Deoxyribose nucleic acid

Business

DNA could be compared to the instruction book of life. DNA is a nucleic acid that makes up the genome, or sum of an organism’s genetic make-up, of an organism. (“ DNA”). The nucleic acid serves as a template for replication and transcription; many cell processes would not be able to take place without the information the DNA provides. DNA is vital to an organism’s survival because without it, there would be no variation among organisms, proteins necessary for the cell to function would not be made, and cells would not be able to reproduce.

(Nowicki,) DNA is essentially a double helix that consists of nucleotides and sugar and phosphate molecules. A double helix is similar to a twisted ladder. Two strands, which consist of alternating sugar and phosphate molecules, are wrapped around each other, with the strands being connected by nucleotides; hydrogen bonds are formed between the nucleotide bases (“ What is DNA?”). Each turn of the double helix is about the length of ten nucleotides; also, each turn has about twenty-five hydrogen bonds, ensuring the stability of the structure (“ The Double Helix”). The nucleotides may be arguably the most important part of the double helix structure.

A nucleotide is made of one of four bases combined with a sugar and phosphate group; the four bases are guanine, cytosine, adenine, and thymine. The four bases are divided into two groups, purines and pyrimidines. Guanine and adenine are purines, and cytosine and thymine are pyrimidines. (“ Nucleotides.”) All DNA has the same basic structure – double helix with nucleotides, deoxyribose, and phosphate molecules.

The only thing that makes jellyfish DNA different from the DNA of an orange is the nucleotide sequence. For example, there are over 3 billion nucleotides in human DNA; over 99% of those nucleotides are the same in all humans. This is why humans have certain traits that are characteristic to the human race. The other 1% accounts for variations in humans , such as skin, eye, and hair color (“ What is DNA?”). Replication is the cell process in which DNA is copied; without DNA replication, the cell would be unable to reproduce. For example, asexual reproduction involves the division of a cell into identical daughter cells.

Because each daughter cell must have a full set of DNA, the parent cell must duplicate its DNA in order to reproduce (Nowicki). In replication, the cell starts out with one set of DNA. First, the two strands of DNA are unzipped from each other. Then, the strand serves as a template as DNA polymerase, an enzyme that plays a major part in replication, attaches free floating nucleotides (Textbook). Replication is considered to be semi-conservative; each set of DNA produced contains one strand from the old DNA molecule and one new strand.

The end result is two identical molecules of DNA. (“ DNA Replication”). The process by which DNA is extracted took many years to perfect. The first step involves the breaking of the cell membrane and cell walls. This is usually done by either blending or squishing the sample.

Second, the unneeded cell parts must be strained away. Then the detergent is added; the detergent, along with the meat tenderizer, helps to further break down the cell membrane and the nuclear envelope. Finally, rubbing

alcohol is added to the mixture. DNA, which stays dissolved in other liquids, becomes solid in rubbing alcohol. After approximately 20 minutes, DNA should be visible in the solution (“ How to Extract DNA…”). Many scientists contributed to what we know about DNA today.

The first scientist to recognize DNA as the genetic material of a cell was Fredrick Griffith. About fourteen years later, in 1942, Oswald Avery established, through many extensive experiments, that DNA comprises an organism’s genome. Around that same time, Erwin Chargaff established the base pairing rules. Two scientists, Rosalind Franklin and Maurice Wilkins made a x-ray picture of DNA, which showed the double helix structure. James Watson and Francis Crick collected knowledge of DNA contributed by these scientists to make an accurate model of DNA.

Wilkins, Watson, and Crick later received the Nobel Prize for their work. (“ History of DNA Research”)