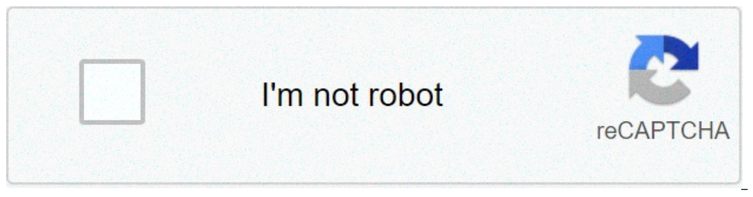

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Structure of 20 amino acids pdf

As a healthy eater, you probably know a thing or two about carbs, protein, and fats. But we're guessing there's one thing you don't give much thought to: amino acids. They're essential for life, and yet, WTF are they!?If you've ever taken the time to Google the term, you likely got a mind-boggling answer about carbon bonds. Luckily, there is a more straightforward answer: "Amino acids are the building blocks of protein," says Elizabeth Shaw, R.D.,an adjunct nutrition professor at San Diego Mesa College. "Unlike carbs or fats, proteins need to have amino acids to form their structure."If that still seems like a lot of technical jargon, here are the only things you really need to know.1. Protein is made up of amino acids.News flash: We need protein to live. It's present in every cell and helps us build and maintain healthy bones, muscle, and skin. Protein, which is found in nuts, seeds, dairy, fish, meat, poultry, and beans, is essentially a long chain of amino acids. So when your body breaks down protein from food, amino acids are what's left.There are three types of amino acids: essential, nonessential, and conditional. (Creative, right?) Essential are the kind that can't be made by your body but are necessary for survival (more on that below). While nonessential seems to imply "not needed," it actually describes amino acids that your body produces on its own. Conditional amino acids are the kind you usually only need if you're ill or stressed.2. Your body can't produce all of them.Of the 20 total amino acids, there are nine your body can't make on its own."These amino acids must come from food sources," says Amy Gorin, R.D. "Without them, the body's cells would use their own proteins to get those missing amino acids. Eventually, this would lead to degradation of the muscles and organs." Translation: No bueno for your body.In case you're curious, the nine essential amino acids are: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. Your body needs each of these in different amounts to build muscle, break down food (i.e., digest it), repair tissue, and many other functions. For example, tryptophan (which gets a false bad rap for making you sleepy after Thanksgiving dinner) helps your body make serotonin, a chemical that's sometimes referred to as a mood-regulating hormone.3. Eating a wide variety of real food is enough.You don't have to go crazy trying to figure out which foods do or don't have certain amino acids, as long as you're eating a decent variety of protein sources every day. Gorin offers this example: If you ate plain 2 percent fat Greek yogurt, pistachios, an apple, and whole-grain cereal for breakfast, you'd be getting a small amount of every essential amino acid—and that's just one meal.So what about supplements? Read enough health blogs and you're bound to come across BCAAs, or branched-chain amino acids. There are three BCAAs: isoleucine, leucine, and valine. Because some studies have suggested BCAAs play a role in exercise performance and recovery, they're popular amongst bodybuilders and athletes, though these findings have been inconsistent.Branched-chain amino acids supplementation enhances exercise capacity and lipid oxidation during endurance exercise after muscle glycogen depletion. Gualano AB, Bozza T, Lopes De Campos P. The Journal of sports medicine and physical fitness, 2011, Jun.;51(1):0022-4707. Branched-chain amino acid supplementation before squat exercise and delayed-onset muscle soreness. Shimomura Y, Inaguma A, Watanabe S. International journal of sport nutrition and exercise metabolism, 2010, Sep.;20(3):1526-484X. But in general, whole foods are a better choice."Speaking for the average athlete—not the Olympian out there—there's no reason to take a supplement unless there's a medical indication you need one," Shaw says. "You can get amino acids from food sources, even as a vegetarian, and still build your muscles."If you're still interested in supplementation, it's best to speak with a doc or dietitian before starting.4. Don't worry about combining incomplete proteins.You've probably heard that rice and beans are a complete or complementary protein, meaning that when you eat them together, you get all essential amino acids at once. Separately, each is considered an incomplete protein, meaning it's low in one or more essential amino acid. Researchers used to believe that incomplete proteins needed to be eaten together (at the same meal in a single sitting) in order for your body to best use them. But that's no longer valid."You don't need to eat the complementary proteins in the same meal," Gorin says. "So if you have a salad with black beans at lunch and a stir-fry over brown rice for dinner, you're getting those complementary proteins in the same day."But she also stresses: Don't overthink this. "What's more important is including a protein source—such as chicken, salmon, eggs, Greek yogurt, tofu—with every meal," Gorin says. If you're eating a balance of protein sources, healthy fats (think nuts or avocados), and whole grains (think brown rice or 100 percent whole-grain bread), you're probably getting a healthy balance of amino acids, Gorin says.We've teamed up with our friends at KIND to help break down some complicated nutrition facts. KIND has even more great content about the ingredients that make for a flavorful life happening over on Medium. Follow Ingredients by clicking below and be sure to recommend the articles you love.Follow Ingredients Called the "building blocks of life," amino acids can be obtained in healthy amounts by eating foods that contain them.Amino acids are compounds that combine to form proteins.Naturally found in our bodies, they're often referred to as the "building blocks of life."Amino acids are needed for the production of enzymes, as well as some hormones and neurotransmitters.They're also involved in numerous metabolic pathways within cells throughout the body.You can obtain amino acids through the foods you eat.After your body digests and breaks down protein, amino acids are left in the body to help do the following:Break down foodGrow and repair body tissueProvide a source of energyPerform other bodily functionsTypes of Amino AcidsAmino acids can be placed in three different groups:Nonessential amino acids: These are produced naturally by your body and have nothing to do with the food you eat.The following are examples of nonessential amino acids:AlanineAsparagineAspartic acidGlutamic acidEssential amino acids: These can't be produced by the body and must come from the food you eat.If you don't eat foods that contain essential amino acids, your body won't have them. The following are essential amino acids:HistidineIsoleucineLeucineLysineMethioninePhenylalanineThreonineTryptophanValineIt isn't necessary to eat essential amino acids at every meal. You can get healthy amounts by eating foods containing them throughout the day.Animal-based foods such as meat, milk, fish, and eggs provide essential amino acids.Plant-based foods such as soy, beans, nuts, and grains also contain essential amino acids.Over the years, there has been controversy about whether vegetarian diets can provide adequate amounts of essential amino acids.Many experts believe that while it may be harder for vegetarians to maintain an adequate intake, they should be able to do so if they follow the American Heart Association's guidelines of 5 to 6 servings of whole grains, and 5 or more servings of vegetables and fruits, per day.Conditional amino acids: These are usually not essential to everyday living but are important when you're sick, injured, or stressed.Conditional amino acids include:ArginineCysteineGlutamineTyrosineGlycineOrnithineProlineSerineWhen you're ill or injured, your body may not be able to produce enough conditional amino acids, and you may need to give your body what it needs through diet or supplements.Talk with your doctor about the safest way to do this.Can Amino Acids Be Harmful?When your body has too much of amino acids, the following effects can occur:Gastrointestinal distress, such as bloatingAbdominal painDiarrheaIncreased risk of gout (buildup of uric acid in the body, leading to joint inflammation)Unhealthy drop in blood pressureChanges in eating patternsNeed for your kidneys to work harder to maintain balanceMost diets provide safe amounts of amino acids.Still, talk with your doctor if you plan to follow a diet that's very high in protein or one that includes amino acid supplements for any reason — including any supplements taken to support intense athletic training. You should try to include each of the nine essential amino acids in your diet each day. These amino acids are present in a variety of different protein-rich foods. The following is a list of the daily required amounts for an average adult (mg/kg of body weight) and the best food sources for each of the nine essential amino acids: Histidine (10 mg/kg): The highest concentrations of histidine are found in various types of meat, poultry, seafood and dairy products. Some grain products, such as rice and buckwheat, also contain histidine. Other sources of histidine include eggs and beans. You'll even find this amino acid in fruits and vegetables, including apples, pomegranates, citrus fruits, bananas, cantaloupe, cauliflower, potatoes, mushrooms, corn, spinach, carrots, celery, cucumber and beets. Leucine (39 mg/kg): Animal-based sources of leucine include beef, poultry, pork, fish, eggs (particularly the whites), gelatin and dairy products. Plant-based sources include soy, legumes (such as beans and lentils), corn, grains, seeds and nuts. In addition, a supplement called spirulina contains exceptionally high levels of leucine, and 100 grams of spirulina can provide more than your daily recommended intake. Isoleucine (20 mg/kg): Isoleucine is found in many of the same sources as leucine but typically at slightly lower concentrations. Animal-based sources include meats, fish, eggs and dairy. Beef, tuna and yogurt are good examples of isoleucine-rich foods. Plant-based sources include soy, legumes, oats, wheat and certain types of seeds. Lysine (30 mg/kg): The highest concentrations of lysine are found in meats, particularly red meat, pork and poultry. However, it can also be found in dairy, certain fish and eggs. Plant-based sources include legumes, soy, spirulina and some fruits and vegetables (such as avocados, mangos, potatoes, leeks and peppers). Methionine (10.4 mg/kg): Meats, eggs and seafood contain the highest concentrations of methionine. In particular, consuming 100 grams of tuna or brazil nuts will give you more than your daily recommended intake. Other plant-based sources, such as grains, soy, beans, corn, cauliflower and spirulina, also contain methionine at lower concentrations. Phenylalanine (25 mg/kg): Eating meat is the best way to get enough phenylalanine, which is found in the highest concentrations in beef, pork and poultry. Seafood, eggs and dairy are also animal-based sources with high phenylalanine levels. Legumes, soy, nuts, seeds and some grains are examples of plant-based sources. In addition, the artificial sweetener aspartame is a source that's often overlooked. Threonine (15 mg/kg): Lean meats (particularly beef, lamb and fish), gelatin and dairy products are good examples of animal-based sources with high threonine content. Carrots, bananas and soy are the richest plant-based sources; 100 grams of soybeans will provide more than your daily recommended value of threonine. Other legumes, nuts, seeds and vegetables contain lower levels of threonine. Tryptophan (4 mg/kg): Although it's commonly associated with turkey, the highest concentrations of tryptophan are actually found in soy, cocoa and certain nuts and seeds. Animal-based sources for this amino acid include poultry, red meats, fish, dairy and eggs. Valine (26 mg/kg): Dairy products and meat are the best sources of valine. Plant-based sources have lower concentrations of this amino acid, but good examples include soy, peanuts, some types of seeds, leafy greens, lentils and mushrooms. Medical content reviewed by Madeline Hubbard, RN, BSN Resource Links: Amino acids are important in biology, biochemistry, and medicine. They are considered to be the building blocks of polypeptides and proteins. Learn about their chemical composition, functions, abbreviations, and properties. An amino acid is an organic compound characterized by having a carboxyl group, amino group, and side-chain attached to a central carbon atom. Amino acids are used as precursors for other molecules in the body. Linking amino acids together forms polypeptides, which may become proteins. Amino acids are made from genetic code in the ribosomes of eukaryotic cells. The genetic code is a code for proteins made within cells. DNA is translated into RNA. Three bases (combinations of adenine, uracil, guanine, and cytosine) code for an amino acid. There is more than one code for most amino acids. Some amino acids may not be made by an organism. These "essential" amino acids must be present in the organism's diet. In addition, other metabolic processes convert molecules into amino acids. An amino acid is a type of organic acid that contains a carboxyl functional group (-COOH) and an amine functional group (-NH2) as well as a side chain (designated as R) that is specific to the individual amino acid. The elements found in all amino acids are carbon, hydrogen, oxygen, and nitrogen, but their side chains may contain other elements as well. Shorthand notation for amino acids may be either a three-letter abbreviation or a single letter. For example, valine may be indicated by V or val; histidine is H or his. Amino acids may function on their own, but more commonly act as monomers to form larger molecules. Linking a few amino acids together forms peptides, and a chain of many amino acids is called a polypeptide. Polypeptides may be modified and combine to become proteins. The process of producing proteins based on an RNA template is called translation. It occurs in the ribosomes of cells. There are 22 amino acids involved in protein production. These amino acids are considered to be proteinogenic. In addition to the proteinogenic amino acids, there are some amino acids that are not found in any protein. An example is the neurotransmitter gamma-aminobutyric acid. Typically, nonproteinogenic amino acids function in amino acid metabolism. The translation of genetic code involves 20 amino acids, which are called canonical amino acids or standard amino acids. For each amino acid, a series of three mRNA residues acts as a codon during translation (the genetic code). The other two amino acids found in proteins are pyrrolysine and selenocysteine. These are specially coded, usually by an mRNA codon that otherwise functions as a stop codon. Common Misspellings: ammino acid Examples of Amino Acids: lysine, glycine, tryptophan Because amino acids are used to build proteins, most of the human body consists of them. Their abundance is second only to water. Amino acids are used to build a variety of molecules and are used in neurotransmitter and lipid transport. Amino acids are capable of chirality, where the functional groups may be on either side of a C-C bond. In the natural world, most amino acids are the L-isomers. There are a few instances of D-isomers. An example is the polypeptide gramicidin, which consists of a mixture of D- and L-isomers. The amino acids most commonly memorized and encountered in biochemistry are: Glycine, Gly, G Valine, Val, V Leucine, Leu, L Isoeucine, Leu, L Proline, Pro, P Threonine, Thr, T Cysteine, Cys, C Methionine, Met, M Phenylalanine, Phe, F Tyrosine, Tyr, Y Tryptophan, Trp, W Arginine, Arg, R Aspartate, Asp, D Glutamate, Glu, E Aparagine, Asn, N Glutamine, Gln, Q Aparagine, Asn, N The characteristics of the amino acids depend on the composition of their R side chain. Using the single-letter abbreviations: Polar or Hydrophilic: N, Q, S, T, K, R, H, D, E Non-Polar or Hydrophobic: A, V, L, I, P, Y, F, M, C Contain Sulfur: C, M Hydrogen Bonding: C, W, N, Q, S, T, Y, K, R, H, D, E Ionizable: D, E, H, C, Y, K, R Cyclic: P Aromatic: F, W, Y (H also, but doesn't display much UV absorption) Aliphatic: G, A, V, L, I, P Forms a Disulfide Bond: C Acidic (Positively Charged at Neutral pH): D, E Basic (Negatively Charged at Neutral pH): K, R