



DNA, nucleotides - your life depends on them!

Our body is jam packed full of DNA and nucleotides. Indeed the DNA in each cell of the body is built from 3 billion nucleotides. Yet, do we actually know what they are, and do we care? We should do, our lives depend on them.

Before we can appreciate how important they are for our continuing healthy life, we first of all, need to understand what DNA and nucleotides are. There is a great 'computer' analogy accredited to Bill Gates, the creator of Microsoft, "DNA is like a computer program but far, far more advanced than any software ever created." Software is a set of instructions for a new program in a computer, likewise, DNA, contains a set of instructions for the assembly of parts, namely proteins, within a cell.

You can also think of DNA as like a written language. For example, both b-o-y-s and y-o-b-s contain the same four letters, but convey different meanings based on their sequence alone. When sequenced correctly, nucleotides, the building blocks in the DNA, tells the cell to mobilise to link amino acids into proteins. The precise sequence of these amino acids, specified by the DNA, is crucial to ensuring that a protein is properly assembled and functional. Damage to the DNA creates errors in assembly, and also to its own replication, namely the sequence of the five different nucleotide building blocks.

So, now we know what DNA and nucleotides are, and why they are so important. We also need to understand how we can protect our DNA, and help to ensure normal DNA and gene replication, and reduce the risk of cancer development. There have to be a number of changes to the genes within a cell before it turns into a cancer cell.

5 ways to protect yourself:

- Prevent damage to the skin from sun burn
- Avoid living and working in areas of high pollution
- Do not smoke
- Avoid asbestos
- Eat healthily

A study funded by Cancer Research UK has estimated that a third of cancer cases in the UK are linked to smoking, alcohol, diet, or being overweight. In the western world, many of us eat too much red and processed meat and not enough fresh fruit and vegetables. This type of diet is known to increase the risk of cancer. Drinking alcohol can also increase

the risk of developing some types of cancer.

Recently, researchers at the Hebrew University of Jerusalem, discovered that early on in a cancer, there aren't enough DNA building blocks, nucleotides, to support the rate of DNA synthesis. When this happens, the genome (total genetic material) can become unstable and develop mutations that further deregulate the cancer. Bester et al. Nucleotide deficiency promotes genomic instability in early stages of cancer development. *Cell*. 2011

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This research suggests that a new way to prevent precancerous cells from developing could be to increase the amount of available DNA building blocks, nucleotides, so that the DNA could be synthesized properly and with fewer additional mutations.