

## DNA Structure

DNA is one of the **nucleic acids**, information-containing molecules in the cell (**ribonucleic acid**, or RNA, is the other nucleic acid). DNA is found in the nucleus of every human cell. (See the sidebar at the bottom of the page for more about RNA and different types of cells). The information in DNA:

- guides the cell (along with RNA) in making new proteins that determine all of our biological traits
- gets passed (copied) from one generation to the next by sex cells

The key to all of these functions is found in the molecular structure of DNA, as described by Watson and Crick.

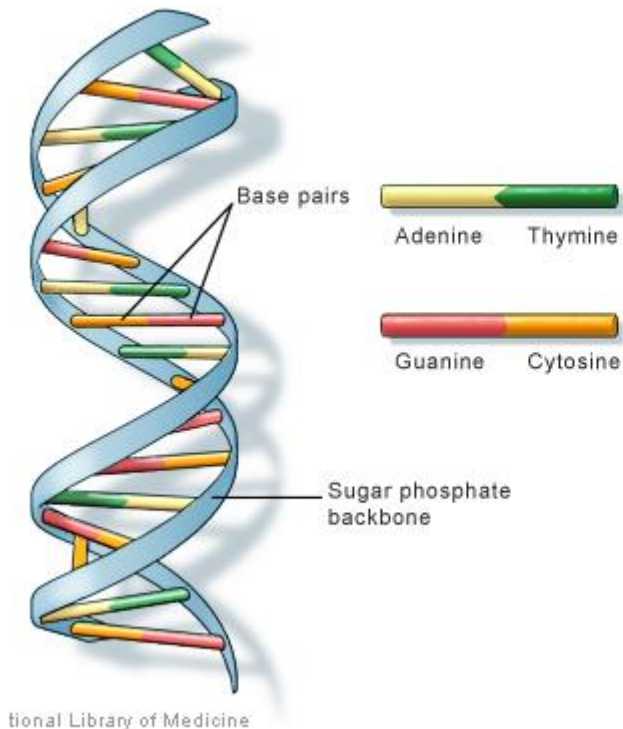
Although it may look complicated, the DNA in a cell is really just a pattern made up of four different parts called **nucleotides**. Imagine a set of blocks that has only four shapes, or an alphabet that has only four letters. DNA is a long string of these blocks or letters. Each nucleotide consists of a sugar (**deoxyribose**) bound on one side to a **phosphate group** and bound on the other side to a **nitrogenous base**.

There are two classes of nitrogen bases called **purines** (double-ringed structures) and **pyrimidines** (single-ringed structures). The four bases in DNA's alphabet are:

- **adenine (A)** - a purine
- **cytosine(C)** - a pyrimidine
- **guanine (G)** - a purine
- **thymine (T)** - a pyrimidine

**Strands of DNA are made of the sugar and phosphate portions of the nucleotides, while the middle parts are made of the nitrogenous bases. The nitrogenous bases on the two strands of DNA pair up, A with T, G with C, and are held together by weak hydrogen bonds.**

Watson and Crick discovered that DNA had two sides, or strands, and that these strands were twisted together like a twisted ladder - the **double helix**. The sides of the ladder comprise the sugar-phosphate portions of adjacent nucleotides bonded together. The hydrogen bonds between phosphates cause the DNA strand to twist. The nitrogenous bases point inward on the ladder and form pairs with bases on the other side, like rungs. Each base pair is formed from two complementary nucleotides bound together by hydrogen bonds. The base pairs in DNA are **adenine with thymine** and **cytosine with guanine**.



**DNA has a spiral staircase-like structure. The steps are formed by the nitrogen bases of the nucleotides where adenine pairs with thymine and cytosine with guanine.**

### Hydrogen Bond

A hydrogen bond is a **weak chemical bond** that occurs between hydrogen atoms and more electronegative atoms, like oxygen, nitrogen and fluorine. The participating atoms can be located on the same molecule (adjacent nucleotides) or on different molecules (adjacent nucleotides on different DNA strands). Hydrogen bonds do not involve the exchange or sharing of electrons like covalent and ionic bonds. The weak attraction is like that between the opposite poles of a magnet. Hydrogen bonds occur over short distances and can be easily formed and broken. They can also stabilize a molecule.