## B B C BITESIZE

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

This is the third episode in a nine-part series on The Cell.

So far in this series on The Cell we've talked about what's inside the cell, and stem cells (undifferentiated cells.)

Let's flip it on its head, in this episode we're going to talk about specialised cells, the differentiated cells, the cells that do a specific job.

There are six key cells you are going to need to know, so that's what we are going to focus on today.

In animal cells, those are nerve cells, muscle cells, and sperm cells.

In plants, it's root hair cells, xylem cells and phloem cells.

When you're given questions about specific cells, there are two things you need to remember.

I call them the two Fs: function and form.

Basically, what does it need to do? Function. And what has it got to do it? Form.

So today, we're going to be applying that to just six cells: nerve cells, muscle cells, sperm cells, root hair cells, xylem cells and phloem cells.

First, nerve cells.

Like your phone or laptop, your body relies on electricity, and it's the nerve cells that carry electrical impulses, to transmit signals from your sense organs to your spinal cord and brain, and back to your muscles or glands.

Signals are passed from one long nerve cell to the next. Think of it like a baton in a relay race passing from one person to the next.

They send and receive electric signals as messages (or nerve impulses) these go from one nerve cell to the next, and eventually, to muscles and glands.

If you didn't have a functioning nervous system, you wouldn't be able to think, feel, or move, so they're very important

How do they work? Well, nerve cells are long. This is so they can be in contact with the brain and spinal cord and the rest of the body.

They have a main cell body containing ribosomes and the nucleus, and if you can't remember what ribosomes do, go back to Episode 1, have a listen and I'll meet you back here.

Attached to the main cell body are dendrites and a long cable called an axon, covered in a fatty, myelin sheath to speed up the messages.

Number two. Muscle cells.

These are how we move when our muscles contract and relax to pull on our bones.

You know how you need to make sure you eat enough protein to help develop your muscles?

That's because muscle cells are made up of proteins that slide over each other and contract to move.

We have three different types of muscle cell: skeletal muscle, smooth muscle and heart muscle.

These cells are powerful because they have a lot of mitochondria to release the energy to help you lift things (skeletal muscles), do a poop (smooth muscles), and keep your heart beating (heart muscles).

Third up, and the last one for animal cells, is sperm.

Sperm cells are genuinely the perfect example of understanding form and function.

So, what is the job of a sperm cell? Swimming to an egg cell, or ovum, and fertilising it.

And the sperm cell looks like a tadpole, with a head, a midsection and a tail.

In the head of the cell, there's a cytoplasm and a nucleus, but also something really cool.

At the tip at the head of the sperm cell, there's an acrosome (you don't need to remember the name) but, it acts like the tip of a heat seeking missile, because inside it's got enzymes that break down the jelly wall of the egg cell, so that the sperm can get inside.

Now we're going to get into it, in a bit more detail in a later episode, but for now you need to know that the nucleus in the sperm only has half the number of chromosomes as a regular cell. This is because the egg cell is going to supply the other half.

The middle of the sperm is full of mitochondria, this releases the energy that powers the tail to swim towards the egg.

Because scientists like long, complicated words, the long tail of the sperm cell is called the flagellum, and it only allows the sperm cell to move forwards like a spinning missile towards the egg.

Alright, we're halfway there. Those three, nerve, muscle and sperm cells, are specialised cells in animals.

Now we're going to look at plants.

Plants don't move to get food like we do so they don't need muscle cells.

Plants need different types of cells and they're all interlinked.

Cell number four is a root hair cell.

Root hair cells are how plants take the things they need from the soil, like water and nutrients.

They need to have a large surface area so they get in between the soil particles and absorb as much as possible (like a really large towel.)

The long part of the cell is what penetrates into the soil, sort of like a tent peg. This cell has a really thin cell wall, that allows for nutrients and water to pass in easily.

And like some of the other cells we talked about, they also have lots of mitochondria, for the energy they need.

But where does all that water go? Well, this is where cell number five, the xylem cell comes in.

Xylem cells need to contain water and transport it around the plant.

They have strong and study walls and stack on top of one another. Together they work kind of like a drinking straw. One long column of dead cells with their ends eroded away, so they can transport water, it'd be a waste of energy if these cells were alive and needed feeding.

Our sixth and final cell is the phloem.

Now if xylem is the water tube, phloem is the food tube. It transports sugars and water from the parts of the plant that generate food to the rest of the plant.

Because this a huge task, it's joined by companion cells that have lots of mitochondria because it takes lots of energy to move this sugar.

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

All episodes are available on BBC Sounds.