**Food Sources of Essential Amino Acids**

*Did you know:* It is easy to get all the protein we need without eating meats (any animal tissue).

*Did you know:* Our body gets all but 1/6 of the protein it needs from recycling old body tissue. This 1/6 must come from essential amino acids we eat.

Every cell in the body is comprised of proteins. Amino acids are the chemical substances that make up protein. Our bodies use 22 amino acids to make the 50,000 different proteins we must have to be healthy. Of the 22 amino acids there are 8 that are essential for human nutrition. An essential amino acid is one that cannot be synthesised from other available resources, and therefore must be supplied as part of the diet.

It is not important to mix plant material at one meal to obtain the 8 amino acids - Our bodies store amino acids in our blood for several hours. So if we miss getting some amino acids in one meal, we can pick them up at some other time during the day. Non-essential amino acids don't need to be supplied in the diet as they can be synthesised from other dietary substances.

Nearly every food, with the exception of fruits, sugars and fats and oils, has enough protein to supply our necessary amino acids if we eat enough of it to get our day's worth of calories. We do not need to eat meat.

**The 8 essential amino acids are:**

- **Tryptophan** - Tryptophan is a precursor for serotonin and melatonin. It is plentiful in chocolate, oats, bananas, dried dates, milk, cottage cheese, meat, fish, turkey and peanuts.
- **Lysine** - Lysine deficiency can result in a deficiency in niacin (Vitamin B) and this can cause the disease pellagra. It is also beneficial in treating and preventing herpes. Lysine sources include green beans, lentils, soybean, spinach and amaranth.
- **Methionine** - Methionine supplies sulphur and other compounds required by the body for normal metabolism and growth. It belongs to a group of compounds called lipotropics that help the liver process fats. It is found in fish, whole grains, and dairy.
- **Valine** - Valine is needed for muscle metabolism, tissue repair, and for the maintenance of proper nitrogen balance in the body. Valine is found in high concentration in the muscle tissue. It is also one of the three branched chain amino acids, which means that it can be used as an energy source by muscle tissue. It may be helpful in treating liver and gallbladder disorders, and it is good for correcting the type of severe amino acid deficiencies that can be caused by drug addiction. Dietary sources of valine include dairy products, grain, meat, mushrooms, peanuts, and soy proteins.
- **Leucine** - Leucine is a branched chain essential amino acid that stimulates muscle protein synthesis and may be the major fuel involved in anabolic (tissue building) reactions. During times of starvation, stress, infection, or recovery from trauma, the body mobilizes leucine as a source for gluconeogenesis (the synthesis of blood sugar in the liver) to aid in the healing process. It has recently been suggested that leucine may have beneficial therapeutic effects on the prevention of protein wasting, as it occurs during starvation, semi-starvation, trauma, or recovery after surgery. Insulin deficiency is known to result in poor utilization of leucine; therefore, individuals who suffer from glucose intolerance may require higher levels of leucine intake. Leucine is found in cottage cheese, sesame seeds, peanuts, dry lentils, chicken, and fish.
- **Isoleucine** - Isoleucine is a branched chain amino acid that is important for blood sugar regulation, muscle development and repair, haemoglobin development, and energy regulation. Deficiencies of isoleucine result
in possible dizziness, headaches, fatigue, depression, confusion and irritability. Isoleucine is found in eggs, fish, lentils, poultry, beef, seeds, soy, wheat, almonds and dairy.

- **Threonine** - Threonine is important for antibody production. It can be converted into glycine and serine. Deficiencies are rare but can result in skin disorders and weakness. Dietary sources of threonine include dairy, beef, poultry, eggs, beans, nuts, and seeds.

- **Phenylalanine** - Phenylalanine serves in the body as a precursor to the catecholamine family of hormones. These hormones include adrenaline and noradrenaline, which are activating substances in the central and peripheral nervous systems. Deficiencies are rare but can include slowed growth, lethargy, liver damage, weakness, oedema, and skin lesions. Food sources or phenylalanine are dairy, almonds, avocados, lima beans, peanuts, and seeds.

**TABLE OF ESSENTIAL AND NONESSENTIAL AMINO ACIDS**

<table>
<thead>
<tr>
<th>Essential amino acids</th>
<th>Nonessential amino acids</th>
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<tbody>
<tr>
<td>Histidine</td>
<td>Alanine</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>Arginine</td>
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<tr>
<td>Leucine</td>
<td>Asparagine</td>
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<tr>
<td>Lysine</td>
<td>Aspartic acid</td>
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<tr>
<td>Methionine</td>
<td>Cysteine</td>
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<tr>
<td>Phenylalanine</td>
<td>Glutamic acid</td>
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<tr>
<td>Threonine</td>
<td>Glutamine</td>
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<tr>
<td>Tryptophan</td>
<td>Glycine</td>
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<td></td>
<td>Serine</td>
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<td>Tyrosine</td>
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Food Sources

Food sources of each of the essential amino acids are mentioned in the previous section describing each essential amino acid. In general terms proteins are found primarily in meats, eggs, milk, rice and beans, although there are also amino acids in vegetable as well. Our bodies have to break down plant or animal protein into the component amino acids and then rebuild protein - human protein. The plant or animal protein cannot be absorbed directly because these proteins have polypeptides with hundreds, or thousands of amino acids joined in peptide bonds that have to be broken with enzymes into the single amino acids that the body can absorb, and then reform into the proteins the body requires. It is more difficult for our bodies to break down animal protein than it is for it to break down plant protein.

Vegetarians and vegans often have low intakes of the amino acid lysine that is prevalent in legumes, eggs and poultry products.

Factors Affecting Amino Acid Bioavailability

- Cooking - Amino acids are more or less sensitive to heat. For example, arginine is extremely stable and will decompose only if exposed to sustained temperatures about 470 degrees F. Carnitine decomposes at temperatures of 284 F. Cooking, in addition to killing micro-organisms, makes the long spiral polypeptide chains unwind, causing the amino acid to become more exposed when it reaches the digestive system.

- Physical nature of the food, whether solid, liquid, powder or tablet; whether and to what extent chemically predigested and the type and amounts of binders, fillers and other nutritive and non-nutritive materials.

- Status of the digestive system - Genetics, age, overall health and specific diseases and illnesses.

- Metabolism or utilization by the intestine before absorption - such as occurs with glutamine.

- Metabolism or utilization in the liver before transfer to the general circulation - For maximal directed effects, amino acids should be taken on an empty stomach and in a dosage that enables significant quantities to reach the target tissues.

Too much protein?

Meats are the most protein dense food, followed by legumes and then grains, oats and rye. Meat eaters usually consume far more protein than they require which can lead to health problems. When we consume more protein than our body needs, we cause excess nitrogen to be excreted as urea in urine. This excess nitrogen has been linked with reduced kidney function in later years. Studies have found that when people have impaired kidney function, reducing protein intake slows the rate of decline of kidney function. High protein intakes may lead to dehydration due to excessive urine output (related to ketone production), and may cause extra metabolic stress to be placed on the liver.

Too much protein in the diet also can increase excretion of calcium, and there is some evidence of high protein diets linked to osteoporosis, particularly when the major protein source is animal. The calcium, on its way through the urinary system, can produce kidney stones.
If our diets are high in protein they are usually low in other food group representatives. Therefore there is an increased risk of inadequate vitamins and minerals (especially antioxidants), low fibre intake, high total and saturated fat intake, excess caloric intake, as well as excess protein intake. These imbalances carry with them long term negative consequences.

**Amino Acid Supplements**

Although most of us obtain sufficient amounts of the essential amino acids in our diets there are conditions that require our bodies to need more than they are getting. In times of physical and emotional stress, illness, injury and surgery the body requires more amino acids than can be gained from food alone, especially when the diet is poor. Many people are turning away from a meat based diet because of considerations for the environment, the animals, and their own health. In these situations it is important that people educate themselves on the best ways to obtain sufficient essential amino acids.

If supplementation is required, but it is important to establish if the body does really need more. If supplementation is required make sure it is pharmaceutical grade, or the highest quality, pure, crystalline amino acids which are best utilised by our body since they do not require digestion and are easily absorbed.

**Sources:**


http://getbig.com/articles/protein.htm