WHAT IS DNA & WHY IT IS IMPORTANT

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What is DNA?

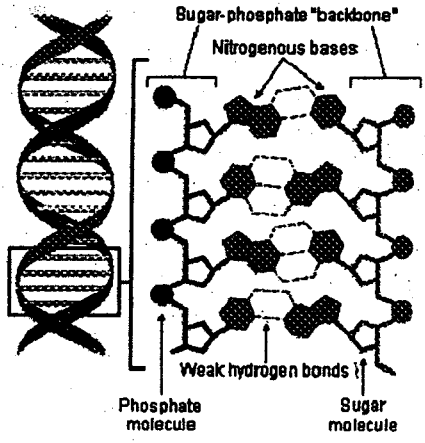
DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms. Nearly every cell in a person's body has the same DNA. The DNA molecule contains the biological instructions that make each species unique. DNA, along with the instructions it contains, is passed from adult organisms to their offspring during reproduction.

Most of the DNA is found inside a special area of the cell called the nucleus (where it is called nuclear DNA). An organism's complete set of nuclear DNA is called its genome. Besides the DNA located in the nucleus, humans and other complex organisms also have a small amount of DNA in cell structures known as mitochondria (where it is called mitochondrial DNA or mtDNA). Mitochondria generate the energy the cell needs to function properly.

DNA is made of chemical building blocks called nucleotides. These building blocks are made of three parts: a phosphate group, a sugar group and one of four types of nitrogen bases. To form a strand of DNA, nucleotides are linked into chains, with the phosphate and sugar groups alternating. The information in DNA is stored as a code made up of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T). The order, or sequence, of these bases determines what biological instructions are contained in a strand of DNA. Each DNA sequence that contains instructions to make a protein is known as a gene. The size of a gene may vary greatly, ranging from about 1,000 bases to 1 million bases in humans. The genome, for a human contains about 3 billion bases and about 20,000 genes on 23 pairs of chromosomes. DNA bases pair up with each other, A with T and C with G, to form units called base pairs. Each base is also attached to a sugar molecule and a phosphate molecule. Together, a base, sugar, and phosphate are called a nucleotide. Nucleotides are arranged in two long strands that form a spiral called a double helix. The structure of the double helix is somewhat like a ladder, with the base pairs forming the ladder's rungs and the sugar and phosphate molecules forming the vertical sidepieces of the ladder.

Because the cell is very small, and because organisms have many DNA molecules per cell, each DNA molecule must be tightly packaged. This packaged form of the DNA is called a chromosome. An important property of DNA is that it can replicate, or make copies of itself. Each strand of DNA in the double helix can serve as a pattern for duplicating the sequence

of bases. This is critical when cells divide because each new cell needs to have an exact copy of the DNA present in the old cell. During DNA replication, DNA unwinds so it can be copied. At other times in the cell cycle, DNA also unwinds so that its instructions can be used to make proteins and for other biological processes. But during cell division, DNA is in its compact chromosome form to enable transfer to new cells.



The Structure of DNA

Why Is DNA Important?

The simplest answer for "Why Is DNA Important?" is that DNA is the prerequisite for life's inception. It dictates life in two manners. Firstly, it transfers hereditary information from generation to generation. Secondly, it controls the production of proteins. DNA even determines the structure of the cell, meaning whether it would be a nerve cell or eye cell etc.

The German biochemist FrederichMiescher first observed DNA in the late 1800s. The importance of DNA became clear in 1953, to the work of James Watson, Francis Crick, Maurice Wilkins and Rosalind Franklin. By studying X-ray diffraction patterns and building models, the scientists figured out the double helix structure of DNA - a structure that enables it to carry biological information from one generation to the next. Its discovery has not only revolutionized science and medicine but it has affected all walks of life; whether they are social, legal, criminal or inheritance related. DNA's discovery has become important to the extent that it has even influenced a nation's security parameters / concerns, as scientists have gone all the way to developing biological weapons.

DNA is the blueprint of biological life from its inception to its growth and till death.

1. Genealogy, i.e. the study of ancestry, depends on the study of DNA. With the help of verbal an written history, and cues from DNA testing, one can trace his ancestors and learn about hi family tree. This resolves not only social matters but legal and inheritance matters as wel Genealogy is also useful in determining the biological mother and other relatives. It can ever tell if two siblings truly share the same parents. Study of DNA in genealogy has also shown its importance in detecting the hereditary diseases and in working out their cure.
2. In forensic science and its applications, DNA is playing an important part. It has resulted in many breakthroughs in criminal cases as it can be used to trace the criminals by comparing the DNA samples found on the crime scene with those extracted from the suspects.
3. DNA stands for the progression and advancement in modern day biotechnology. DNA's discovery has proved very important to agriculture. Scientists have used this knowledge to improve the food products and crops by genetically modifying them and making them more powerful to fight diseases. This way they have increased themagnitude of agricultural production. Similar technology has been applied by animal farming industry resulting in improved breeding and stronger built of animals.

Developments in biology and especially genetic studies have answered the question of "What does DNA stand for?" However, not all that DNA stands for is good. DNA has changed the concept of security and defense for a country because of the dangers it faces from the development of biological weapons. These biological weapons, based on DNA technology, can be exploited to not only paralyze but also demoralize a nation by causing a devastating breakout of viral, infectious and untreatable diseases. Many germs of the known and curable diseases have been improvised to become more dangerous and incurable. These bombs are easy to be manufactured with this existing knowledge, as they do not require high technology or heavy investment. If these bombs ever fall in the wrong hands they can cause a high security risk globally. Therefore all is not fine about DNA's discovery; we have to be very careful about the ill uses of this technology.

In conclusion, DNA, the acronym for Deoxyribonucleic Acid, stands for the key foundation on which the structure of life is built. It is the set of instructions contained within the DNA and the difference in these instructions from one DNA to the other that results in one organism / human being different from the other; what it is, what its physical features will be and even what diseases it will be predisposed to. As an example, the difference describes here is not only in terms of different hair color and facial features but that these human beings even differ in the way they react to the same situation and same environment.