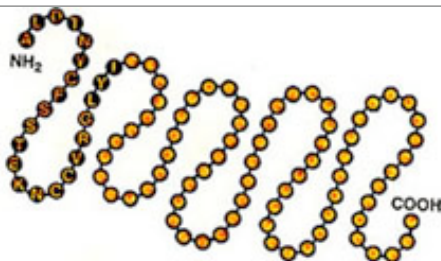


The Structure of Amino Acids in Proteins

Polymers are strings of monomers, and sometimes monomers in such strings have charges. In this background piece, we focus on the monomer 'beads' of proteins, called amino acids, which carry the different charges.

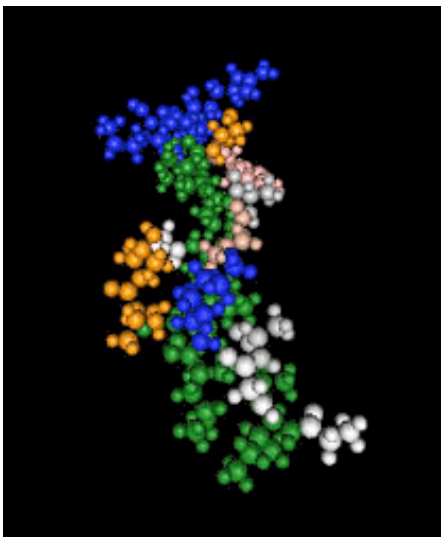
What is an Amino Acid?

Proteins in all living creatures on Earth--from plants to animals to microbes-- are made from the same 20 plus types of amino acids. The abundance of possible combinations of amino acids makes the huge variety of proteins possible. There are at least 60-70,000 different types of proteins in humans alone!



A polymer chain of monomer beads

To the left, you can see amino acids arranged as "beads" in a protein strand. Long, flexible strands of protein can be shaped into parts for the cell. Most protein chains get first twisted into a helix or sheet. Then they assume a specific shape for a certain job, such as carrying another molecule to where it is needed, identifying an intruder, or joining or breaking up a molecule.

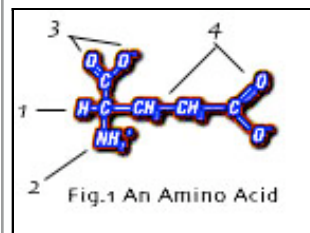


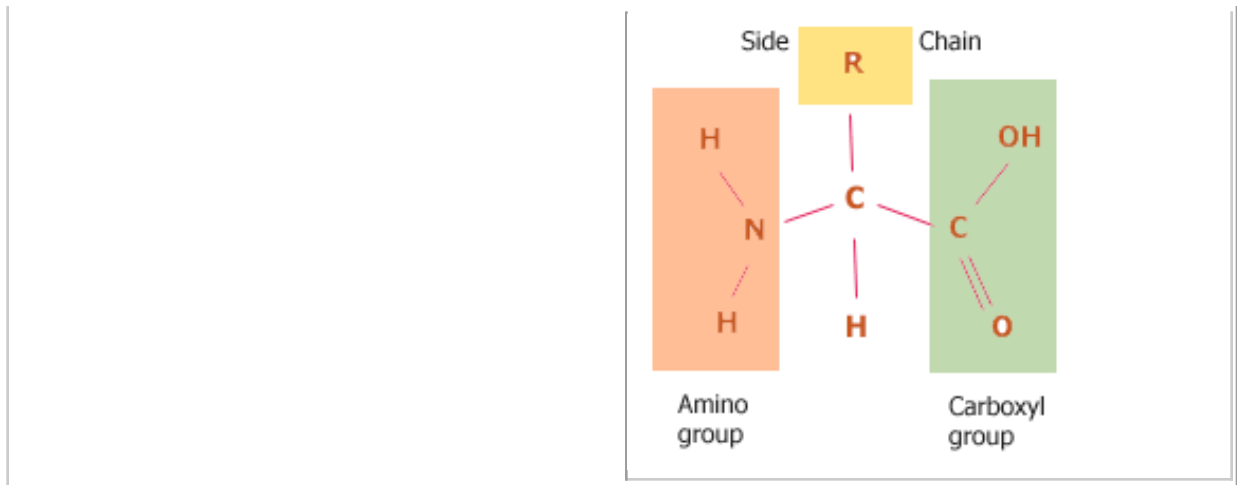
This model reveals the three-dimensional shape of a protein, emphasizing the position of its amino acids. Each amino acid has been colored/shaded, and each bead represents an atom.

Every amino acid has four groups of atoms attached to a central carbon atom.

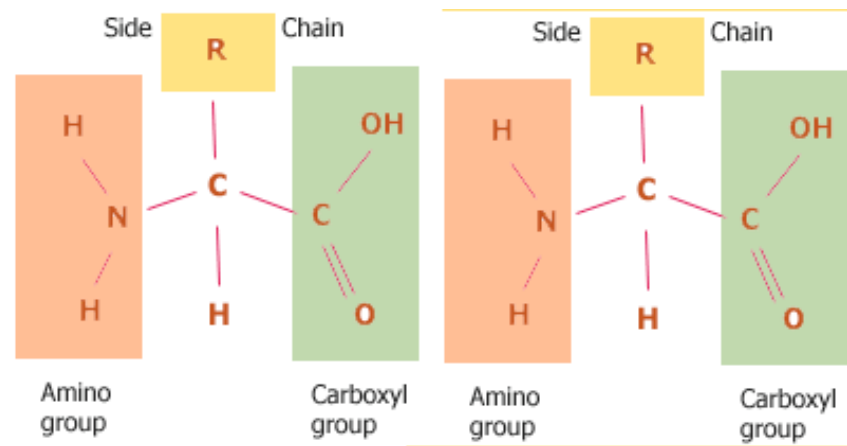
These groups are:

1. A single hydrogen: H
2. An amino group: (-NH₂)
3. A carboxyl group: -COOH (acidic)
4. One of 20* possible side chains (also called radicals or residues).

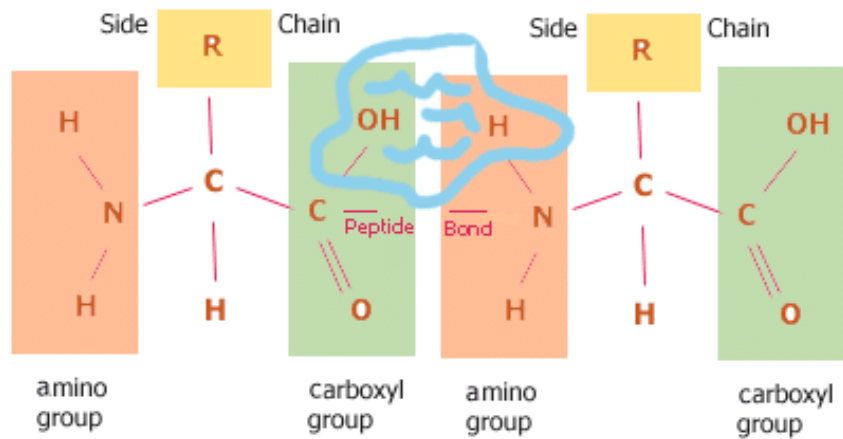




Joining amino acids



When amino acids are joined together, a peptide bond (see red line below) is made and water comes off.



What difference do the side chains make?

The interactions between various side chains of the protein with each other and with water molecules create its special three-dimensional protein shape. This in turn determines how it works biologically, whether it will be used for the construction of a cell wall, for example, or for one of cell's molecular machines, such as those that move cells or protect them from intruders.

Scientists have discovered that all amino acids play very important roles in the shaping of a protein. Sometimes a replacement of just one amino acid can dramatically affect the shape of a protein.

Read more about amino acids.

http://www.biology.arizona.edu/biochemistry/problem_sets/aa/aa.html

http://www.concord.org/~barbara/homs_workbench/amino_acids1.html