

#ret #flo

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# 1 | Proteins

## 1.1 | Structures

- Proteins account for 50% of the dry mass of most cells
- Enzymes are mostly proteins
- Very structurally complex
  - They are constructed from the same 20 sets of amino acids
- A polypeptide is a polymer of amino acids
  - A protein is made up of one or more polypeptides
- A protein must serve a biological function to be a protein
  - It also must be folded and coiled into a specific 3 dimensional structure
- There are many types of proteins
  - Enzymatic proteins
    - \* Selective acceleration of chemical reactions
    - \* Digestive enzymes are an example that catalyze the hydrolysis of bonds in food
  - Defensive proteins
    - \* Protect against disease
    - \* Antibodies are an example and inactivate as well as help destroy viruses and bacteria
  - Storage proteins
    - \* Storage of amino acids
    - \* Casein is an example which is in milk and is the major source of amino acids for baby mammals
  - Transport proteins
    - \* Transport of substances
    - \* Hemoglobin is an example that transports oxygen from the lungs to other parts of the body.
  - Hormonal proteins
    - \* COordination of an organism's activities
    - \* Insulin is an example as it causes other tissues to take up glucose thus regulating the blood sugar concentration
  - Receptor proteins
    - \* Response of cell to chemical stimuli
    - \* Responsible for stuff like detecting signaling molecules released by other nerve cells
  - Contractile and motor proteins
    - \* Meant for movement
    - \* Responsible for stuff like flagella

- Structural proteins
  - \* They are used as support
  - \* Keratin is an example

### ### Amino Acids

- All amino acids share a common structure
  - It is an organic molecule with both an amino group and a carboxyl group
    - \* An amino group is two Hydrogens bonded with a nitrogen and a carboxyl group is an oxygen double bonded with a carbon and an OH bonded with the same carbon
  - The side chain determines the unique characteristics of the particular amino acid

#### 1.1.1 | Protein Structure

- The specific function of a protein is a result of their shape
- There is now easier sequencing of proteins, but originally it was very difficult
- The protein may spontaneously fold once constructed
- Proteins share three superimposed levels of structure, known as primary, secondary, and tertiary structure
  - A fourth Quaternary structure arises once when a protein is made of two or more polypeptide chains
- Primary structure
  - A sequence of amino acids
- Secondary structure
  - These are coils and folds formed by hydrogen bonds from partial charges
  - An example would be a helix and pleated sheet
- Tertiary structure
  - It is the overall shape of a polypeptide resulting from interactions between the side chains
- Quaternary structure
  - This is the overall protein structure resulting from the polypeptide sub-units
- Primary structure is very fundamental and even a slight change can cause large consequences
- Chemical conditions can alter a proteins shape
  - Denaturing is when a protein becomes mishapen and therefore biologically inactive
- Many proteins have been sequenced
- Misfolded proteins are the causes of many diseases
- Crystallography is a technique for obtaining the 3d shape of a protein
- Nucleic acids are made of polynucleotides which are made of nucleotides