and renewable natural gas (RNG) can be a useful source of energy from waste. Landfills, treatment plants, and other places where anaerobic processes occur can be set up to collect biogas, which can then be purified into renewable natural gas (RNG) and used as a form of clean, renewable energy.