

# **B B C BITESIZE**

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

This is episode four of a nine-part series on The Cell.

In this episode we're going to talk about a really important part of the cell, a really important part of your body, a really important part of you: DNA.

In the first episode about cell structure, I said, 'almost all cells contain DNA.'

DNA is genetic material. Without DNA, there would be no life on earth, as we know it.

DNA is basically the instruction manual for building and maintaining a living organism.

So today, we're going to go into a bit more detail about what DNA is, how it's made and how it works.

You might hear references to other things that we're going to cover later in the series, like proteins.

So don't worry if you leave today only knowing DNA.

It's going to be useful for you to have the structure of the cell clear in your mind, so if you need a refresher, go back and have another listen to Episode 1.

Otherwise, grab a pen, let's get into it.

DNA (or deoxyribonucleic acid) is a type of molecule known as a polymer.

This means it's a large, complex molecule, made up of different, smaller chemicals called monomers that have been added together.

Top tip: the word "poly" means many and "mono" means one. Like a monorail has one track, a polygon has many different sides, monosyllabic is a single syllable and polymath is a person who knows many things, like you when you've listened to this podcast.

When it comes to monomers, you can think of them like beads on a string. You can add as many beads as you like, in whatever combination to make polymers.

And that makes them capable of holding information. And in the case of DNA, that information is the genetic code, the instructions to build a living organism, and more specifically, how to make proteins that help the cell do what it needs to do (but more on them later in the series).

DNA has four different 'beads' that you can choose from, these are monomers known as nucleotide bases, or just bases for short.

There are four different bases called: adenine, thymine, cytosine and guanine (or A,T,C,G.)

There's a specific pattern: A matches with T and G matches with C.

It has to be this way because that gives DNA its structure, which you might have seen without realising, those tight twisted ladder shapes, known as the DNA double helix.

The bases are the rungs of the ladder. This is why when scientists talk about DNA, they refer to them as base pairs.

Weak hydrogen bonds form between A and T, and separately between G and C.

And the rope, in the DNA rope ladder, is made from alternating sugar and phosphate molecules.

DNA contains many important small sections called genes.

A gene is a small section of DNA that contains the code for a specific sequence of amino acids.

These are the building blocks to make proteins that the cell needs (but don't worry – more on that later).

DNA is a polymer, made of 4 monomers called nucleotide bases: A, T G, and C.

DNA is incredibly long. Think about 3 billion base pairs per cell.

If you stretched the DNA in one cell all the way out, it would be about 2m long and all the DNA in all your cells put together would be about twice the diameter of the Solar System.

So you're probably wondering how something that big could fit inside the cell, right?

Well, inside every cell is the nucleus, which basically like a folder for our DNA.

But the DNA is super tightly coiled, imagine your hair being twisted around itself until it's barely noticeable. Same thing here, they're known as chromosomes, your DNA tightly coiled around proteins and slotted inside the nucleus.

Most of your cells (there are some exceptions – but they are waiting for you in episode 6, so don't worry about that right now) contain 46 chromosomes in 23 pairs.

Remember genes are heritable, you get one of each from each of your parents.

So, each gene contains a series of instructions for making a specific protein.

The DNA is arranged into chromosomes in 23 pairs, that's 46 chromosomes in each cell.

Your entire genetic code, the complete set of instructions for how you grow, develop and function is called your genome.

I know it might sound difficult but here's a good way of thinking about it (we'll go smallest to biggest, and I'm hungry, so its food related.)

Bases are the letters.

DNA are like the words on a page.

Genes are the recipes.

Chromosomes are the cookbooks (of which you have 23 pairs – so 46 books in total.)

And the genome is the cuisine, like Ghanaian cuisine contains all the recipes that make up Ghanaian food.

There is something like 30 trillion cells in your body.

And nearly every cell contains the instructions for your entire genome.

Scientists have only recently worked out what this set of instructions is, this is the Human Genome Project, and it's really exciting, cutting edge science, to help us find out how we evolved, how to treat diseases, and where we came from and where we are going.

I'm Dr Alex Lathbridge and this is Bitesize Biology. To listen to the rest of this series, and the other Bitesize podcasts, search Bitesize on BBC Sounds.