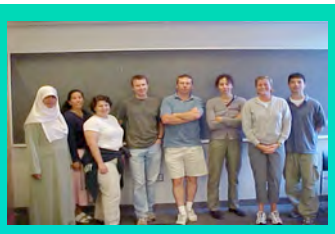
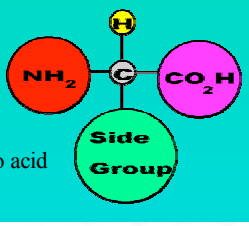


PROTEIN CHEMISTRY

Ms. Kazmi's Summer 2004 Project



An Amio acid

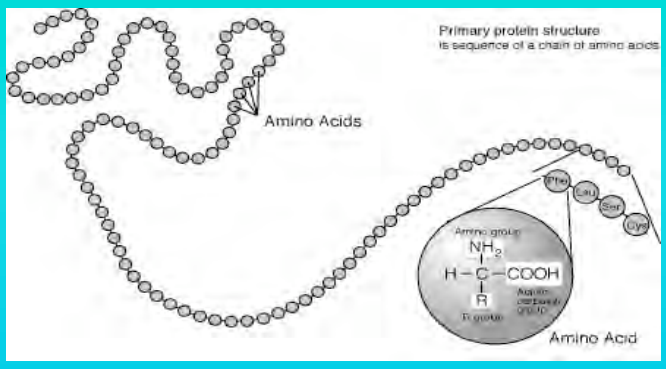
What is a Protein?

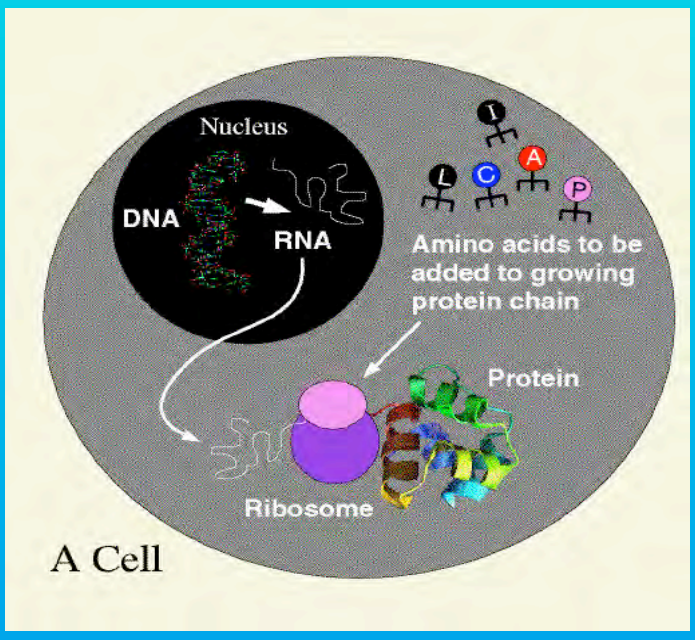
Proteins are polymers of amino acids joined together by peptide bonds. There are 20 different amino acids that make up essentially all proteins on earth. Each of these amino acids has a fundamental design composed of a central carbon (also called the alpha carbon) bonded to:

- a hydrogen
- a carboxyl group
- an amino group
- a unique side chain or R-group

The characteristic that distinguishes one amino acid from another is its unique side chain.

Proteins are essential to the structure, function, and regulation of the body. Examples are hormones, enzymes, and antibodies.





How Does a Cell Make Proteins?

1. The cell first makes a copy of the DNA instructions. The DNA instructions contain a region which controls how often a copy is made. The copy is made of a different type of nucleic acid called RNA.
2. The RNA copy is moved to the protein making machinery in the cell which is called the "ribosome".
3. Every set of three RNA bases in a row control which amino acid is to be added to a growing protein molecule.
4. A special three base code (usually ATG) tells the ribosome where the instructions on how to make the protein begin in the sequence.
5. The copy of the DNA chain passes through this protein making machinery like a tape through a tape player.
6. The ribosome, however, produces protein instead of sound!

Using Quantum Dots to Track mRNA to Protein

Quantum dots are crystals made of semiconducting compounds and that are less than a millionth of an inch in diameter. They are referred to as "nanocrystals." Under ultraviolet light, each quantum dot radiates a brilliant color, depending on its size. For example, larger dots radiate red and smaller dots shine blue.

To use quantum dots as molecular labels, the researchers coax the nanocrystals into the pores of tiny, plastic beads that are tagged with a molecular probe--a protein or DNA sequence that binds strongly to the molecule of interest. After the probe binds to its molecular target in a cell or other biological sample, scientists can visualize the location or abundance of the molecule by lighting up the quantum dots with ultraviolet light.

By mixing quantum dots in different colors and intensities, the scientists predict they can create 10,000 to 40,000 distinguishable quantum dot labels. With each label corresponding to a particular gene or protein, the researchers can detect tens of thousands of molecules all at once.

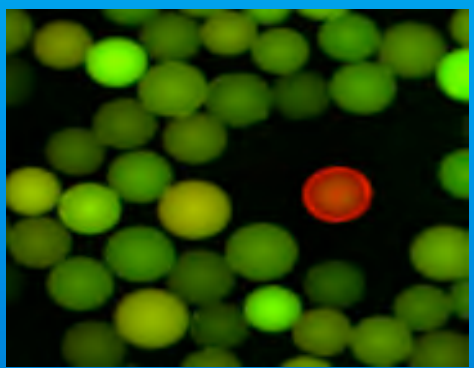
Quantum dots offer many technical advantages over traditional fluorescent dyes and newer DNA chip technologies, which are commonly used to detect and track biological molecules:

a) They are brighter and easier to visualize than organic dyes.

b) They are more flexible and yield faster results than other current technologies.

c) They are useful in identifying and tracking molecules in basic biomedical studies.

d) They promise faster, more flexible, and less costly tests for on-the-spot clinical analyses such as screening for illegal drugs and diagnosing conditions ranging from HIV infection to allergies.



On-bead capture of Qdot 605 Streptavidin Conjugate within a library of peptides displayed on TentaGel beads (Rapp Polymere). http://www.qdots.com/live