Amino Acids, Proteins, and Enzymes

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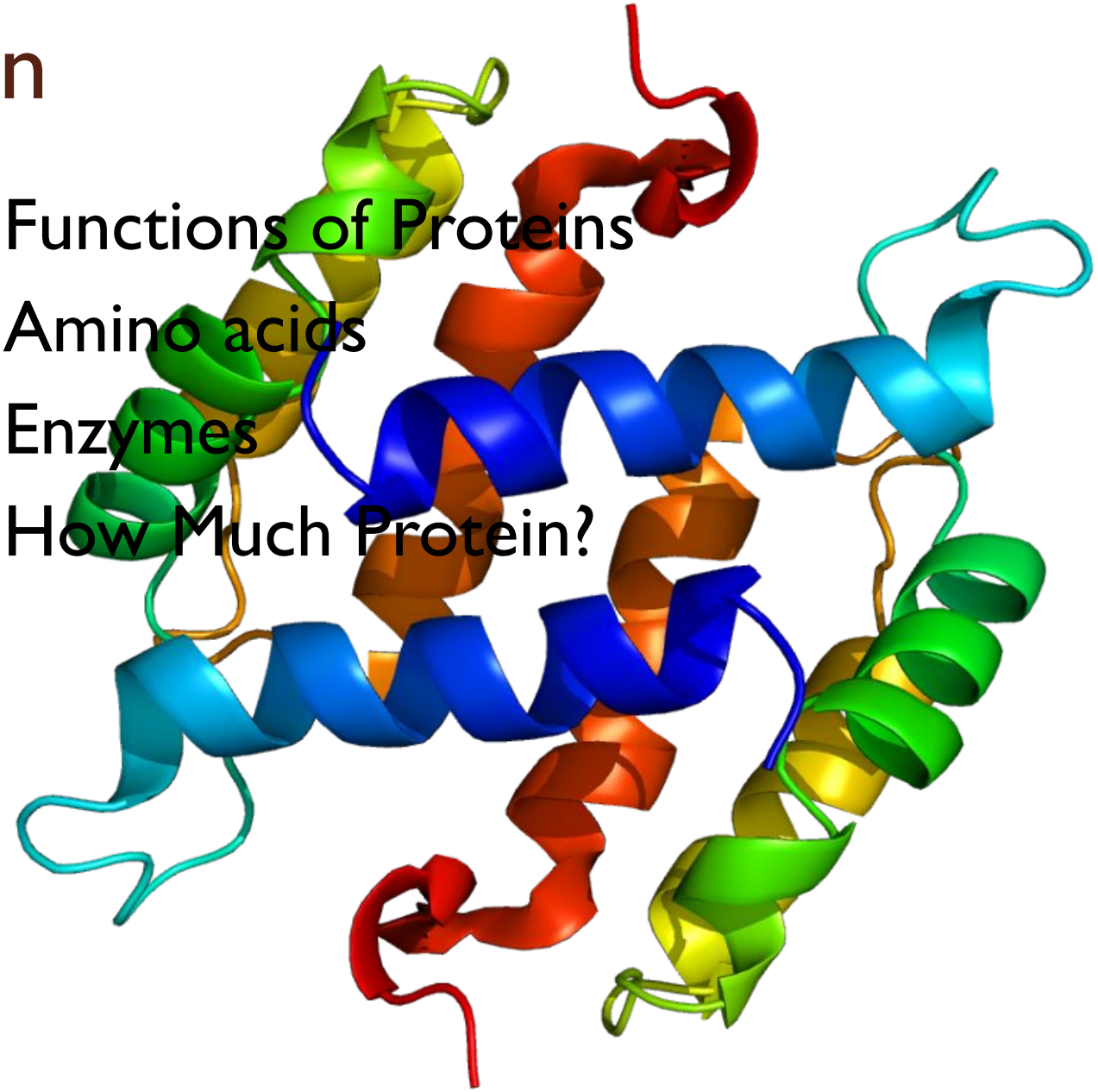
Plan

I. Functions of Proteins
II. Amino acids
III. Enzymes
IV. How Much Protein?



I. Functions of Proteins

- Proteins • in the body are polymers made from 20 different amino acids • differ in characteristics and functions that depend on the order of amino acids that make up the protein • perform many different functions in the body, such as provide structure, transport oxygen, direct biological reactions, control against infection, and even be a source of energy

I. Functions of Proteins

- Proteins, composed of many amino acids, (the molecular building blocks of proteins), 20 of them are very important and are needed for muscle and tissue building, repair and maintenance. Cells, organs, the immune system, skin, hair, blood,cartilage, bones, fingernails, enzymes and some hormones. The body as a whole requires protein.

Animal Sources of Protein

- Meat, eggs, dairy products, poultry and fish contain all of the essential amino acids to create the proteins our bodies need. Some animal sources such as beef and egg yolk have a high amount of saturated fat and cholesterol with a concern for clogged arteries and heart disease.

My preferred animal sources are fish which contains Omega-3 fatty acids (essential fatty acids), then skinless chicken and turkey and egg whites, followed by low- fat and non-fat milk products and low fat cheese. Limited consumption of beef should be lean cuts of unprocessed meat

Animal Sources of Protein

- Vitamin B12 an essential nutrient is protein-bound in animal foods, which maintains a healthy nervous system and creates nerve coverings called myelin sheaths that protect nerve endings and supports red blood cell production.

  As of 2004 no plant sources of vitamin B12 had been found, though many had been tested including various seaweeds, algae and fermented foods. Where claims have been made as to B12 being present in a plant source, it has not been based on the test for MMA levels, and any subsequent tests have found no reduction in MMA, proving the presence only of inactive analogues

Plant Sources of Protein

- Nuts, seeds, and legumes (such as black beans and lentils kidney, lima, garbanzo, and pinto beans, soybeans, and black-eyed peas. Plants are missing some of the essential amino acids our bodies need to produce protein.

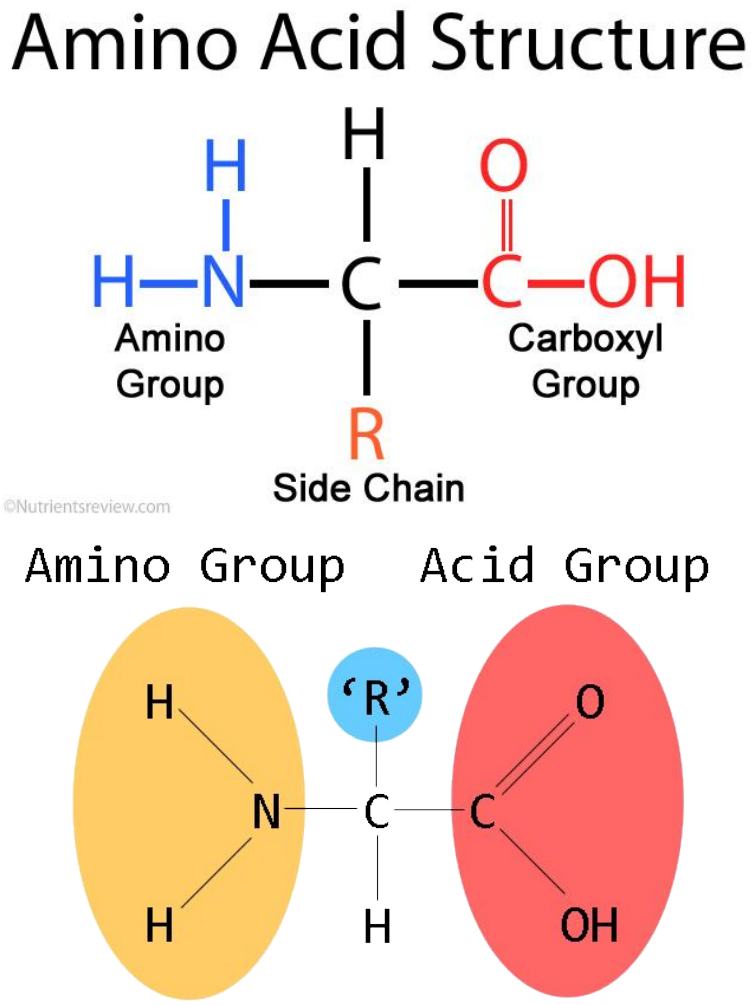
Vegetarians and vegans can combine plant sources (complementary proteins) to obtain all of theessential amino acids the body needs by eating red beans with rice, lentils with rice, soybeans, green beans with almonds, ground sesame seeds, and corn tortillas with beans

II. Amino acids

- The body makes 10 of the 20 amino acids needed to produce protein. The other 10 essential amino acidsare essential because they can only be obtained from eating protein-rich foods. Amino Acids makeenzymes which are protein molecules.
- The body does not store excess essential amino acids for later use. They must obtained from food every day. Essential amino acids, which aren't produced by our bodies, are found in meat, poultry, fish and dairy products

II. Amino acids

- The 10 amino acids that the body can produce are alanine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine and tyrosine. The essential amino acids the body can't produce are arginine (required for the young, but not for adults), histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine



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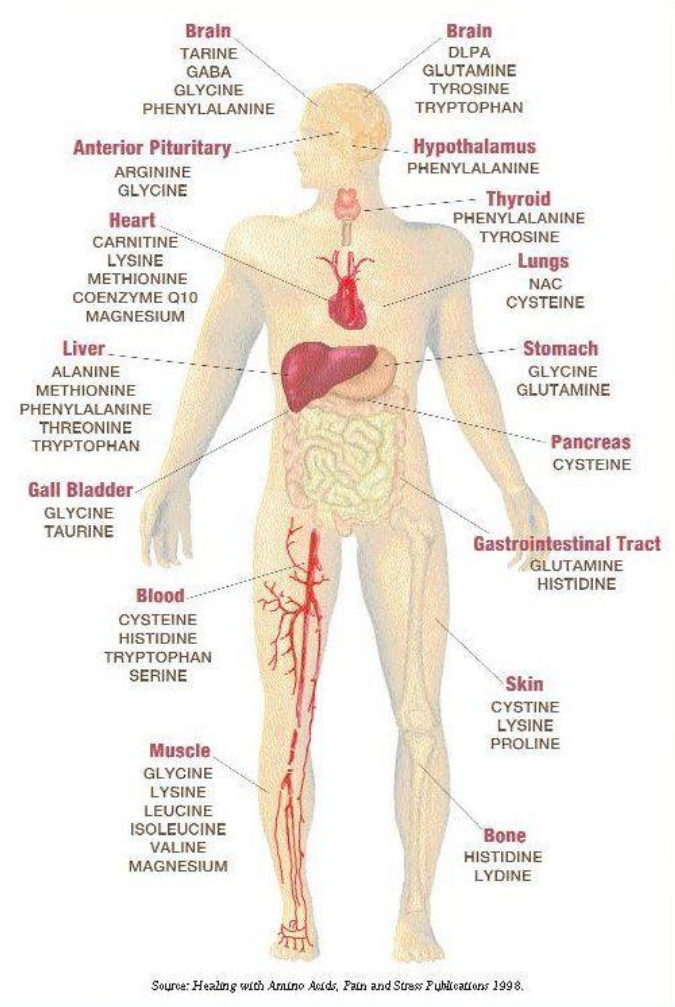
- Essential Amino Acids and Essential Fatty Acids can't be produce by your body; they must be obtain from the food you eat

Essential Fatty Acids

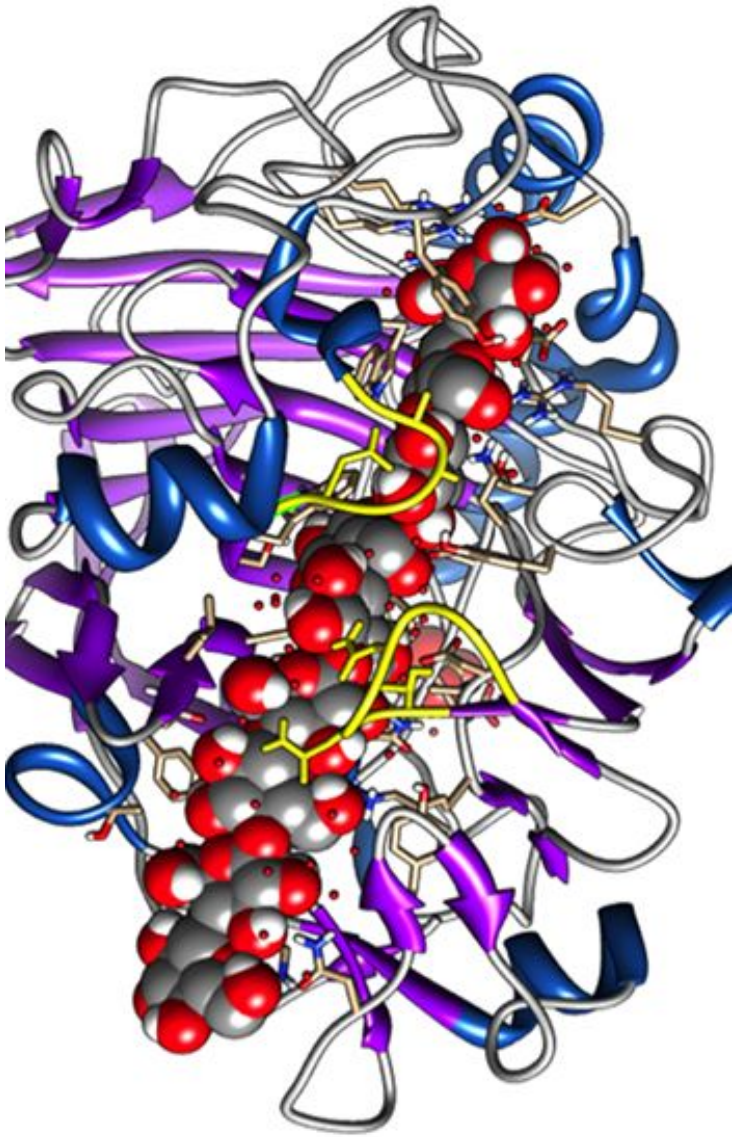
- Your body needs *Essential Fatty Acids* to lubricate skin and tissue (keep the outer walls of your cells supple), allow cell membranes to function normally and the brain and nervous system to function properly.
- Essential Fatty Acids (*EFAs*) are fats that your body doesn't manufacture, you can get them from extra virgin olive oil, flaxseeds, flaxseed meal, hempseed oil, hempseeds, walnuts, pumpkin seeds, whole nuts, grains, legumes, sesame seeds, avocados, some dark leafy green vegetables (kale, spinach, mustard greens, collards, etc.), coconut oil, canola oil (cold-pressed and unrefined, not from genetically modified soybeans), wheat germ oil, salmon, mackerel, sardines, anchovies, albacore tuna, trout, cantaloupe and papaya

Essential Amino Acids



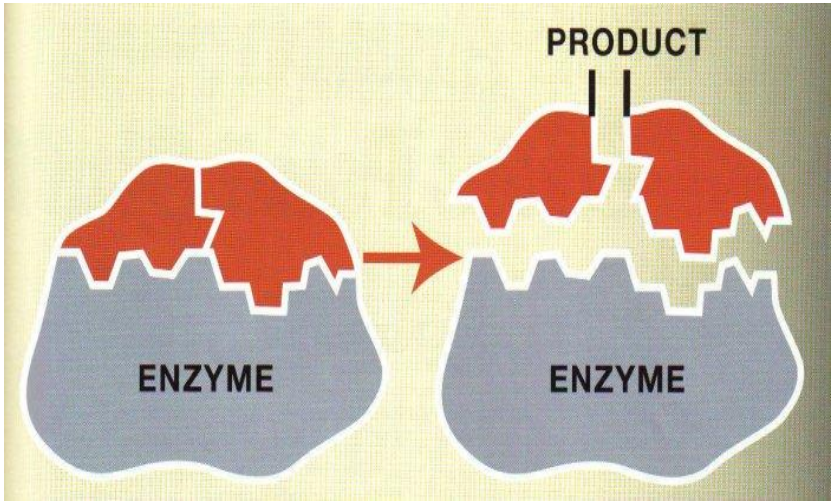
III. Enzymes

- Enzymes made from amino acids are protein molecules that act as catalysts that support biochemical reactions (allowing certain chemical reactions to take place much quicker (accelerate) than the reactions would occur on their own), support hormones that influence metabolism (they speed up (accelerate) the rate at which metabolic processes and reactions occur in living organisms) and support hemoglobin which carries oxygen and antibodies to fight infection

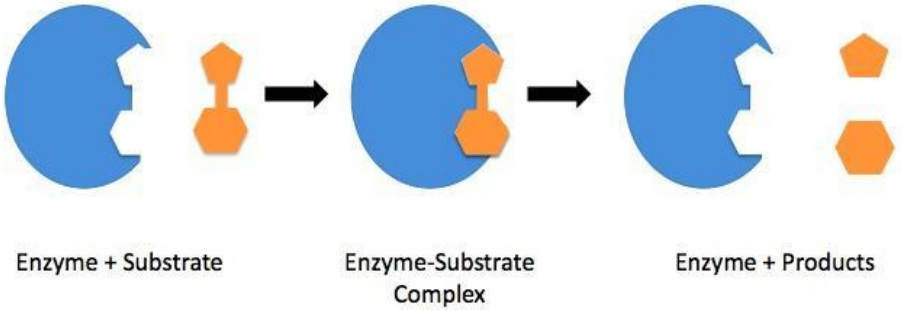


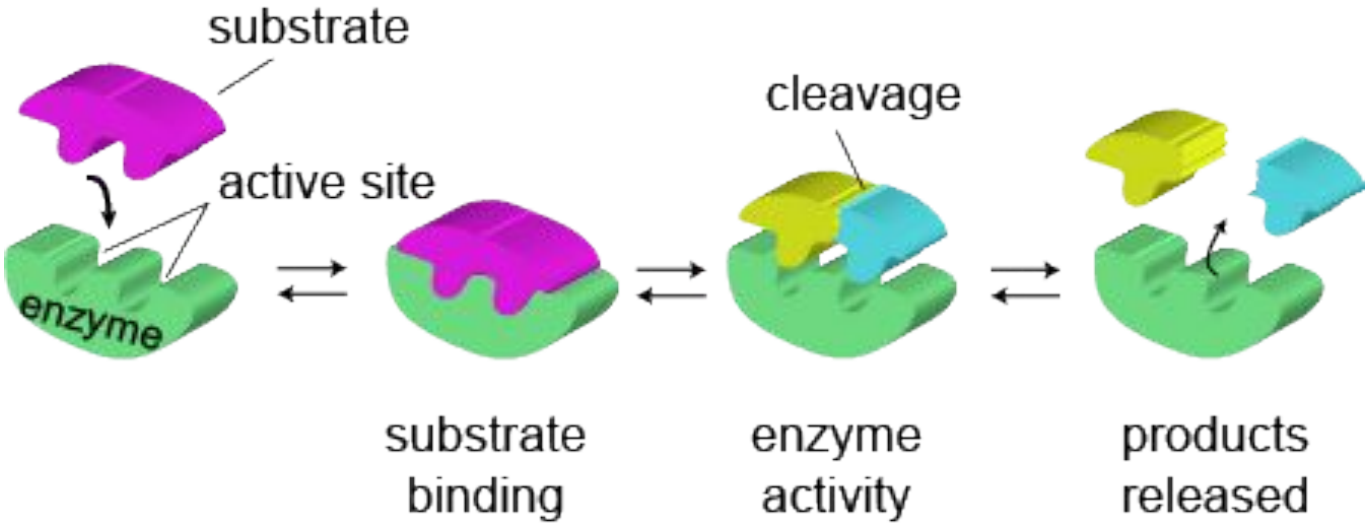
III. Enzymes

- Digestive enzymes are used by your body to digest protein, carbohydrates and fat (lipids). Your digestive system receives the enzymes from the foods you eat and some of them are produced in your body by your digestive organs. They cause food that you eat to be broken down much faster (accelerate) than would occur without them



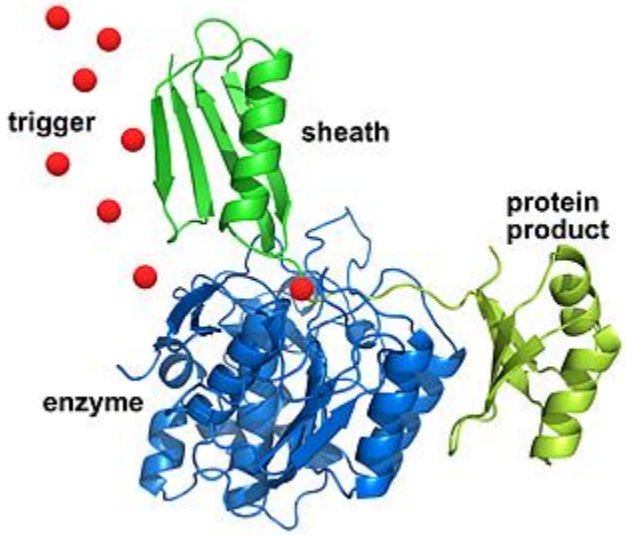
III. Enzyme working





Proteins as enzymes

- This page is an introduction to how proteins can work as enzymes - biological catalysts. You should realise that this is written to cover the needs of a number of UK-based chemistrysyllabuses for 16 - 18 year olds. If you want detailed knowledge about enzymes for a biology or biochemistry course, you are probably in the wrong place! This is just an introduction



Enzymes as catalysts

- Enzymes are mainly globular proteins - protein molecules where the tertiary structure has given the molecule a generally rounded, ball shape (although perhaps a very squashed ball in some cases). The other type of proteins (fibrous proteins) have long thin structures and are found in tissues like muscle and hair. We aren't interested in those in this topic.
- These globular proteins can be amazingly active catalysts. You are probably familiar with the use of catalysts like manganese(IV) oxide in decomposing hydrogen peroxide to give oxygen and water. The enzyme catalase will also do this - but at a spectacular rate compared with inorganic catalysts.
- One molecule of catalase can decompose almost a hundred thousand molecules of hydrogen peroxide every second. That's very impressive!

IV. How Much Protein?

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- Ideally, you should consume 0.36 grams of protein for every pound of body weight, according to recommended daily allowances (RDA) set by the Food and Nutrition Board. So if you weigh 170 pounds, you need about 61 grams of protein each day

Protein should also make up approximately 15% of your total daily caloric intake, also according to the RDA. In a diet of 1,800 calories a day, for example, about 270 of those calories should come from protein

IV. HOW MUCH PROTEIN?

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- A 6-ounce broiled porterhouse steak gives you about 40 grams of protein. But it also delivers about 38 grams of fat, 14 of them saturated. That's more than 60 percent of the recommended daily intake for saturated fat. The same amount of salmon gives you 34 grams of protein and 18 grams of fat, 4 of them saturated