

DNA Structure

(Video Narration)

Basic Molecular Biology: Basic Science DNA Structure

Deoxyribonucleic Acid or DNA is a complex molecule that consists of many components. Let's break down the components into four groups: basic elements, nucleosides, nucleotides, and nucleic acids. Each of these four groups builds upon the other to form the familiar structure of DNA. The basic elements that compose DNA are five atoms: carbon, nitrogen, oxygen, phosphorous, and hydrogen. A nucleoside is the combination of these atoms into two structures, a five-carbon sugar molecule called deoxyribose, which is responsible for the name of DNA, and one of four nitrogen bases. The four types of nitrogen bases found in DNA are: adenine, thymine, guanine, and cytosine. Together, these two structures form the supporting backbone of DNA. A nucleotide consists of the previous nucleoside and a phosphate group. When nucleotides form chains they are referred to as nucleic acids, thus DNA is a type of nucleic acid. In the living cell, DNA is not produced as a single strand, but on a template formed by a preexisting DNA strand, creating a second strand of nucleotides that is attached to the template strand, thus forming a double strand of DNA. The nitrogen bases protruding from the existing strand bind to bases of the strand being synthesized according to the base pairing rules: Adenine binds to Thymine, and Cytosine binds to Guanine. Note that the second strand is arranged in the opposite orientation relative to the existing strand. For orientation purposes, the carbon atoms in the nucleotide sugar are numbered one through five. The phosphate group is attached at carbon five and is appropriately called the five prime end. The next nucleotide in the chain attaches at the third carbon and is called the three prime end. Therefore, each nucleotide strand has a 5 prime end and a 3 prime end, and, each strand is in opposite orientation to one another when in a double strand.