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

This is episode six in our nine-part series on the cell.

Today, we're going to find out about cell division, basically how cells divide themselves to grow and repair damage and keep the same genetic material along the way.

We'll talk through the stages of the cell cycle and how some cells doing things a little bit different makes us all unique.

This is all to do with DNA. So, if you need a little reminder about DNA and the genome, you can jump back and have a listen to episode 4 that before we get into today.

Every cell in your body has been made by some other cell. And it's important that the new cells have the same genetic material as the old ones.

Because that's the thing, for you to get taller as you grow up or for your skin to heal itself if you get a cut, new cells have to be perfect copies of the old ones.

This is down to a process called mitosis.

In the most basic terms, mitosis in plants and animals, including humans, can be summed up as:

A parent cell grows bigger, copies its DNA, and splits in two to make two new daughter cells.

Is there a little bit more to it than that? Yeah, there are like 6 minutes left on this thing.

Now mitosis happens as part of the Cell Cycle.

You need to remember the stages, so grab a pen and write this down.

The cell cycle can be broken down into six key stages:

Interphase, Prophase, Metaphase, Anaphase, Telophase, and Cytokinesis.

Interphase is always at the start, Cytokinesis is always at the end, and the four stages in the middle are what makes up mitosis.

So, let's go through this six-part cell cycle.

1. Interphase. The DNA copies itself and the cell enlarges.

2. Prophase. The cell prepares itself by condensing DNA into chromosomes and breaks down the nucleus.

3. Metaphase. The chromosomes line up across the middle of the cell.

4. Anaphase. The chromosomes are pulled to the opposite ends of the cell.

5. Telophase. Two new nuclear membranes form around the chromosomes at each end of the cell.

6. Cytokinesis. The cell divides down the middle to become two new cells. We call these daughter cells.

The first part of the cell cycle is a stage known as Interphase.

Most of the cells in your body right now are in Interphase. You can think of interphase as the in between phase. It's a time when cells go through their normal processes. It's the part of the cell cycle where the cells aren't dividing but they are getting ready for it.

The cell grows in size and copies everything. That means DNA inside the original cell's nucleus replicate and are checked for errors.

Next up is the first stage of mitosis: Prophase.

The way I remember this is that prophase is your prep phase.

DNA strands become more visible when they condense, forming really compact, tightly twisted structures known as chromosomes – containing all of the cell's genetic data (or genome). As well as that, the membrane around the nucleus breaks down.

Next up is Metaphase. I call it the "middle phase" of mitosis, because all of chromosomes line up along the middle of the cell.

Next up is Anaphase. Chromosome pairs get pulled apart from the middle to opposite ends of the cell and stay there. One copy of each pair is at the end of the cell. So, each side of this large dividing cell has a regular amount of chromosomes for one cell.

Next, we have Telophase. This is where new membranes form around the chromosomes at each end of the cell. One cell with two new nuclei.

So that's mitosis over, but how does one large cell become two daughter cells?

This is Cytokinesis. This is where the cell membrane pinches in and eventually divides into two daughter cells.

And because it's a cycle, it's straight back into interphase to happen all over again.

If mitosis is all about making identical genetic copies, what happens when you need some variation in cells?

You get half of your DNA from each of your parents. Half from egg cells, or ova, and half from sperm cells. So why don't people with the same biological parents look exactly alike?

Because, if you have siblings, one of you might have your dad's chin and the other might have your mum's nose.

This is because, genetically speaking, no two egg cells from a person are likely to be the same, just as no two sperm cells from someone are likely to be the same. But how?

It's the next process you are going to need to remember: meiosis.

Generally speaking, every cell in a human body (apart from red blood cells, but don't worry about them for now) contains 46 chromosomes and these chromosomes are in 23 pairs.

Cells with 23 pairs of chromosomes are known as diploid (you can think double, paired.)

But reproductive cells, called gametes, like eggs and sperm cells are different. They've only got one set of chromosomes and they aren't paired. So, 23 chromosomes. They're known as haploid (or half, unpaired.)

Egg cells and sperm cells merge in fertilisation. They combine their 23 chromosomes, ending up with 46 chromosomes in total.

Like in mitosis, the way most cells copy themselves for growth and repair, meiosis starts with Interphase, where the cell doubles the amount of DNA within.

In Prophase, it gets different. Because in meiosis, some sections of DNA are randomly exchanged between the different chromosome pairs, after they've condensed. This creates a unique set of chromosomes that has never existed before. Think of each chromosome pair that's doing this as being like two decks of cards being randomly shuffled together.

Then it's pretty much like mitosis. Chromosome pairs line up, they get pulled apart, form new nuclei and divide into two.

Like mitosis, this creates two new cells. But they're still diploid cells, they've got 46 chromosomes in 23 pairs.

So, this means that each new cell has to do another cell division. Because, gametes are sex cells, they need to have 23 chromosomes only.

But - and this is key – without interphase – so no DNA copying itself and no shuffling over DNA again.

So after the end of this second round of division, we're at the end of meiosis and we have created four, haploid sex cells from one diploid parent cell.

Ok – let's go through that again

Step 1. The chromosomes make copies of themselves

Step 2. Chromosome pairs line up

Step 3. Sections of DNA get swapped like two decks of cards being shuffled together

Step 4. First cell division: chromosome pairs separate

Step 5. Second cell division: DNA is now half that of a normal cell.

So now you've got four cells, each with a single set of chromosomes. These form gametes, your sperm or eggs.

I'm Dr Alex Lathbridge and this is Biology Bitesize. All episodes available on BBC Sounds