

B B C BITESIZE

Hello. I'm Dr Alex Lathbridge and this is Bitesize Biology.

This is the first in a six-part series all about the organisation of plants and animals, basically how all the bits of us work together.

Here we're going to mainly focus on the human digestive system, but first let's get you up to speed with how cells, tissues, organs and organ systems interact.

Make sure you've got a pen and paper handy to take some notes or draw a diagram. And remember, you can pause at any time, if you need to make some notes.

First things first, we've got the most basic building blocks of any organism – the cell. If you're a living thing, you're made up of cells.

If this sounds new to you, go and listen to our series on The Cell on BBC Sounds.

A tissue is a group of similar cells, in the same place that work together to do a similar job or function. An example of this is muscle tissue, where lots of similar cells group together to make your muscles work.

So cells work together to form something greater: tissues.

But when lots of different tissues work together in the same place, they form organs. Things like the heart, lungs and stomach.

And then finally, organs work together to form organ systems. This is where a group of organs (now they're not necessarily in the same place) but they all team up to do a function or a job.

For instance, your digestive system, it's not just your stomach, even though you might think so. It's a combination of your salivary glands, stomach, large intestine, small intestine, all working together to help you digest, break down, and absorb food.

So, the human digestive system. This is an organ system that makes sure that we get what we need from food and gets rid of any waste products. It's the focus of this episode.

We're going to look at the different organs involved in digestion and the special adaptations they have in order to do their function. So grab a pen and write this down.

1. Its first job is to break down food into different molecules. Food is made up of large and insoluble molecules, so organs involved in the digestion process have special tricks up their sleeve to break down food into smaller molecules.

2. absorbing the nutrients. They're also involved in absorbing the nutrients we need from food, in an exchange system. It does this by having a very large surface area.

So let's go on the journey of food moving through our bodies. You're going to need to remember this.

Digestion starts in the mouth.

Have you ever noticed saliva appearing in your mouth when you eat? The salivary gland is an organ that releases saliva, which contains an enzyme called amylase, and amylase helps to break down carbohydrates. This is called chemical digestion.

We're going to talk about enzymes in much more detail in the next episode, but right now you're good.

So when we bite our food, our teeth are helping to break it down into smaller pieces, which increases the surface area of the food. This is called mechanical digestion. So that combination of mechanical and chemical digestion helps move things along.

So after swallowing the food, it travels down a long tube called the oesophagus, which carries food from the mouth to the stomach, and that's where the next stage of digestion happens.

The stomach - it's a big, hollow, muscular, J-shaped organ, that's got lots of weapons to break down food.

It's got strong, muscular stomach walls, and that churns up the food. So that's mechanical digestion.

The stomach contains an enzyme called protease. That breaks down proteins so that is chemical digestion.

The stomach also contains hydrochloric acid, and that's a strong acid. So it kills any bacteria in food and it lowers the pH of the environment, so that helps protease enzymes to work. So that's chemical digestion.

After all of that has happened in the stomach, the food particles get passed along, into the small and large intestines, and that's the next step of our digestion journey.

So let's start with the small intestine, because that's where the food goes next. The small intestine is made up of two sections, and they have weird names, the duodenum and the ileum.

The food passes first into the duodenum, that's where lipids, that's fats, are digested. Plus, there's even more digestion of proteins and carbohydrates.

So the ileum is the next part of the small intestine – it's a super special place of the digestive system. This is because, all of those pieces of food, this is where they finally get absorbed by the bloodstream and taken to the rest of the body for energy, growth and repair. We talked about this in the series on The Cell when we covered active transport.

So what makes the ileum so good at absorbing all of this? Let's talk form and function.

Imagine your ileum is like an empty toilet roll tube, and on the inside of this tube, there are millions of tiny finger-like projections that stick out and help grab the nutrients from your food as it passes down the tube.

These are called villi. Villi is the plural form to describe lots of them, an individual one is called a villus. In our series on The Cell, we spoke about how important surface area is to absorption. All of those villi increase the surface area quite a lot, lots of surface area means lots of absorption.

So let's take a look at these villi

They have three adaptations that help with its main function of absorbing food.

1. the surface layer of villus is only one cell thick - so there's a thin wall for food to travel through
2. the villi have a good blood supply from a network of blood vessels and that helps carry the absorbed food away
3. each villus is covered in its own little villi. Yes, the villi have villi, and those villi are called microvilli.

Your liver, pancreas, and gall bladder all help out here. Your liver produces bile, and that gets stored in the gall bladder, before being squirted into the small intestine, like soap in a car wash.

Remember, in the stomach there was a lot of hydrochloric acid to help enzymes there work and to kill bacteria. So we need bile to neutralise that acidity of the food, so digestive enzymes made in the pancreas can work.

Bile also helps with fat digestion. It makes these large fat globules smaller, so that increases the surface area for the enzymes to work on.

Anything left in the small intestine carries on the journey to the large intestine. This is where water is absorbed and a process called egestion begins. Egestion, not digestion, which is taking food in.

Egestion is a fancy way of saying that the undigested food leaves your body as faecal matter. Don't say poo in your exam, you're better than that. This faecal matter travels out through the rectum to the anus.

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