

# Fermentation in a Bag (at Home)

Middle School

## Introduction

Ethanol is a renewable source of fuel for vehicles that is widely produced from corn. Ethanol production is reliant on anaerobic fermentation of corn sugars by yeast. Scientists and industry professionals are always working to make the fermentation procedure more efficient. Different enzymes are added to the corn to break the starch into simple sugars that the yeast can process into ethanol. This lab allows students to experiment with different variables in the fermentation process to determine their effect.

When a fuel, such as gasoline, is burned, carbon is released into the atmosphere in the form of carbon dioxide. Burning fossil fuels adds extra carbon dioxide to the atmosphere. This extra carbon dioxide traps heat from the sun and is a major contributing factor in climate change.

Ethanol made from corn also releases carbon dioxide into the atmosphere, but unlike burning fossil fuels, corn plants have already absorbed the CO<sub>2</sub> from corn grown last season. This means that by using ethanol we can cycle carbon dioxide between the plants and atmosphere, as opposed to releasing fossilized carbon from oil.

## Materials

- Feed stock: cracked corn, corn syrup, corn starch, corn meal, dextrose or glucose, fructose, sucrose (table sugar), sweet corn
- Active dry yeast (1 tsp per bag)
- Measuring spoons
- Measuring cups
- Snack size resealable bags
- Index cards
- Rulers
- Paper towels

## Directions

1. Label resealable bags for each kind of food you are going to feed the yeast
2. In a snack-size resealable zipper bag combine 1 tsp of feedstock material and 1 tsp of yeast
3. Add 1/4 cup of warm water and zip the bag closed, removing as much air as possible.
4. Mix gently. Lay the bag on a flat horizontal surface and watch for results.
5. Collect data in 5-minute intervals by placing an index card on top of the bag, parallel to the table.

6. Hold the ruler perpendicular to the table and record where the paper intersects the ruler. Record this measurement every 5 minutes for 30 minutes in the data section. After 20-30 minutes, some of the bags will approach their maximum height. (Note: As the yeast produces carbon dioxide, the expanding bag may pop. Be sure to monitor the bag and release the gas if the bag becomes over inflated.)

\*\*once you are done with the experiment, we suggest you open the bag before you throw it away so it does not explode in your trash

## Questions

The following questions will allow the students to review what they have learned and apply this new knowledge in the fermenting of ethanol lab.

- How could you tell when fermentation was occurring?
- What was filling the bag up?
- How did the yeast respond to different kinds of food?