

## Peanut Butter SUPERFOOD Nutritional Facts

### Protein

- ✚ The human body is literally a protein factory. Proteins comprise 20% of our total body mass.
- ✚ We are made of protein from our bones to our muscles, arteries and veins, skin, hair, and fingernails.
- ✚ Our heart, brain, liver, kidneys, and lungs are built of tissue made of proteins.
- ✚ To be short of protein is to be lacking in the very substance of life.
- ✚ Protein plays a crucial role in almost all biological processes and amino acids are the building blocks of protein.
- ✚ Proteins help carry the oxygen that reddens our blood.
- ✚ In the form of enzymes, proteins digest our food, synthesize essential substances, and break down waste products for elimination.
- ✚ When fat and carbohydrates are insufficient, proteins produce the energy we need for life.
- ✚ Proteins in combination with a substance called sterols form hormones, which regulate the delicate chemical changes that constantly take place within the body.
- ✚ The chromosomes, which pass on our characteristics to our children, include protein in their structure.
- ✚ Protein is needed to “carry” fat and cholesterol throughout the body.
- ✚ Proteins give cells their structure.
- ✚ Proteins play a key role in the transport and the storage of nutrients.
- ✚ Amino acids have an influence on the function of organs, glands, tendons and arteries and are essential for healing wounds and repairing tissue, especially in the muscles, bones, skin and hair
- ✚ Are responsible for the removal of all kinds of waste deposits produced in connection with the metabolism.
- ✚ There are (currently) 20 biologically active amino acids in humans. In nature, there are more than 100 different types of amino acids to be found.
- ✚ For optimum health, protein containing all the essential amino acids in the correct amounts must be consumed every day; it cannot be stored in the body like fat.

- ✚ Animal proteins are the best kinds of proteins in terms of their nutritional value. Eliminating meat, milk and eggs because of the cholesterol and fat they contain means losing the high-quality protein and other essential nutrients they provide.
- ✚ Plant proteins can provide the essential amino acids only if they are carefully chosen to balance one another, and then must be eaten in large amounts.
- ✚ The human body in its complexity needs dozens of nutritive substances. The one that stands before all others is protein, or proteins, since there is not one but hundreds of kinds of protein.
- ✚ Proteins, our most complex substances, are made up of varying combinations of nitrogen-containing amino acids.
- ✚ There are twenty different amino acids that are important to the body. These twenty combine together in hundreds of intricate chemical patterns to create a variety of complex protein structures.
- ✚ When we eat foods that are sources of protein, such as meat, milk, cheese, eggs, beans or peas, the digestive system first breaks down the food proteins into their amino acids, and after they are absorbed into the blood, enzymes in the body recombine them into certain sequences to produce the proteins suited to the body's special needs, such as making red blood cells or building muscles.
- ✚ Because the human body synthesizes only 20 different amino acids out of the many types found in nature, they are referred to as 'biologically active'.

Here, you will find a summary of many, but not all of the amazing properties of each of amino acids, all present in SanoBe Peanut Butter SUPERFOOD.

SanoBe Peanut Butter SuperFood contains 19 of the 20 amino acids known to be utilized by the body and they are in a balanced and easy to absorb and utilize ratio to meet the body's needs.

Here is a sampling.

## KEY

\* Essential Amino Acids – These are the nine amino acids that cannot be produced by the human body and therefore must be supplied by the diet.

### 1 Aspartic Acid

- ✚ is found in high levels throughout the human body, especially in the brain
- ✚ promotes healthy metabolism
- ✚ Treats fatigue and depression, in that it generates cellular energy
- ✚ Plays important role in the Krebs (sleep) cycle, during which other amino acids are being produced.
- ✚ moves the coenzyme NADH (nicotinamide adenine dinucleotide) molecules from the main body of the cell to its mitochondria, where it is used to generate adenosine triphosphate (ATP), the fuel that powers all cellular activity. In short, the more NADH a cell has, the more chemical fuel it produces, and the more energy you have to get through your day.
- ✚ helps transport minerals needed to for healthy RNA and DNA to the cells, and strengthens the immune system by promoting increased production of immunoglobulins and antibodies (immune system proteins).
- ✚ keeps your mind sharp by increasing concentrations of NADH in the brain, which is thought to boost the production of neurotransmitters and chemicals needed for normal mental functioning. It also removes excess toxins from the cells.
- ✚ can help protect the liver from some drug toxicity and the body from radiation.

- ✚ can help form the ribonucleotides that assist production of DNA and RNA and aids energy production from carbohydrate metabolism.
- ✚ may help improve the function of the immune system,
- ✚ may play a role in protecting against toxins, and neural and brain disorders.
- ✚ reportedly helps treat chronic fatigue.
- ✚ can be easily converted to glucose when demand for glucose exceeds supply.
- ✚ is found in dairy, beef, poultry, sugar cane, molasses, sprouting seeds, oat flakes, luncheon meats, sausage meat, wild game, avocado, asparagus.

## 2 Threonine \*

- ✚ promotes normal growth by helping to maintain the proper protein balance in the body.
- ✚ supports cardiovascular, liver, central nervous, and immune system function.
- ✚ is needed to create glycine and serine, two amino acids that are necessary for the production of collagen, elastin, and muscle tissue.
- ✚ helps keep connective tissues and muscles throughout the body strong and elastic, including the heart, where it is found in significant amounts.
- ✚ helps build strong bones and tooth enamel
- ✚ may speed wound healing or recovery from injury.
- ✚ combines with the amino acids aspartic acid and methione to help the liver with lipotropic function, or the digestion of fats and fatty acids. Without enough threonine in the body, fats could build up in the liver and ultimately cause liver failure.
- ✚ supports the immune system by aiding in the production of antibodies, and because it is found largely in the central nervous system, may be helpful in treating some types of depression.
- ✚ supplementation may also be useful for treatment of Lou Gehrig's Disease, also known as Amyotrophic Lateral Sclerosis (ALS), because it increases glycine levels in the central nervous system (administering glycine is ineffective, since it cannot cross into the central nervous system).
- ✚ Research indicates that symptoms of Multiple Sclerosis (MS), another disease that affects the nerve and muscle function, may be

lessened with threonine supplementation. One 1992 study showed that 7.5 grams of threonine taken daily decreased spasticity among study participants.

### 3 Serine

- ✚ Serine is derived from the amino acid glycine. It is important to overall good health, both physical and mental.
- ✚ is especially important to proper functioning of the brain and central nervous system.
- ✚ Serine helps form the phospholipids needed to make every cell in your body.
- ✚ is involved in the function of RNA and DNA, fat and fatty acid metabolism, muscle formation, and the maintenance of a healthy immune system.
- ✚ The proteins used to form the brain, as well as the protective myelin sheaths that cover the nerves, contain serine. Without serine, the myelin sheaths could fray and become less efficient at delivering messages between the brain and nerve endings in the body, essentially short circuiting mental function.
- ✚ is needed to produce tryptophan, an amino acid that is used to make serotonin, a mood-determining brain chemical. Both serotonin and tryptophan shortages have been linked to depression, insomnia, confusion, and anxiety.
- ✚ Research suggests that low levels of serine may contribute to chronic fatigue syndrome (CFS) and fibromyalgia (FM).
- ✚ Serine helps produce immunoglobulins and antibodies for a strong immune system,
- ✚ aids in the absorption of creatine, a substance made from amino acids that helps build and maintain all the muscles in the body, including the heart.

### 4 Glutamic Acid

- ✚ functions as an important neurotransmitter,
- ✚ a metabolic intermediate in the Krebs cycle,
- ✚ helps in the elimination of toxic ammonia from the body.
- ✚ is responsible for one of the human senses of taste, termed *umami*, adding to the classical taste sensations of sweet, salty, sour, and bitter. Umami applies to the sensation of savoriness, the detection

of glutamates in such foods as meats, cheese, and other protein-heavy foods. Beyond its practical value, taste adds to the human enjoyment of creation, joining such diverse senses as being able to see various colors, hear different sounds, smell a vast array of odors, and so forth. Such senses allow interaction with nature and touch upon the inner aspect of people. As a source for umami, MSG, the sodium salt of glutamic acid, is used to enhance the flavor of foods.

- ✚ is an excitatory neurotransmitter that increases the firing of neurons in the central nervous system. It is a major excitatory neurotransmitter in the brain and spinal cord. It is converted into either glutamine or Gamma-Aminobutyric Acid (GABA), two other amino acids that help pass messages to the brain.
- ✚ Glutamic Acid is important in the metabolism of sugars and fats, and aids in the transportation of potassium into the spinal fluid and across blood-brain barrier. Although it does not pass the blood-brain barrier as readily as glutamine does, it is found at high levels in the blood and may infiltrate the brain in small amounts. The brain can use **glutamic acid** as fuel.
- ✚ Glutamic acid helps to correct personality disorders and is useful in treating childhood behavioral disorders.
- ✚ It is used in the treatment of epilepsy, mental retardation, muscular dystrophy, ulcers, and hypoglycemic coma, a complication of insulin treatment for diabetes.
- ✚ It is a component of folate (folic acid), a B vitamin that helps the body break down amino acids.

## Glycine

- ✚ used to help create muscle tissue and convert glucose into energy.
- ✚ essential to maintaining healthy central nervous and digestive systems
- ✚ has recently been shown to provide protection via antioxidants from some types of cancer.
- ✚ Glycine is used in the body to help construct normal DNA and RNA strands—the genetic material needed for proper cellular function and formation.
- ✚ It helps prevent the breakdown of muscle by boosting the body's levels of creatine, a compound that helps build muscle mass.

- ✦ High concentrations of **glycine** are found not only in the muscles, but in the skin and other connective tissues as well. Almost 1/3 of collagen, which keeps the skin and connective tissue firm and flexible, is composed of glycine. (High amounts of Glycine are also found in gelatin, which is a form of denatured collagen).
- ✦ Without glycine the body would not be able to repair damaged tissues; the skin would become slack as it succumbed to UV rays, oxidation, and free radical damage, and wounds would never heal.
- ✦ Glycine is considered a glucogenic amino acid, which means it helps supply the body with glucose needed for energy.
- ✦ It helps regulate blood sugar levels, and thus glycine supplementation may be useful for treating symptoms characterized by low energy and fatigue, such as hypoglycemia, anemia, and Chronic Fatigue Syndrome (CFS).
- ✦ Glycine is essential for a healthy, normally functioning digestive system. It helps regulate the synthesis of the bile acid used to digest fats, and is included in many commercial gastric antacid agents
- ✦ Glycine is necessary for central nervous system function. Research has shown that this amino acid can help inhibit the neurotransmitters that cause seizure activity, hyperactivity, and manic (bipolar) depression. Glycine can also be converted to another neurotransmitter, serine, as needed, and may be beneficial in the management of schizophrenia. In one study, twenty-two schizophrenic patients, who did not initially respond to traditional treatments, added glycine to their ongoing antipsychotic medication and found that it significantly reduced their symptoms. Glycine intake among the participants ranged from 40 to 90 grams daily (0.8 grams per kilogram of body weight). More research concerning the effects of glycine on schizophrenia is underway.
- ✦ Studies have shown that glycine also helps improve memory retrieval loss in those that suffer from a wide variety of sleep-depriving conditions, including schizophrenia, Parkinson's disease, Huntington's disease, jet lag, and overwork.
- ✦ Results from preliminary studies of glycine as a potential treatment for cancer have been promising, and suggest that it may help prevent the development of cancerous tumors and melanoma. In laboratory mice, dietary glycine prevented tumor growth by

inhibiting angiogenesis, the process by which tumors develop their own blood supply.

- ✚ Glycine also seems to play a role in keeping the prostate healthy. In one study, glycine was shown to help reduce the symptoms of prostatic hyperplasia in men.
- ✚ High-protein foods, such as fish, meat, beans, milk, and cheese, are the best dietary sources of glycine. Glycine is also available in capsule and powder forms, and as part of many combination amino acid supplements. There have been no toxic effects associated with glycine, although some people have reported that taking this supplement causes stomach upset.

## Alanine

- ✚ helps the body convert the simple sugar glucose into energy
- ✚ eliminates excess toxins from the liver.
- ✚ has been shown to help protect cells from being damaged during intense aerobic activity, when the body cannibalizes muscle protein to help produce energy.
- ✚ is crucial for preserving balanced levels of nitrogen and glucose in the body, which it does through a series of chemical actions called the alanine cycle. During the alanine cycle, any excess amino acids (proteins) in cells or tissues are transferred to a receptor molecule called pyruvate, which is produced by the breakdown of glucose. The pyruvate is then converted to alanine and transferred to the liver. The liver extracts nitrogen from alanine and converts some of it back into pyruvate, which can then be used to produce more glucose. Any excess nitrogen is then converted into urea and passed out of the body during urination. This cycle, glucose—pyruvate—alanine—pyruvate—glucose, helps supply the body with the energy it needs to support cellular life. It also ensures that a constant supply of pyruvate is available to allow the synthesis of glucose and amino acids in the body.
- ✚ plays a key role in maintaining glucose levels and thus energy supplies in the body.
- ✚ may help regulate blood sugar. Research has found that for people with insulin-dependent diabetes, taking an oral dose of L-alanine effectively prevents nighttime hypoglycemia.

## Valine \*

- ✚ Valine is a branched-chain amino acid (BCAA) that works with the other two BCAAs, isoleucine and leucine, to promote normal growth, repair tissues, regulate blood sugar, and provide the body with energy.
- ✚ helps stimulate the central nervous system, and is needed for proper mental functioning.
- ✚ helps prevent the breakdown of muscle by supplying the muscles with extra glucose for energy production during intense physical activity.
- ✚ helps remove potentially toxic excess nitrogen from the liver, and is able to transport nitrogen to other tissues in the body as needed.
- ✚ may help treat liver and gallbladder disease, as well as damage to these organs caused by alcoholism and drug abuse.
- ✚ Valine may help treat or even reverse hepatic encephalopathy, or alcohol-related brain damage.
- ✚ A deficiency of valine may also affect the myelin covering of the nerves, and cause degenerative neurological conditions.
- ✚ People that exercise a lot, have a low-protein diet, or are seriously trying to build muscle mass should consider valine supplementation. Valine is available in stand-alone supplemental form, but should always be taken together with the other two branched-chain amino acids, isoleucine and leucine. The ideal balance is 2 milligrams of leucine and valine for each 1 milligram of isoleucine. Combination supplements that provide all three of the BCAAs may be more convenient.
- ✚ An excessively high intake of valine may cause a skin crawling sensation and even hallucinations.
- ✚ Too much valine in the diet can also disrupt liver and kidney function and increase the amount of ammonia in the body. People with impaired liver or kidney function should not take isoleucine without first consulting a physician, as large doses of amino acids may aggravate these conditions.

#### Methionine \*

- ✚ Methionine is an essential amino acid that helps the body process and eliminate fat.
- ✚ It contains sulfur, a substance that is required for the production of the body's most abundant natural antioxidant, glutathione.

- ✚ The body also needs plenty of **methionine** to produce two other sulfur-containing amino acids, cysteine and taurine, which help the body eliminate toxins, build strong, healthy tissues, and promote cardiovascular health.
- ✚ Methionine is a lipotropic, or a chemical substance that helps the liver process fats (lipids). Other lipotropics include choline, inositol, and betaine (trimethylglycine), all of which help prevent the accumulation of fat in the liver and thus ensure normal liver function, which is essential for the elimination of toxins from the body.
- ✚ Methionine also supports liver function by regulating glutathione supplies; glutathione is needed to help neutralize toxins in the liver.
- ✚ Methionine is needed to make creatine, a nutrient naturally found primarily in muscle tissue that provides the energy our muscles need to move,
- ✚ and has been found to boost athletic performance during short, intense workouts. Creatine is necessary for all muscular function, and thus supports normal functioning of the heart and circulatory system.
- ✚ Methionine is essential for the formation of healthy collagen used to form skin, nails, and connective tissue,
- ✚ and helps reduce the level of inflammatory histamines in the body. People with conditions linked to excessive histamine production, such as arthritis and chronic allergies, may benefit from methionine supplementation.
- ✚ may also help treat symptoms of pancreatitis and Parkinson's disease.
- ✚ It has also been found to be helpful for treatment of urinary tract infections; like cranberry, methionine helps prevent bacteria from sticking to and proliferating in the walls of the urinary tract.
- ✚ Recently a form of methionine supplement called S-adenosylmethionine) has become available. Research has shown that S-adenosylmethionine is effective for treatment of arthritis and some forms of depression. The average dose is 400 milligrams three times daily, and it works best when taken with a B-complex vitamin. You can also obtain S-adenosylmethionine at any local pharmacy or health food store.
- ✚ is an essential amino acid, which means it must be obtained through dietary sources. It is found in a variety of natural food sources,

including beans, eggs, fish, garlic, lentils, meat, onions, soybeans, seeds, and yogurt.

### Isoleucine \*

- ✚ an amino acid that is best known for its ability to increase endurance and help heal and repair muscle tissue and encourage clotting at the site of injury. This amino acid is especially important to serious athletes and body builders because its primary function in the body is to boost energy and help the body recover from strenuous physical activity.
- ✚ is a branched-chain amino acid (BCAA). There are three branched-chain amino acids in the body, isoleucine, valine, and leucine, and all of them help promote muscle recovery after exercise. Isoleucine is actually broken down for energy within the muscle tissue. It also keeps energy levels stable by helping to regulate blood sugar
- ✚ a deficiency of **isoleucine** produces symptoms similar to those of hypoglycemia, and may include headaches, dizziness, fatigue, depression, confusion, and irritability.

### Leucine \*

- ✚ works with the amino acids isoleucine and valine to repair muscles, regulate blood sugar, and provide the body with energy
- ✚ increases production of growth hormones
- ✚ helps burn visceral fat, which is located in the deepest layers of the body and the least responsive to dieting and exercise.
- ✚ Leucine, isoleucine, and valine are branched-chain amino acids (BCAAs), and all three of them help promote muscle recovery after exercise. **Leucine** is the most effective BCAA for preventing muscle loss because it breaks down and is converted to glucose more quickly than isoleucine and valine. Increased glucose supplies prevent the body's cannibalization of muscle for energy during intense workouts, so it is no surprise that this amino acid supplement is popular among professional body builders
- ✚ promotes the healing of bones, skin, and muscle tissue after traumatic injury, and is often recommended for those recovering from surgery.
- ✚ leucine helps to regulate blood sugar because it is so easily converted to glucose

- ✚ a deficiency of leucine produces symptoms similar to those of hypoglycemia, which may include headaches, dizziness, fatigue, depression, confusion, and irritability.
- ✚ Natural sources of leucine include brown rice, beans, meat, nuts, soy flour, and whole wheat.
- ✚ People who exercise a lot, have a low-protein diet, or are seriously trying to build muscle mass should consider leucine supplementation. Leucine is also available in stand-alone supplemental form, but should always be taken together with the other two branched-chain amino acids, isoleucine and valine. The ideal balance is 2 milligrams of leucine and valine for each 1 milligram of isoleucine. Combination supplements that provide all three of the BCAAs may be more convenient.

## Tyrosine

- ✚ is a non-essential amino acid that helps regulate mood and stimulates the nervous system
- ✚ helps speed up the metabolism
- ✚ treats conditions characterized by chronic fatigue.
- ✚ makes many important brain chemicals that help regulate appetite, pain sensitivity, and the body's response to stress
- ✚ aids in normal functioning of the thyroid, pituitary, and adrenal glands—low levels of tyrosine may lead to hypothyroidism, low blood pressure, chronic fatigue, and sluggish metabolism.
- ✚ the body needs both tyrosine and the essential amino acid phenylalanine to make epinephrine, dopamine, and norepinephrine, three neurotransmitters that basically control the way you perceive and interact with your environment. Without adequate amounts of phenylalanine, the body can't manufacture its own supply of tyrosine; without adequate amounts of tyrosine, the body cannot metabolize phenylalanine. A shortage of either of these amino acids could leave you vulnerable to a host of mental disorders, including anxiety, depression, low libido, and chronic fatigue.
- ✚ Tyrosine supplements, especially when combined with 5-HTP (5-hydroxy-tryptophan) supplements, have been used successfully to treat depression.
- ✚ Tyrosine supplementation has also been used for treatment of allergies, headaches, Parkinson's disease, and drug withdrawal.

## Phenylalanine \*

- ✚ an essential amino acid that is needed for normal functioning of the central nervous system
- ✚ has been used successfully to help control symptoms of depression and chronic pain, as well as other diseases linked to a malfunctioning central nervous system.
- ✚ is especially effective for treating brain disorders because it is able to penetrate the blood-brain barrier. The blood-brain barrier is a protective barrier formed by the red blood cells and the glia of the brain that protects the brain from any toxins, bacteria, and viruses, etc., that are circulating through the bloodstream. Only chemicals that are able to cross this barrier can directly affect brain function.
- ✚ the body needs **phenylalanine** to make epinephrine, dopamine, and norepinephrine, three neurotransmitters that basically control the way you perceive and interact with your environment.
- ✚ phenylalanine supplementation may help you feel happier, less hungry and more alert
- ✚ is to treat chronic pain and improve memory and concentration
- ✚ recent research indicates that phenylalanine, which aids in melatonin production, may be effective for treatment of vitiligo, a condition that causes white patches on the skin. Subjects treated by these researchers took 50 to 100 milligrams oral L-phenylalanine and applied topical 10 percent phenylalanine gel each day and reported an average improvement rate of 83 percent
- ✚ There are three different kinds of phenylalanine: L-phenylalanine, D-phenylalanine, and DL-phenylalanine. Each type of phenylalanine is used to treat different symptoms. D-phenylalanine is more effective for controlling pain, while L-phenylalanine is more effective for regulating mood, appetite, and mental alertness; DL-phenylalanine affects both pain sensitivity and mental state.
- ✚ People who suffer from arthritis, obesity, severe menstrual cramps or mild depression may want to speak to their doctor about trying phenylalanine supplementation. Phenylalanine supplements come in capsule, tablet, and powder form
- ✚ Phenylalanine has also been used to treat Parkinson's disease, and schizophrenia, but anyone with a serious health condition should

not take any form of supplementation without first consulting their physician about proper dosage and possible side effects.

### Lysine \*

- ✚ Lysine is an essential amino acid that is well known for its antiviral properties. It helps prevent outbreaks of herpes and cold sores, and is needed for hormone production and the growth as well as maintenance of bones in both children and adults.
- ✚ is involved in the production of antibodies for a strong, healthy immune system, which may be part of the reason it is so effective at fighting herpes viruses. helps prevent the body's absorption of the amino acid arginine, which the herpes virus must have in order to replicate. Studies have shown that taking supplemental L-lysine in combination with vitamin C and flavonoids can effectively fight and/or prevent herpes outbreaks. Results of a six-month trial involving more than 50 people indicate that lysine is far more effective than a placebo in preventing cold sores.
- ✚ Lysine supplements have also been used to prevent eruptions of shingles, a blistering condition that is caused by the herpes varicella-zoster. Lysine also helps herpes and cold sores heal more quickly.
- ✚ promotes the formation of both collagen and muscle protein, and may help speed recovery from surgery and sports injuries as well.
- ✚ Good sources of lysine include cheese, eggs, fish, lima beans, milk, potatoes, red meat, soy products, and yeast.
- ✚ Most people get enough lysine from their diet, but there have been recorded cases of lysine deficiency, particularly in those that have a low-protein diet or eating disorder. A lysine deficiency may include symptoms of bloodshot eyes, hair loss, an inability to concentrate, irritability, lack of energy, poor appetite, reproductive disorders, retarded growth, and weight loss.

### Histidine \*

- ✚ is an amino acid that is used to develop and maintain healthy tissues in all parts of the body, particularly the myelin sheaths that coat nerve cells and ensure the transmission of messages from the brain to various parts of the body
- ✚ may be useful for treatment of mental disorders as well as certain types of sexual dysfunction.

- ✚ levels in the body must be balanced to ensure good mental and physical health. High levels of this amino acid have been linked to the presence of psychological disorders such as anxiety and schizophrenia, while low levels of histidine are thought contribute to the development of rheumatoid arthritis and the type of deafness that results from nerve damage. Taking **histidine** supplements may help relieve symptoms of rheumatoid arthritis.
- ✚ is important to normal sexual functioning, because it gets converted into histamine, a chemical needed to stimulate sexual arousal. When taken together with vitamin B3 (niacin) and vitamin B6 (pyridoxine), histidine can increase sexual pleasure by boosting histamine levels in the body.
- ✚ is needed to help the immune system know when the body is experiencing an allergic reaction, and for the production of gastric juices needed for normal digestion.
- ✚ acts as a natural detoxifier, protecting against radiation damage, and removing heavy metals from the system
- ✚ may help prevent the onset of AIDS—histidine is crucial to the production of both red and white blood cells.
- ✚ is found in many high-protein foods, such as meat and dairy products, as well as grains such as rice, wheat, and rye
- ✚ it is not certain if histidine is an essential or non-essential amino acid—most health experts agree that, although the body manufactures its own histidine, it is fairly easy for natural supplies to run short.
- ✚ Because it has a proven effect on the central nervous system and histamine production, people with manic (bipolar) depression should not take supplemental histidine without first consulting their physician.
- ✚ Anyone with liver or kidney disorders should not take histidine without first consulting with a licensed health care provider. Taking any one amino acid supplement may cause levels of nitrogen in the body to become imbalanced, as well as disrupt the Krebs cycle by which toxins are eliminated from the liver and kidneys.

## Arginine

- ✚ Arginine, or L-arginine, is an amino acid that is needed to keep the liver, skin, joints, and muscles healthy

- ✚ helps strengthen the body's immune system, regulates hormones and blood sugar, and promotes male fertility
- ✚ may improve circulation and treat impotence and heart disease.
- ✚ is considered a semi-essential amino acid because, although the body manufactures its own supply, there are times when dietary supplementation may be required, such as in the case of severe wounds or illness. In addition, newborns are not able to make their own supply of this substance, so arginine is considered essential in the first months of life
- ✚ stimulates the immune system by increasing the output of T lymphocytes (T- cells) from the thymus gland
- ✚ recent studies have focused on the potential of arginine as a treatment for AIDS, cancer, and other diseases linked to a depressed immune system
- ✚ helps detoxify the liver by neutralizing the effects of ammonia and other toxic substances in the body. It is required for the generation of urea, which is needed for removal of toxic ammonia from the body during urination
- ✚ Large concentrations of arginine are found in the skin, and this amino acid plays a key role in the health of all the body's connective tissues, particularly the muscles
- ✚ helps the body process both creatine, a natural substance that helps build muscle mass, and nitrogen, a chemical needed for muscle metabolism
- ✚ may help reduce body fat and speed up weight loss
- ✚ helps heal and repair damaged tissues, and thus may be beneficial to both athletes and those suffering from arthritis.

## Proline

- ✚ Proline is an amino acid needed for the production of collagen and cartilage. It keeps muscles and joints flexible and helps reduce sagging and wrinkling that accompany UV exposure and normal aging of the skin.
- ✚ helps the body break down proteins for use in creating healthy cells in the body

- ✚ is absolutely essential to the development and maintenance of healthy skin and connective tissues, especially at the site of traumatic tissue injury
- ✚ **Proline** and lysine (another one of the amino acids that is important to protein synthesis) are both needed to make hydroxyproline and hydroxylysine, two amino acids that form collagen. Collagen helps to heal cartilage and to cushion the joints and vertebrae. For this reason, proline supplementation may prove beneficial for treatment of conditions such as osteoarthritis, persistent soft tissue strains, and chronic back pain.
- ✚ The body needs proline to maintain muscle tissue. Decreases in proline levels have been noted in prolonged endurance runners and others following prolonged exercise. Serious athletes that subject their body to routine, rigorous workouts may want to take a supplement containing proline in order to avoid losing muscle mass—the body begins to cannibalize its muscle for energy when glucose supplies run low
- ✚ is a nonessential amino acid. The body makes proline from glutamic acid, and deficiency is rare in healthy individuals with a healthy diet. However, people recovering from traumatic injury, particularly skin injuries such as severe burns, may want to supplement this amino acid. People with pain caused by insufficient cartilage or collagen formation could benefit from extra proline in their diet as well.

## Hydroxyproline

- ✚ Hydroxyproline is necessary for the construction of the body's major structural protein, collagen
- ✚ Defects in collagen synthesis lead to easy bruising, internal bleeding, breakdown of connective tissue of the ligaments and tendons, and increased risk to blood vessel damage
- ✚ Increased spill of hydroxyproline in the urine is generally associated with breakdown of connective tissue due to disease process and may also be a manifestation of vitamin C deficiency.
- ✚ Deficiency of hydroxyproline will only occur if there is a deficiency of vitamin C.
- ✚ The body uses hydroxyproline to make collagen, tendons, ligaments and heart muscle. Collagen contains approximately 15 percent proline. For this reason, adequate proline is beneficial for

the treatment of conditions such as osteoarthritis, soft tissue sprains and chronic back pain.

## Cysteine

- ✚ The antioxidant supplement, n- **acetylcysteine**, is a sulfur-based amino acid needed to make glutathione, a natural antioxidant enzyme produced in the body to fight free-radical activity. Without glutathione, your body's immune system would be greatly compromised, and left with little defense against toxins and disease.
- ✚ is found in beta-keratin, the main protein in nails, skin and hair. It helps maintain a healthy, youthful appearance by encouraging collagen production and skin elasticity.
- ✚ N-acetyl cysteine (NAC) is a form of the amino acid **cysteine** that is most easily absorbed from supplements. NAC may be effective in the prevention and/or treatment of cancer, heavy metal poisoning, smoker's cough, bronchitis, heart disease, cystic fibrosis, acetaminophen poisoning, and septic shock. Its detoxifying effects may also help enhance the benefits of regular exercise by protecting the body from oxidative stress.
- ✚ Because cysteine has been shown to stimulate the production of T4 white blood cells, NAC supplementation is being studied as a possible treatment for people with AIDS. It is thought that participants taking 1800 milligrams of NAC supplements each day could significantly decrease their chances of developing full-blown AIDS. The immune boosting effects of acetylcysteine may also provide protection against Influenza, and supplementation should be considered by those segments of the population most vulnerable to the effects of the flu virus, especially the elderly and those with chronic illness.
- ✚ can help protect the lungs from carcinogens found in tobacco smoke
- ✚ can protect the liver against the toxic effects of alcohol
- ✚ can reduce toxic side effects of some drugs used to treat cancer. NAC has been used successfully to treat arsenic and mercury poisoning.
- ✚ There is no Recommended Dietary Allowance (RDA) for cysteine. It can be manufactured within the body, and can also be obtained through high protein foods, such as meat and eggs. Wheat,

broccoli, garlic, onions and red peppers are also good natural sources of cysteine.

### Tryptophan \*

- ✚ may enhance relaxation and sleep,
- ✚ relieves minor premenstrual symptoms,
- ✚ soothes nerves and anxiety, and
- ✚ reduces carbohydrate cravings.
- ✚ is important for the production of serotonin. Serotonin is one of the key brain chemicals involved in regulating mood.
- ✚ is necessary for the production of niacin (B3) and requires B6, biotin, vitamin C and zinc to form the enzyme needed for conversion.
- ✚ Tryptophan or 5-hydroxytryptamine (the middle step in the conversion of tryptophan to serotonin) supplementation may help increase serotonin levels and help relieve fibromyalgia symptoms.
- ✚ is useful in treating menopausal depressive conditions
- ✚ alleviates the symptoms of restless leg syndrome.
- ✚ helps control hyperactivity in children,
- ✚ relieves stress,
- ✚ enhances the release of growth hormones necessary for the production of vitamin B6 (pyridoxine).
- ✚ is involved in the body's regulation of sleep. Increasing tryptophan may help to normalize sleep patterns.
- ✚ people suffering from migraine headaches have abnormal levels of tryptophan, and in this supplementation may be helpful.
- ✚ is a protein without which humans could not survive. It comprises one of the building blocks of DNA and is vital to the production of serotonin and melatonin.
- ✚ is widely accessible in dairy foods, bananas, chocolate and poultry.
- ✚ Certain old-fashioned cures for sleeplessness were based on the consumption of foods with tryptophan. For example, drinking a glass of milk before bed was said to aid in sleeping. Though people were unaware at the time that this amino acid existed, it is clear that such early prescriptions for increasing sleepiness were at least mildly effective. Today, one may hear similar prescriptions for

including tryptophan foods in the diet not only to promote sleep but also to improve mood.

✚ Since serotonin is produced through the action of tryptophan, low levels of it in the body may result in depression or anxiety. Most drugs that treat anxiety and depression do not, however, supplement this amino acid, but inhibit serotonin from being too quickly absorbed by the brain. The increased level of free serotonin is thought to decrease anxiety and depression, and is frequently effective. Though unproven, those who suffer from anxiety or depression might also be able to increase their serotonin levels by adding tryptophan-rich foods to their diet. Including dairy products, which are also thought to help trim waistlines, may make antidepressants more effective.