

Investigation 1 Energy in all of us

Like all living things, we need food to survive. We use it to generate energy to grow, stay active and protect against illness.

But before we can enjoy its benefits, our bodies must convert the food we eat into usable energy. We call the process which converts food into energy respiration.

Central to this process is the oxygen (O_2) we breathe in through our lungs and which is present in every living cell in our bodies.

Respiration works like this: after the food we eat has been broken down into its various parts and reaches our cells, its nutrients react with the O_2 in these cells to produce energy.

As well as generating energy, respiration also produces carbon dioxide (CO_2), which we expel from our bodies every time we exhale.

Take a deep breath, hold it for a moment and breathe out again. You are breathing out CO_2 .

Some organisms produce energy without the need for O_2 . Yeast, for example, is a micro-organism or fungus, and it can respire without the presence of O_2 yet is still able to produce energy and CO_2 . This experiment will show you how it does this.

YOU WILL NEED One packet of active dry yeast • One cup of very warm water ($40^\circ C$) • Two tablespoons of sugar • A large rubber balloon • A one litre empty plastic bottle • String • Matches •

- 1 Stretch out the balloon by blowing it up and letting the air out a few times.
- 2 Add the yeast and sugar to the cup of warm water and stir.
- 3 When the yeast and sugar has dissolved pour the solution into the plastic bottle.
- 4 Attach the balloon to the top of the bottle and secure it with a piece of string.
- 5 Let the balloon inflate; watch how it slowly stands up straight.
- 6 While pinching the neck of the balloon to prevent the gas escaping, remove the balloon from the bottle.
- 7 Get another lab partner to light a match. Remember lab safety and hold the match away from your face.
- 8 Slowly let the air from the balloon pass out over the lighted match, keeping it a safe distance from the lighted match.
- 9 Record what happens to the lighted match.



Tell Me More!

As the yeast feeds on the sugar, it produces carbon dioxide (CO_2). With no place to go but up, this gas slowly fills the balloon.

A very similar process happens as bread rises. During baking, CO_2 from the yeast fills thousands of balloon-like bubbles in the dough, giving the baked bread its airy texture.

CO_2 is also produced when we burn coal, oil or gas (fossil fuels). Too much CO_2 can harm our environment. It collects in the earth's atmosphere and traps too much of the sun's heat, causing temperatures on earth to rise. This effect of trapping the sun's heat within our atmosphere is known as the greenhouse effect. Saving energy in our homes and schools by using less electricity can help reduce the greenhouse effect.