

# What are enzymes?



## What is an enzyme?

An enzyme is a natural substance found in humans, animals, plants and most biological material, including many of the foods you eat such as pineapples and pawpaws. Basically an enzyme makes things happen. It can't always do that by itself; it may need vitamins, minerals or other enzymes or nutrients to achieve its purpose, and these are called co-factors. In humans, thousands of enzymes control most of the body's functions, from brain power to hormones to digestion.

## How can you tell what's an enzyme?

Most enzyme names end in -ase. Lipase is an enzyme responsible for breaking down fats.

## How do they work in the body?

They can work in different ways. Our cells are able to talk to each other. That may sound weird, but it is called cell signalling. They don't talk about the weather or the latest movie. They send messages to each other which can trigger normal cell death, called apoptosis, or catastrophic cell death, which is necrosis. Some cells warn other cells about infections like viruses - these are called T helper cells and are part of our immune system.



So, when an enzyme is needed, there is a complex process which triggers a series of events. Sometimes an enzyme may begin in an inactive form, and another nutrient is sent along to activate it. We need a constant enzyme supply because enzymes get used up.

## What happens if you don't have the right enzyme?

That depends on whether you're born with that condition or if you acquire it by having a bad diet. If you're born with that condition, such as phenylketonuria or galactosemia, then you will have problems digesting food all your life. With galactosemia, for example, you will lack the enzyme responsible for metabolising galactose which is found in milk.

You can also lack some enzymes because your diet is bad, or you've had an accident and been on a drip in hospital for a long time, unable to eat. In this case, you may contract a disease, or have impaired health because your body is unable to function properly. Obesity can also result from lack of the correct enzymes which then affects the thyroid gland.



## Are enzymes destroyed in cooking like some vitamins are?

Yes. If the temperature exceeds 47.8 degrees C, then enzymes begin to die. That's why eating raw salads and fruits is very good for you. Apart from giving you lots of fibre and phytonutrients, it preserves the heat-sensitive vitamins and enzymes.

## What else can enzymes do?

- \* you need enzymes to break down protein into amino acids so they can work in the body
- \* enzymes help to extract the minerals you want from your food and then they use them to balance out solids and fluids inside and outside the cell which equalises their pressure
- \* enzymes are needed to control all mental and physical functions
- \* enzymes help to detox the body by alkalising minerals which combines with acid wastes and toxic fragments, and prepares all this waste for excretion
- \* vitamins (which are necessary for life) can't work without enzymes

## What happens to enzymes when we age?

Like most body functions, enzymes tend to lessen as we get older. This can affect digestion so that we don't break down our food properly, and gradually we develop diseases we'd rather not have, like bowel cancer or heart disease or Alzheimers.



## Can we take enzymes as a supplement?

Certainly. There are many digestive enzyme products on the market. If you are a vegan, you will need to study the label, as many are of porcine origin, but vegetable enzymes are available too. Take with each meal for best results. Also eat pineapple and pawpaw.

# What are enzymes?



## How do you know if you need enzyme supplements?

That's both a simple and a tricky question. If you lack digestive enzymes, then you'll have symptoms of indigestion, such as wind, bloating, stomach pain, nausea, constipation and eventually other symptoms like allergies, headaches, fatigue, maybe dry skin and other symptoms which you might not think could come from your gut.

The tricky part of that question is that these symptoms can also have other causes. A full case history is needed to determine whether your symptoms are really caused by lack of enzymes, or whether it's lack of hydrochloric acid in the stomach, or overuse of painkillers (NSAIDS), or is a side effect of other medication, or just plain bad diet.

## Are there different enzymes in different places in the body?

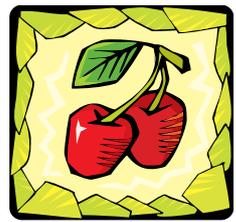
Yes. In the mouth we have salivary amylase, which is released when you chew (that's why chewing is really important, even for soft foods). This breaks down carbs.

In the stomach, hydrochloric acid and pepsin are needed to break down protein. If you don't have enough of either, you won't get proper breakdown of protein into amino acids which are needed for thousands of body functions, including DNA and RNA replication. If this is faulty, cells don't replace themselves properly and you start getting diseases and allergies. Also if there's not enough acid, Vitamins B9 and 12 aren't absorbed, so you can get anaemia. More complications include cracking and peeling fingernails, poor hair growth, cracking skin, fatigue, bowel diseases, liver dysfunction and lots more.



Lots of things happen with enzymes in the small intestine, which is where most of your absorption takes place. The small intestine receives secretions and enzymes from the pancreas, liver and the gallbladder. The first section, the duodenum, is primarily responsible for the absorption of minerals. The second section, the jejunum, absorbs water-soluble vitamins, protein and carbohydrates. The ileum is the third section and it absorbs fat-soluble vitamins, fat, cholesterol and bile salts.

Some of the enzymes that work in this part of the intestine are lipase, to digest fats, amylases which break down carbs, proteases such as trypsin, chymotrypsin and carboxypeptidase to digest protein. The proteases also act to keep this part of the intestine healthy and free from unwanted bacteria, worms and candida.



The liver and gallbladder also contribute with the liver producing bile which is stored in the gallbladder. Bile makes fats water-soluble and helps you to get the fat soluble vitamins out of your food. The liver processes cholesterol, carbs and proteins and detoxes other substances you don't want.

By the time the food gets to the large intestine, most of the big enzyme work is done, but there may still be other processes requiring enzymes.

## If someone has a lack of appetite, do they have enough enzymes?

Probably not, as there are a number of triggers like salivating when you smell onions or bacon frying, or a ripe mango or something you like. This starts the process in the brain, which sends messages to other parts of the body to get the enzymes ready.

## Are there things I can do without taking supplements?

Definitely. Take something bitter (lemon in water, rocket, Swedish bitters) 10 - 20 minutes before eating. The bitters stimulate the liver and gallbladder as well as the appetite. Apple cider vinegar in water just before or with each meal can help, as the malic acid in the apples stimulates digestion. B vitamins are needed to produce the digestive enzymes, so make sure you eat plenty of foods rich in these. Most animal proteins have good sources. And buy a vegie salt instead of ordinary salt, as they have more potassium than the sodium in normal salt. Potassium chloride helps produce hydrochloric acid.

