Monster Genetics Science Show Resource – Understanding DNA

Deoxyribonucleic Acid or **DNA** contains the recipe for building life. All the cells in your body (apart from red blood cells!) contain DNA. If you stretch out the DNA from one cell it would be around **2 metres** long! Just how does something so big fit inside a single cell, which is 0.03mm or about 1 tenth the size of a single strand of hair!? Well, it is down to the unique structure of DNA. DNA is made up of 4 building blocks called nucleotides, these are, adenine (A), thymine (T), guanine (G), and cytosine (C). Nucleotides join together, A with T and G with C to form **base pairs** which link the 2 **complimentary** strands of DNA together. DNA forms a shape know as a **double helix**; this special shape makes it possible to fit a lot of information into a small volume! Digital information stored on your computer or smart phone is binary, stored in a series of 0's and 1's. DNA is quaternary (having A, T, Gand C) meaning genetic code can store **twice** as much information! In fact, 1 gram of DNA is capable of storing 215 petabytes (215 million gigabytes) of data!

Meet an Oxford Brookes Researcher

Oxford Brookes researcher Dr Priya Samuel experiments with DNA in her research…

FIGURE 1 DR PRIYA SAMUEL EXPERIMENTING IN HER LABORATORY AT OXFORD BROOKES

My research is on the disease cancer and its treatment. Cancer is partly caused because there are several damaging changes in the DNA which the cell is not able to repair – this sometimes leads to the cell behaving unnaturally and growing uncontrollably. We can study the DNA as well as the RNA and the protein that are made from the DNA for changes that might tell us the specific characteristics of the cancers and how they might behave when they are treated. All cells including cancer cells send out messages in the form of chemicals such as hormones, proteins and RNA which can be picked up by other cells. Some of these may be packaged into a tiny bubble covered by membrane – these are like a 'message in a bottle'. These are called 'Extracellular Vesicles' or EVs. EVs are released into the blood and may carry proteins or RNA that are specific to the cell that made them. EVs can then be separated from the blood and examined for specific proteins or RNA. EVs from cancer cells can have special proteins/ RNA. As part of my research, we take EVs from cancer cells and put them on other cells – both cancer and normal cells to see if they can change the behaviour of these cells – do they make them grow faster? Do they make them die more quickly? Do they make them more sticky? Do they influence the proteins they make? If we are able to learn how EVs influence other cells, we might be able to block some of these messages - this might make it more difficult for the cancer cells to grow. This will help us understand better how cancer cells grow and help researchers design better and more effective treatment for cancer.

DNA Origami

Why not get creative by having a go at our DNA origami? Where you can make your very own 3D DNA double helix model!! Download and print the DNA origami template, nucleotide guide and folding instructions. You can colour your template and label the nucleotides – remember A pairs with T and G pairs with C. Once you've done this get an adult to help you complete the tricky folding to form your Origami DNA double helix! Why not share your makes with us @ScienceBazaar using #SciBazSat