NUTRITIONAL GUIDE

For Personal Trainers

Personal Training Partners

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PERSONAL TRAINING PARTNERS, INC.
WWW.PTPFITPRO.COM

Personal Training Partners

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Introduction

At Personal Training Partners we believe that fitness, and the pursuit of it, are an essential part of a life that is lived to the fullest. In this modern world we have created an atmosphere where we have very little time for fitness, and just as important, nutrition. We live in a world that is full of processed foods that are easy to fix and consume. This has led to a society that has lost touch with its own sense of wellness.

Not that many years ago, obesity was the exception, now it is the norm. The rates of diseases such as diabetes, cancers, and heart disease are on the rise and reaching epidemic proportions.

It is possible that for the first time in history, one generation (baby boomers) could have a longer life than their children. So, as a fitness professionals, it is our duty to not only to arm ourselves with as much knowledge about fitness (in all its forms) but also to understand nutrition; and not just from the stand point of carbohydrates, fats, and protein.

Many people are beginning to wake up to the idea that more surgery, more pills and less physical activity are not working. These folks are beginning to filter into our gyms and public parks, trying to get their bodies to work again. Some of those people are having success on their own but the vast majority are just making matters worse. This is where we come in, the fitness pro. It is up to us to condition these people and apply our knowledge to do it safely and without injury. Along with our knowledge of exercise and exercise equipment, must come the understanding of how to properly and safely implement a training program that allows the client to reach their goals. And of course, along with any fitness training, a complete and nutritionally sound diet is critical to success.

Most of the time when people first start down the road to a fitter healthier body they mistakenly believe that just doing an exercise class and cutting the calories is going to do the trick. This almost always leads to disaster. It takes an in-depth understanding of the body, and how it works, to design and implement the correct course of action and get our clients truly into good shape (even if it is just to look good in their bathing suits). Simply cutting calories or cutting carbs is not going to get it done. It is essential to have a basic understanding of vitamins and minerals and the effect they have on the body, especially in the areas of muscle growth, fat utilization, and the metabolism.

This guide was put together to provide you, as a professional trainer, a quick reference source to help you spot nutritional deficiencies and/or toxicities in your clients. Then, it is our hope you will be able to steer your clients to the proper health care provider.

It is also our desire that after reading this guide you will have a better understanding of the complexities and the interaction of vitamins and minerals in our bodies. It's not just the carbohydrates, fats, and proteins; it's also about vitamins and minerals interacting to provide the pathways to efficiently use our fuels to power workouts and physical change. Happy Training!

Ryan

Personal Training Partners

Macronutrients

Carbohydrate, Protein & Fat



The big three. They are responsible for all of the energy produced in our bodies. They have caloric content and are the only nutrients, aside from alcohol (not included because it is not essential), that have calories. They are also the fuel used to grow and maintain our tissues and have a role to play in all the processes in our bodies.

These three nutrients are called macro because we require more of them (by far) than any other vitamin or mineral necessary to maintain a healthy body. They are the ones that almost all dieters focus on; whether it is counting calories, eating more of one and less off another, or, in some cases, completely eliminating one altogether. Each are necessary and each has a specific role to play that cannot be ignored for long.

There is growing evidence that in order for us to maintain balance and keep the risk of chronic disease to a minimum these three nutrients need to be consumed within a certain range.

Carbohydrate:

4 calories per gram, recommend 45-65% of calories

Carbohydrates come in three main type's; simple, complex, and dietary fiber.

- **Simple** carbohydrates are mono and disaccharides; one and two part sugars. They are easy for the body to absorb and put to use and they quickly raise blood sugar levels.
- **Complex** carbohydrates are found in starches and contain sugars with more than two parts to the chain. This makes them slow absorbing so that blood sugar levels rise more slowly and last longer. This is an important consideration especially in sports performance.
- **Dietary fiber** is slow moving and indigestible but is critical to intestinal health.

Simple and complex carbs are the bodies' main fuel source because they are quickly converted to glucose a sugar that can be used by all of the body's cells. They are the only fuel source for the brain and heart and they can be stored in the liver and muscle tissue for later use.

Fiber is an indigestible carbohydrate the body needs to help move waste through and out of the body. It has been shown that a diet high in fiber can help reduce the risk of chronic disease including diabetes, obesity, and some cancers. Large quantities of fiber are found in starchy foods such as potatoes and grains but they are also abundant in fruits, vegetables, nuts, beans, and seeds.

Protein:

4 calories per gram, recommend 10-35% of calories

Protein is made up of 4 elements; carbon, hydrogen and oxygen. Unlike carbohydrates and fat protein also contains nitrogen. These four elements combine in different ways to form amino acids.

A complete protein is made up of 20 amino acids; nine of which are called essential. That means since the body cannot produce them they must be supplied by diet, and all twenty must be present for protein synthesis to take place.

Protein's main function is in the growth, maintenance, and repair of tissues in the body. Protein is also involved with hormone production as well as in the making of many enzymes in the body. Those enzymes have a role in almost everything the body does. Surprisingly, protein is only used for energy when other sources are not available, especially carbohydrates.

Food sources include meats, fish, poultry, milk, cheese, nuts, legumes, and some other starchy vegetables. Of course animal sources also contain complete proteins. Since plant proteins are almost always incomplete they must be combined to form a complete protein. Therefore, vegetarians need to be careful to eat the right combination of foods to get a complete protein.

Fats:

9 calories per gram 20-35% of calories

Fats occur naturally in two types; saturated and unsaturated fatty acids.

- **Saturated fat** is one in which all of the hydrogen double bonds are full. They tend to be solid at room temperature such as butter.
- **Unsaturated fats** have broken chains of double bonds so they can take on hydrogen. These are further broken down into *monounsaturated* and *polyunsaturated fats* which tend to be liquid at room temperature i.e., vegetable oil. Monounsaturated fats have one hydrogen bond missing and polyunsaturated have two or more bonds unfilled.

Polyunsaturated fats are broken into even more parts but we are concerned with Omega-3 and Omega-6; named for the spot on the chain where the first break in the hydrogen bonds is located.

There is a third type of fat that is of concern called *trans-fat*. A chemical process that partially hydrogenates polyunsaturated fats manufactures these fats. This is done to extend the shelf life of some oils and harden some things such as margarine.

Trans-fat and saturated fats get the label of bad fats because they cause harm to the body. Trans-fat interferes with the body's ability to regulate its cholesterol levels. Saturated fats have the same effect as trans-fat in that they raise cholesterol levels in the blood. Both trans-fat and saturated fat also increase our risk of heart disease.

Polyunsaturated fats, especially omega-3 and omega-6 fats, decrease both cholesterol and our risk of heart disease.

Fats help with normal growth and development and must be present for the absorption of vitamins A, D, E, and K and they are also helpful in maintaining cell membranes.

Fat is also a big energy producer and is the primary fuel used by muscles when performing aerobic exercise. This is an important consideration especially with endurance athletes.

Fats can be found in a wide range of foods. Some good sources are; meats, poultry, fish, nuts, milk products, butter, margin, oils, and grains. Some good sources of polyunsaturated fat are olive oil, avocados, some fish, and nuts.

FAT-SOLUBLE VITAMINS

A, D, E & K

All of these four vitamins can be stored in the body for future use. Because of this people eating a well-balanced diet are rarely deficient in this group. However people on low fat, no fat, or vegan diets may have trouble getting enough because they are typically found in foods that contain fat. While diseases caused by deficiencies in A,D,E &K are rare in the United States, symptoms of mild deficiencies can develop and people should consult their health care provider when this occurs.

There are some health problems that can cause the body to decrease the absorption of fat and therefore the absorption of these vitamins. Most people however do not need to supplement these vitamins. Mega dosing these can lead to toxicity which can cause serious health problems. The body only uses small amounts of these vitamins and stores them in the liver and fat tissues for long periods of time. These vitamins will not be lost when cooking the foods that contain them.

Fat-soluble vitamins are absorbed in the intestines along with dietary fat during digestion. They are transported through the blood to the liver where they are sorted out then stored or burned. While in the intestines the absorption rate is at a 40% to 90% efficiency but this depends mostly on the bodies need for the particular vitamin.

Vitamin A

Vitamin A is one of the fat soluble vitamins. In most people about 90% of this vitamin is stored in the liver. The rest is stored in the kidneys, lungs, and adipose tissue.

Vitamin A; Retinol is most often consumed as Beta Carotene. The body can store approximately a one-year supply but the oversupply of this vitamin can cause toxicity. Absorption: Fibrous proteins and dietary fiber bind carotenoids and reduce absorption to 20 to 40 percent and can be further slowed by an increase in consumption. Dietary fats, proteins, and vitamin E enhance the absorption of carotenoids. Bile must be present for the intestines to absorb carotenoids.

RDA:

(RAE) Retinol Activity Equivalent RAE= 1 micro gram (mg) of Retinol, 12micro grams (mg) of Beta Carotene, and 24 mg of other carotenoids. Males 14 and older 900 mg RAE Females 14 and older 700 mg RAE Pregnant women 770 mg RAE Lactating women 1300 mg RAE

Sources:

Pre formed vitamin A, as retinoid can be found in animal foods such as liver, egg yolks, cheese, butter, fortified milk, and fish liver oils. Pro Vitamin A as carotenoids can be found in plant foods such as dark green leafy vegetables as well as yellow, orange vegetables. Some fruits like limes, oranges, pineapple, and cantaloupe are also rich in Beta Carotene. One medium carrot will provide about 200 percent and a serving of liver about 1000 percent of your RDA.

Deficiencies:

However rare in the US vitamin A deficiencies can cause growth and development problems in children leading to bone deformities. One of the first signs of a deficiency is night blindness, which can be corrected by as little as one dose. A long-term deficiency can cause total blindness and this is not correctable. Skin can become hard and scaly due to an oversupply of skin cells. Some research suggests that a lack of vitamin A can interfere with Gluconeogenesis in the liver, which could be a problem for endurance athletes.

Toxicity:

Toxicity is rare from those acquiring this vitamin from diet aside from a diet high in liver and fish oils. Those who are supplementing the UL or upper limit for adults is 3000 micro grams RAE as retinol. Signs of toxicity include nausea, headaches, fatigue, peeling skin, joint pain, and liver and spleen damage. In young children, over supplementation of Vitamin A can possible be fatal. Pregnant women should consult a doctor before supplementing Vitamin A as retinol.

Function:

It keeps skin cells and mucous membranes healthy. It is critical for the eyes and eyesight. It helps in development and bone growth. It also helps fight infection and aids the immune system.

Vitamin K

Vitamin K is a fat-soluble vitamin discovered in 1929 in Denmark. The K is derived from the word Koagulation which is Danish for coagulation. This vitamin is in a family of compounds known as quinones. It is synthesized by the intestinal bacteria. The stores of vitamin K are relatively small and they are kept in the liver. This is a very important vitamin because without it we could bleed to death from a small cut.

Absorption inhibitors:

Mega doses of either vitamin A or E can counter vitamin K. A seems to inhibit the absorption and E can counter act the clotting effect of K. Long term use of antibiotics can kill the bacteria in the colon and stop the production and absorption of K produced in the colon.

Regulation of absorption:

Vitamin K seems to be readily absorbable in healthy adults as long as dietary fat is present and one is not taking mega doses of vitamin A or on long term antibiotics.

A diet that includes a healthy amount of dietary fat should be sufficient. People who suffer from fat mal-absorption diseases or are on long-term antibiotics may become deficient.

RDA:

The DRI for K is 120mg for men and 90mg for women and that amount does not change for pregnant or lactating women. No UL has been established for vitamin K.

Sources:

We get our K from two sources. First from the bacteria living in our colon and second from food such as green leafy vegetables. Good sources include spinach, brussel sprouts, broccoli, and also from certain oils such a canola, cottonseed, and olive. These oils have to be stored properly because light degrades the vitamin K content.

Deficiencies:

Deficiencies in healthy adults are rare because so little of this vitamin is needed. They may occur in people on very low fat diets or those on long-term antibiotic medications because of the lack of intestinal bacteria**.** People suffering from fat mal-absorption diseases such as cystic fibrosis, crohn's, or ulcerative colitis may need supplementation but that is best left up to your physician.

Toxicity:

Vitamin K is stored in the liver and in bone. The body excretes vitamin K rapidly and therefore no UL has been established for K. An overdose of vitamin K can cause hemolytic anemia.

Functions:

When you get a cut, clotting must occur, so the body produces a series of proteins. Within this series of proteins, four are depended on vitamin K and all must bind with

calcium. In addition to this, Vitamin K assists in the mineralization of bone helping it to stay dense.

Vitamin E

This nutrient has long been given credit for any number of functions. In recent years however, research suggests that there may be a link between vitamin E and some chronic diseases associated with aging. In 1922 scientists discovered a compound in vegetable oil that was needed by rats to reproduce. They called it Tocopherol. Some forty years later science found that humans needed it also and they called this compound Vitamin E. In 1968 the food and nutrition board listed it as a necessary nutrient.

Absorption inhibitors:

Dietary fat must be present for the absorption of vitamin E. The body stores this vitamin in adipose tissue rather than the liver. About 90 percent of stored vitamin E can be found in adipose tissue and the rest in virtually every cell membrane of the body. Vitamin E is carried through the blood stream by chylomicrons and lipoproteins.

Regulation of absorption:

When dietary fat is present, the intestines will absorb about 20 to 80 percent of the Alpha Tocopherol present. As supply increases, the absorption rate decreases and the excess is passed out of the body.

RDA:

For infants up to a year; 4 to 5 mg daily. For children up to 9 years; 6 to 7 mg; 9 to 13; 11mg daily and from 13 on up; 15mg daily. In some cases, vitamin E is expressed in IU's; the exchange is 1.5 mg= 1IU.

Sources:

Vitamin E is found primarily in vegetable and seed oils such as soybean, corn, and safflower oil and in products such as margarine that are made from the oils. Other good sources include fortified cereals, tomato paste, sunflower seed kernels, almonds, eggs and spinach.

Deficiencies:

Vitamin E is widely distributed in the food supply and therefore deficiencies are rare except in those with fat mal-absorption diseases and cystic fibrosis. Those with these disease and those

on very low fat diets may exhibit symptoms such as anemia in which red blood cells release their hemoglobin prematurely. This could lead to impaired oxygen transport and lower someone's VO2 max.

Toxicity:

Vitamin E compared to other fat-soluble vitamins is relatively nontoxic. In cases of large dose supplementation vitamin E can interfere with vitamin K's ability to aid in blood clotting. Also, in causes where a client may be on anti-coagulant medications they should consultant with their physician prior to supplementing vitamin E.

Functions:

Vitamin E is considered to be an antioxidant and as such helps in the body's fight to rid itself from the damaged caused by free radicals. Free radicals attack cell membranes and DNA itself. This can lead to chronic disease such as cancer.

Vitamin D

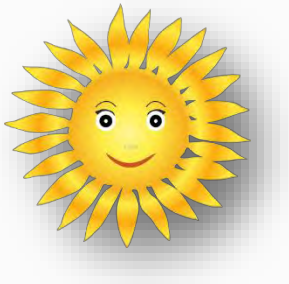
This vitamin is most often gotten through exposure to the sun and in fortified foods. When acquired by sun exposure the body synthesizes Cholecalciferol, a pro-hormone, and the liver and kidneys later convert this into a hormone called Calcitriol.

Absorption inhibitors:

Most of this vitamin is acquired by exposure to the sun and sun screens block its absorption. Dietary vitamin D is absorbed with fat in the intestines.

Regulation of absorption:

Plants are a poor source for this vitamin so most of us and especially vegetarians must get their vitamin D through sun exposure. The rate at which we get this vitamin through the sun varies widely depending on where you live, your age, and even the time of year. The use of sunscreen will block the absorption of UV rays and this stops the synthesis of vitamin D.



RDA:

Even though the body can synthesize vitamin D most scientists still believe it to be an essential nutrient and must therefore be a part of the diet. The following recommendations have been developed. The following are expressed in adequate intake or (AI) Men and women between the ages of 19 and 50, 5 micrograms per day.

Daily requirements between the ages of 51 and 70 are10 micrograms per day and 70 plus require15 micrograms. In international units or (IU) 1 micrograms = 40 IU.

Sources:

Fatty fish such as sardines, salmon, and mackerel, as well as egg yolks and shitake mushrooms also are good sources. Fortified foods including milk, breakfast cereals, margarine, orange juice, grains, and bread are good sources.

Deficiencies:

The body has the ability to store large amounts of vitamin D in the liver. However long term deficiencies do occur due to diet and lack of exposure to sun. In children the lack of this vitamin causes a reduction in calcium absorption and the bones fail to harden. This is called Rickets and is most often seen in bowed legs or knocked knees. In adults, Osteomalacia or soft bones occurs for the same reason as it does in children. This deficiency also affects the parathyroid hormone, which can cause calcium losses from bone.

Toxicity:

Exposure to the sun won't cause toxicity. However supplementation can and one should be careful taking high doses. Consult a doctor when taking more than the recommended doses. Toxicity comes in the form of Hypercalcemia, which is characterized by high levels of calcium in blood, bone loss and kidney stones. Signs of toxicity include excessive urination and thirst.

Functions:

Vitamin D's main job is to regulate blood levels of calcium, cell differentiation, and growth. Some research suggests that vitamin D helps protect against some cancers. There are several other areas where research is being done. Where deficiencies are concerned there may be a link between this and cardiovascular disease, multiple sclerosis, and type 1 diabetes.

WATER-SOLUBLE VITAMINS

B"s and C

The B complex and Vitamin C make up the water-soluble vitamin group. Since this group is water soluble the kidneys tend to excrete any excess in urine. The body does not store these vitamins (with the exception of B12 which can be stored in large amounts in the liver and excreted in urine).

The effects of a deficiency may begin to manifest in as little as two to four weeks and often show up in the form of diminished physical performance. One of their main functions is to act as coenzymes to help the body get energy from their macronutrients. These vitamins are also active with maintaining healthy skin, appetite, nervous system, and red blood cell formation.

They are found in a wide variety of foods, however, they are heat sensitive and cooking can damage them. Additionally, water can cause them to leech and reduce their potency. Also, because milling and other processing procedures reduce the vitamin content of some of our staple foods, the government has, since the 40's, enriched these processed foods to ensure that they are consumed by the public.

Biotin:

Is classified as one of the water-soluble B vitamins. Mold, bacteria, yeast and some plants can synthesize biotin. It is an essential vitamin to all mammals.

Absorption inhibitors:

It is absorbed in the intestines and is part of a dependent carrier mediated process that it shares with pantothenic acid; a protein in egg whites binds biotin and prevents its absorption.

Regulation of absorption:

The body readily absorbs biotin. In some, a rare genic disorder can lead to biotin depletion. Signs of this are hair loss, rash, convulsions, and neurological disorders.

RDA:

The RDA for Biotin is 30 micrograms for adults; less for children and slightly more for lactating women.

Sources:

It can be found in green leafy vegetables, organ meat, legumes, egg yolk, and are synthesized in the bacteria of the intestines.

Deficiencies:

Deficiencies are extremely rare in healthy individuals. They may occur in people taking long term anti conversant medications or those that have a diet high in egg whites. Again, the symptoms include hair loss, rash, convulsions and some neurological disorders.

Toxicity:

This vitamin does not appear to be toxic. Therefore no UL has been established.

Functions:

Like other B vitamins it acts as a coenzyme involved in metabolic actions. Biotin is involved with the synthesis of glucose and fatty acids. As a result of this, it may play a part in endurance athletic performance.

Folate (B9):

It is one of the water-soluble B vitamins. The body cannot store it nor can it produce it so it must be consumed. The name Folate comes from the food that is the best source and that is dark green leafy vegetables or foliage. Folate is the natural form found in food and folic acid is the synthetic form used to fortify foods.

Absorption inhibitors:

The presences of B12 is necessary to absorb folate. Those with diets low in folate, alcoholics and women who take oral contraceptives are at risk. The alcohol and contraceptive drugs may inhibit the absorption of folate.

Regulation of absorption:

Folic acid, which is the synthetic form of folate, is almost fully absorbed by the body and is are found in supplements and in fortified foods. Folate found in foods naturally are only about 2/3 absorbed by the body.

RDA:

To account for the differences in absorption rates between folic acids and natural folate, the RDA is expressed in DFE or dietary folate equivalent. For men and women 19 and older that dose is 400 micrograms per day. For women who are pregnant or breast feeding the dose goes up to 600 and 500 when breast feeding.

Sources:

Green leafy vegetables, organ meats like liver, beans and whole grains as well as some fruits such as oranges and bananas. In the United States and Canada all cereal and grain products are fortified.

Deficiencies:

Scientists believe that folate deficiency may be the most common vitamin deficiency.
Alcoholism, oral contraceptive and drug use may cause mal-absorption of this nutrient.

Those who may have poor diets including the elderly are also at risk. A lack of folate may contribute to heart disease because it plays a role in reducing homocysteine levels. It is also active in RBC development; a lack of which has been blamed for certain types of anemia. This may have an effect on aerobic performance due to the

lack of oxygen carriers. Folate is also active in the formation of DNA and RNA and, as a result, may play a part in certain cancer formation.

Toxicity:

Since Folate and vitamin B12 work so closely together, folate can mask a B12 deficiency and exacerbate the problems with that condition. Folate toxicity may also prompt the neurological problems brought on by a vitamin B12 deficiency.

Functions:

Folate functions in a number of coenzyme forms and takes an active role in metabolic processes along with other nutrients including vitamins B6 and B12. Other co-enzyme activities include DNA synthesis, amino acid metabolism, cell division, and RBC maturation.

Niacin B3:

When first discovered it was called nicotinic acid. Then, scientists at the University of Wisconsin, used it to cure dogs of the canine version of a human disease caused by niacin deficiency Pellagra. After this discovery, acid was renamed Niacin so it would not be confused with nicotine in tobacco. It is a component in co-enzymes that participate in over 200 metabolic pathways.

Absorption inhibitors:

As one of the water-soluble B vitamins, it is readily available in many foods and can be easily absorbed by the body and put to use. There is however a protein in corn that binds niacin and prevents its absorption. Poor diet and/or starvation seem also to lead to deficiencies.

Regulation of absorption:

Niacin is typical of the B vitamins. The body readily absorbs niacin and excretes the excess in urine. However, unlike other B vitamins, it is possible to absorb too much niacin and experience toxicity.

RDA:

Your body can make niacin from tryptophan and essential amino acid and therefore RDA for niacin is in NE or niacin equivalent. One NE equals 1mg of niacin and 1mg can be made from 60mg of tryptophan. With that in mind, the doses are as follows; 16 NE for men, 14 NE for women. There are additional doses for other groups. The UL for niacin is 35 mg per day.

Sources:

Niacin is found in protein containing foods such as; lean meats, chicken, organ meat, fish, beans, peanuts, beetroot, whole grains, milk and eggs.

Deficiencies:

At one point in time the disease Pellagra was common, especially in the southwest where Indian corn was common in the diet. Then, when we started to enrich grain products and other food, it became rare and is easy to treat. The symptoms of deficiencies are loss of appetite, skin rash, a lack of energy, muscular weakness and mental confusion (dementia). Severe deficiencies will lead to Pellagra. Severe dementia and diarrhea are the symptoms.

Toxicity:

Niacin is used in the treatment of high cholesterol but if prescribed in mega doses can lead to toxicity. It is usually not severe and only lasts for about fifteen minutes. The symptoms are a skin rash accompanied with red splotchy skin (often referred to as a niacin rash). However, some severe liver toxicity has been reported but this is only associated with slow release niacin formulas.

Functions:

Key functions include both aerobic and anaerobic energy production. They also help the body use fats and proteins and are needed in the health of skin, eyes, hair and liver. Niacin also helps the nervous system.

Pantothenic Acid (B5):

In the 1930's a scientist discovered that yeast needed a certain nutrient. He theorized that if yeast needed this nutrient then humans might too. In 1940, scientists named this compound Pantothenic, after the Greek word pantothenic, meaning "from every side".

Absorption inhibitors:

It appears to be readily absorbed by the body. The bacteria in the intestines also produce it however it is not known whether bacteria produced B5 can be absorbed.

Regulation of absorption:

Again, it appears that the body has no trouble absorbing B5.

RDA:

The AI for adults is 30 micrograms; for the younger ones somewhat less and more for lactating women.

Sources:

B5 is found in a wide variety of foods but the best sources include, eggs, organ meats, legumes, yeasts and whole grains.

Deficiencies:

Only under experimental conditions have deficiencies in humans been observed. Symptoms include; fatigue, muscle cramps and impairment of coordination.

Toxicity:

There are no toxic effects observed except for mild diarrhea. Therefore no UL has been established.

Functions:

B5 is a major component of co-enzyme A, which plays the major role in the Krebs cycle. It also plays a major role in the metabolism of carbohydrates, fats, and protein for use as energy. B5 also functions to help create a chemical that is released to initiate muscle contraction.

Riboflavin (B2)

It is one of the water-soluble vitamins and is not stored in the body. B2 was once considered to be part of the Thiamin vitamin until it was discovered that heat killed Thiamin and left a heat resistant compound dubbed Riboflavin. Eventfully it became known as B2.

Absorption inhibitors:

Poor diet, along with long-term barbiturate, use can cause the liver to activate enzymes that accelerate the metabolism of Riboflavin.

Regulation of absorption:

Riboflavin is readily absorbed up to about 30mg per meal. It is absorbed in the upper duodenum and any excess is passed in the urine.

RDA:

For adult men the RDA is 1.3mg and for women it is 1.1mg. The difference is due to the higher energy needs of men in general. Therefore, it is1.4mg for pregnant women, and 1.6mg for lactating women. As with thiamin, there is no UL established.

Sources: Riboflavin is found in enriched grain products, as well as milk, dairy products, eggs, dark green leafy vegetables, mushrooms and in high protein foods such as lean meats and organ meats. Packing and storing of food is important because Riboflavin is light sensitive.

Deficiencies:

Again, it is very rare in the United States. The deficiency is called Aribоflavinosis. It first appears as cracks at the corners of the mouth and progresses to anemia hammering B6 metabolism. It has been suggested, and some studies indicate, that untrained athletes taking on an aerobic training program may need additional riboflavin in the early stages to produce additional flavoprotiens in muscle.
No UL has been established and no toxicity has been reported.

Functions:

Riboflavin is an important player in the energy production pathways. It is part of an enzyme that is responsible for the breaking down of the fatty acids that are used in energy production. It also works with other B vitamins to help with body growth and red blood cell production, along with the use of carbohydrates for energy.

Thiamin B1

It wasn't until milling of grains became popular was it discovered that beriberi had origins in the diet. It was discovered that adding meat, milk, and whole grains to sailors diets cured them of this disease. Since that time vitamin B1 has become known as the ant beriberi vitamin.

Absorption inhibitors:

Poor diet and alcohol seem to be the only two things that get in the way of proper absorption of Thiamin.

Regulation of absorption:

In recent years a lot of progress has been made in the field of intestinal absorption of the water-soluble vitamins. However for our purposes, there is no current UI for the B vitamins and no cases of toxicity.

RDA:

Thiamin dosage is more a function of calories burned or consumed. For adult men it is 1.2mg and for women 1.1mg. For pregnant and lactating women it is slightly higher at 1.5mg. This is due to the higher calorie need by these women.

Sources:

Whole grain cereals, rice, pork and legumes are excellent sources. If you are eating a balanced diet with enough energy any deficiency is unlikely.

Deficiencies:

Beriberi is caused by severe thiamin deficiencies usually brought on by poor nutrition and heavy alcohol consumption. Symptoms include severe muscle weakness and nerve dysfunction.

Toxicity:

There is apparently no benefit to supplementing thiamin and no risk to toxicity either. Maintain a healthy diet with adequate calories of nutritional food.

Functions:

Thiamin is a part of the co-enzyme thiamin pyrophosphate and is needed to convert pyruvate to acetyl Co A for the start of the Krebs cycle. Thiamin is also important for normal nervous system function.

Vitamin B6:

B6 is a water soluble and is not stored in the body in large quantities. It is a naturally occurring substance with six separate compounds.

Absorption inhibitors:

Alcohol again plays a role in the slowing of absorption of this vitamin. Systemic inflammation brought on by chronic disease may inhibit the metabolism of B6. Some medications can interfere with B6 metabolism. The use of diuretics and oral contraceptives has also been associated with deficiencies.

Regulation of absorption:

The body seems to absorb B6 easily with only drugs, alcohol, and chronic disease affecting the body's ability to absorb this vitamin. Supplementing this vitamin should be done with the help of your health care provider, as there are serious side effects from toxicity.

RDA:

For men and women between the ages of 19 to 50 the RDA is 1.3mg. After the age of 50 it increases to 1.7mg for men and 1.5 for women. If you are on a very high protein diet the need for additional B6 may be needed. The UL for B6 is 100mg for adults and less for younger men and women.

Sources:

B6 is widely found in fish. It can also be found in avocados, legumes, bananas, nuts, and whole grains.

Deficiencies:

Symptoms of a B6 deficiency include confusion, depression, irritability, and mouth and tongue sores. They also include impaired immune function, nausea, weakness, and anemia. In theory, endurance athletes may suffer from a deficiency because of B6's role in hemoglobin formation and the metabolism of carbohydrates for energy.

Toxicity:

There does not appear to be any benefit from large doses of vitamin B6 on athletic performances. However, there is a risk of severe health problems from large doses of this vitamin. Problems that may occur from high doses of B6 are Peripheral nerve damage that can become permanent. This includes sensory coordination of position

and vibration as well as extremity numbness and tingling. This too may become permanent.

Functions:

B6 helps in protein, carbohydrate, and fat metabolism for use as energy. It is also active in the blood helping to grow more hemoglobin and oxygen carrier. In the nervous system it helps produce several neuro transmitters necessary for normal brain function. B6 also needs to be present to absorb vitamin B12.

Vitamin B12:

Unlike other water-soluble vitamins your body can store large amounts of vitamin B12 and does so mainly in the liver. Folate and B12 work so closely together that a shortage of either will produce a shortage of the other. It is also the latest vitamin discovered.

Absorption inhibitors:

A pure vegan diet can be a real problem especially those who avoid dairy and eggs as plant foods contain almost no vitamin B12. B12 also has a fairly complex absorption cycle. If any of several components are not available then no B12 will be absorbed. The B12 that is created by bacteria in the intestines is created too far down to be absorbed.

Regulation of absorption:

Given the fairly complex absorption cycle you would think that it would be easy to be deficient in this vitamin. However that is not the case as decencies are very rare.

RDA:

The adult recommended dosage is 2.4 micrograms. After the age of 50 some adults don't produce as much stomach acid and it is recommended that they get as much as they can through fortified foods.

Sources:

Include animal meats, fish, poultry, cheese, eggs, and milk. Fortified grains and cereals are also a good source. Plant foods and fruit offer little to none B12. The B12 produced in the bowel is too far down to be absorbed.

Deficiencies:

May not appear for up to 12 years and may not appear at all. Symptoms of deficiency include diarrhea, fatigue, and loss of appetite, pale skin, or shortness of breath while exercising. The results of B12 deficiency can be severe. They include Anemia and nerve damage that can include paralysis.

Toxicity:

No toxic effects have been reported because of vitamin B12 mega doses. However contrary to popular belief there has been no proof that mega doses of B12 will improve athletic performance.

Functions:

B12 is found in all cells and is part of DNA synthesis. B12 helps to develop red blood cells with the aide of folic acid and it also helps to develop myelin sheath around nerves which is critical for normal nerve function. B12 must be present for folate to be absorbed and vice versa. It also lowers homocysteine levels which reduces the risk of heart disease.

Vitamin C (ascorbic acid):

During the early days of sea voyages a disease called scurvy added to the risk of this type of travel. For some reason some people seemed to avoid this disease. In 1746, a ships surgeon in the British navy used six remedies in a controlled experiment and discovered that only those who consumed lemons or oranges recovered from this disease.

And then in the 1800's, during potato scarcities, scurvy began showing up. Because it was now known that vegetables also prevented scurvy scientists in 1930 were able to isolate the substance that prevented scurvy. They called it Vitamin C.

Absorption inhibitors:

It is absorbed at about 100% (up to about 200 mg when taken at one time). The excess is excreted in the urine.

Regulation of absorption:

The body readily absorbs vitamin C and when a saturation has been reached it expels the excess through the kidneys.

RDA: It is set at 90mg for men and 70mg for women. It is slightly less for children and slightly more for lactating women. The UL is set at 2000mg per day.

Sources:

The best sources are fruits and vegetables; especially citrus fruits such as lemons and oranges. The leafy parts of green vegetables, as well as potatoes, tomatoes and strawberries.

Deficiencies:

Deficiencies are rare because of the abundance of fruits and vegetables. The body also has a store of 1.5 to 3.0 grams of vitamin C.

Smoking, aspirin and oral contraceptives along with stress may increase the need for vitamin C. The major deficiency disease is scurvy. It is characterized by tissue break down in the gums, tendons, and cartilage. The symptoms of this look like bleeding gums, rupture of skin blood vessels, slow wound healing, muscle cramps and weakness.

Toxicity:

Does not appear to be toxic. However, in people who take 2000mg per day for a long period of time may experience nausea, abdominal cramps, diarrhea, and nose bleeds. For those with kidney disease, excess vitamin C could contribute to kidney stones.

Functions:

Vitamin C's main role is in the formation of collagen. It is also used in bone and cartilage formation and is active in hormone and neurotransmitter formation which are excreted during exercise when the body is undergoing stress. It is involved with RBC formation, wound repair, regulation of folic acid, cholesterol and amino acids. It is a powerful antioxidant.

Minerals

Unlike vitamins or macronutrients minerals are inorganic elements or ions. They also do not change during digestion and absorption. They are not destroyed by heat light or alkalinity. They are found in the soil and so they are wide spread in food. Animal sources are the most dependable because the tissues in animals tend to hold onto minerals in the amounts they need to survive. Plant sources aren't as dependable because they are totally dependent on the soil in which they grow.

The minerals listed in this section are considered essential and are needed in various quantities to keep the body running normally. The body uses hormones to control absorption because once absorbed they are difficult for the body to dispose. The body is very efficient at regulating absorption however deficiencies and toxicities do occur and they can have a severe effect on health. Minerals perform many essential functions in the body including acting to balance fluids in the body, acting to make bone, and working to get oxygen to the cells.

Minerals are classified into two groups; **major** or macro minerals and **trace** or micro minerals. This has nothing to do with the importance they play in physiological function. It is simply a division in the daily requirement and the total amount held by the body. We need 100 mg or more per day of major minerals and at least a total of 5 grams held. Less for the trace minerals.

Calcium Ca:

About 2 percent of our body weight is calcium. It plays a role in a number of functions in the body but we know it best as a building block of our bones and teeth and without it our bones could become so brittle they would just snap.

Absorption inhibitors:

Without vitamin D calcium cannot be absorbed. Vitamins C, E, and K, along with magnesium and boron, also assist in calcium absorption. Exercise can also help. The body has a hard time absorbing large amounts of calcium so spreading out your consumption of calcium and or supplements is recommended.

Regulation of absorption:

Calcium is so important and its levels are maintained in a very tight range by calcitonin, parathyroid hormone and vitamin D.

RDA:

As children to early adult; about 1300mg. From 19 to your early 50's; about 1000mg. After 50 it goes back up to 1200mg.

Sources:

Dairy, some fish, dark green leafy vegetables, tofu, legumes, and nuts.

Deficiencies:

Deficiencies are fairly common in this country especially among women. Inadequate intake or increased excretion in sweat due to exercise have been associated with elevated risk to colon cancer, high blood pressure and osteoporosis.

Toxicity:

Hypercalcemia is rare, as a balanced diet will not produce enough calcium to be toxic. The body uses two hormones to control the levels of calcium in the body. Of the two, parathyroid can cause the body to hold toxic levels of calcium. As much as 90% of all Hypercalcemia is caused by hyperparathyroidism. Symptoms of toxicity include stomach pains, diarrhea, nausea, pain and bone curvature. In severe cases, mental instability is a symptom.

Functions:

Calcium is used a lot in the body. It builds and maintains healthy bones and teeth. It also helps to clot blood, send and receive nerve signals, flex and relax muscle, helps release hormones and helps maintain a healthy heartbeat.

Chloride (Cl):

Chloride is a major negative ion in the extracellular fluid. It is consumed as a component of table salt. It is a critical factor in PH balance and fluid balance.

Absorption inhibitors:

It is subject to the same absorption and regulation as is sodium.

Regulation of absorption:

Chloride is regulating in the same way as sodium and is the counter to sodium's positive charge.

RDA:

In adult men and women 2300 mg. The UL is 3500 mg and the body stores about 75 g.

Sources: It is in table salt and many vegetables. Along with potassium it is widely distributed in many foods. As with sodium most people get more than they need.

Deficiencies:

Deficiencies are rare but they can happen. As with sodium most people get more than they need in their diet however deficiencies do occur.
The symptoms include loss of appetite, muscle weakness, and dehydration.

Deficiencies can lead to alkalosis, which can cause excessively high blood PH, and excessive loss of potassium in urine.

Toxicity:

Hyperchlorimia is the condition caused by excess chloride in the blood. Causes include high blood sodium, diabetes, kidney failure, vomiting and diarrhea. Symptoms include dehydration, intense thirst, weakness, high blood sugar, hypertension and possible coma.

Functions:

It works with sodium and potassium to maintain proper fluid balances in the body. It also helps the nervous system transmit signals and is a part of stomach fluids to aide in digestion.

Magnesium (Mg):

Magnesium is very abundant in our bodies. We store about 25 grams of it mostly in the bones. It is active in many chemical reactions in the body. It is a positive ion and is related to calcium and phosphorus.

Absorption inhibitors:

The body absorbs magnesium at only about 20 to 50% of the ingested and available amount. The small intestine is where most is absorbed.

Regulation of absorption:

The body is very efficient at storing magnesium and the kidneys are also good at limiting loss in urine so deficiencies are rare.

RDA:

Adults from 19-30; 400 mg for men and 310 mg for women. 31-70; 420 mg men and 320 women. The average American diet contains only about three quarters of the RDA, however, the body stores magnesium so well in bone that deficiencies are rare.

Sources:

Green leafy vegetables, whole grains, nuts, some bran cereals, brown rice, some fish, meats and milk. Refined foods are generally poor sources.

Deficiencies:

Again, the body is very efficient at storing and keeping magnesium so deficiencies are rare. However, for the chronically low, (alcoholics and some drug users) deficiencies can occur. In those cases, it can start with loss of appetite, nausea, vomiting, fatigue, weakness and progress to tingling and muscle cramps; especially in the small muscles. And from there, abnormal heart rates. In severe cases, it can lead to low calcium and potassium levels.

Toxicity:

Toxicity is very rare because the kidneys are good at excreting the excess in urine. However, excessive supplementation can cause toxicity. Risks increase with kidney disease because of the kidneys inability to excrete the excess. Usually toxicity is accompanied with diarrhea, nausea, and abdominal cramping. In extreme cases irregular heart beat and cardiac arrest are possible.

Functions:

Magnesium is very important to active people. It is involved in more than 300 metabolic reactions. It is active in the mitochondria helping to produce ATP. It is also involved with neuromuscular, cardiovascular, and hormonal function. It aids in protein metabolism and is a part of an enzyme that metabolizes glucose.

Phosphorus (P):

It is the second most abundant mineral in the body. It makes up roughly 1% of body weight and is found in every cell in the body.

Absorption inhibitors:

The presence of Vitamin D is necessary for the intestinal absorption of phosphorus. It cannot be absorbed in the stomach.

Regulation of absorption:

The body, along with vitamin D and calcium, readily absorbs phosphorus in the intestines and the critical acid base balance is achieved by excreting excess phosphorus through the kidneys. This is achieved by the use of the endocrine hormones.

RDA:

Adult men and women 700 mg daily. UL of 4000 mg. The body holds about 850 g.

Sources:

Some seed, cheese, fish, lean meat pork and beef, nuts, shellfish, low fat dairy, beans and lentils, and fortified foods.

Deficiencies:

It is extremely rare because it is so wide spread in our diets and the body is very efficient at maintaining a proper balance. If deficiency does occur it can cause a loss of appetite, anemia, muscle weakness, rickets in children, and Osteomalacia in adults. Outward signs could include numbness, tingling in the extremities, and difficulty walking. In severe cases it can be life threating.

Toxicity:

There doesn't appear to be a direct link between Phosphorus and toxicity. However, a high diet intake of Phosphorus can cause calcium mal-absorption which can lead to colon cancer and hypertension.

Functions:

The main function, like calcium, is to maintain healthy bones and teeth. Phosphorus is also active in carbohydrate and fat metabolism as well as manufacture of certain proteins. It is also active in the making of ATP, which is the substance that cells use as energy. Phosphorus, along with B vitamins, aids in normal heartbeat, kidney function, nerve signals and muscle contractions. The body is also dependent on Phosphorus to help maintain acid base balance or PH balance.

Potassium (K):

Potassium is to intercellular fluids as sodium is to extracellular fluids. Unlike sodium, the more potassium one consumes, the more of a lowering effect it has on hypertension. Potassium is the primary positive ion in the body.

Absorption inhibitors:

Alcohol, caffeine drinks, sugar and some diuretic drugs can cause the body to lose potassium. The body absorbs potassium well and uses the kidneys to excrete the excess.

Regulation of absorption:

Since the body has a need for a high level of potassium it absorbs the available supply very well. The body uses the adrenal hormone Aldosterone to regulate its potassium level by stimulating the kidneys to either dump or spare the mineral, depending on what it needs.

RDA:

For adult men and women; 4700 mg. No UL has been established. The body stores about 180 g.

Sources:

Potassium is found in most foods but is in high concentrations in bananas, citrus fruits, fresh vegies, dairy, and meat and fish.

Deficiencies:

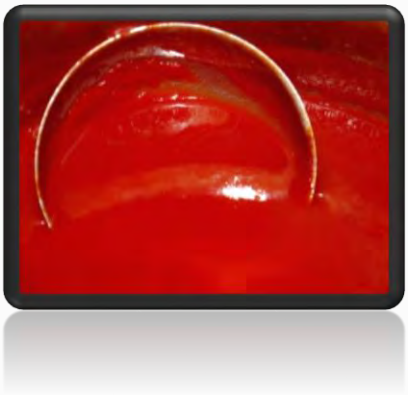
Deficiencies are manifest by severe vomiting or diarrhea. The use of some diuretics, alcoholism, and anorexia can cause severe potassium deficiency. The symptoms include fatigue muscle weakness and cramps, bloating, constipation and unusual pain. In severe cases, muscular paralysis and abnormal heart rhythms.

Toxicity:

Is a serious matter as excess potassium in the blood can cause electrical disruption and this can cause cardiac arrhythmias and possible death. Single doses in excess of 18000 mg may cause a heart attack.

Functions:

Potassium is the major regulator of intercellular fluid and is involved in the generation of nerve impulses in muscle including the heart. Potassium also aides in energy production in muscle by transporting glucose into cells; and it aides in the production of ATP.



Sodium Na:

Sodium is an essential mineral that is needed to maintain fluid balances in the body. We know sodium by another name. Salt, an often vilified mineral that we are led to believe is bad for us. However, it is essential in small quantities in our diet to maintain good health.

Absorption:

The colon, at about 95% of the consumed amount, easily absorbs sodium and the kidneys regulate the sodium levels in the body.

Regulation of absorption:

Since sodium determines the amount of extracellular fluid in the body its regulation is very important. This is done hormonally using Aldosterone, which works by affecting the re-absorption balance of sodium to maintain the proper extracellular fluids. This balance is constantly changing; especially during exercise, making it very important to stay well hydrated.

RDA:

For adults the AI is set at 1500 milligrams per day. The UL is set at 2300 milligrams per day. Rarely in this country do people not get enough sodium in their diets. The average for Americans is 3000 to 6000 milligrams of sodium per day.

Sources:

The more processed the food the more sodium it will contain. Something as simple as a tomato will contain about 6 milligrams a cup of tomato sauce will contain about 1000 milligrams.

Deficiencies:

Are pretty rare and when they do occur the treatment is simply to replace the fluid and minerals. Usually deficiencies occurs from excessive and prolonged sweating, severe diarrhea, or vomiting. If not treated, extracellular fluid begins to enter the cells and when the brain swells the victim can experience headache, confusion, seizures, and even a coma.

Toxicity:

Chronic high intake of sodium can lead people who are genetically predisposed to hypertension. High blood concentrations of sodium can lead to osteoporosis by causing excess calcium loss.

Functions:

Sodium in the intestines aids in the absorption of amino acids. However, its main function is to regulate the levels of extracellular fluids. A by-product of sodium it that it

Trace minerals

Chromium (Cr);

Chromium was first discovered in 1797 but it wasn't until the late 50's and early 60's when chromium was established as an essential mineral playing a role in the metabolism of glucose in cells.

Absorption:

Not a lot is known about the absorption of chromium into the body.

RDA:

Adult men; .035 mg and women; .025. There is no UL established and the body holds about .006 grams.

Sources:

Good sources include brewer's yeast, processed meats, whole grains, broccoli and spices.

Deficiencies:

Chromium deficiencies are rare. In fact, the only cases we have are patients on long- term intravenous feeding that are being given chromium deficient solutions. They were recorded as having abnormal glucose utilization and an increase in insulin requirements.

Toxicity:

Since ingested chromium is so poorly absorbed, and the excess so quickly excreted in urine toxicity, there are no toxic symptoms reported with excess dietary or supplemented chromium. However, supplementation of chromium picolinate may increase damage to the DNA.

Functions:

Chromium as a co-factor can enhance the effects of insulin on the target tissue. It may also play a role in immune function and health. Athletes have gained a lot of interest in chromium because of its proposed effects on performance.

Copper (Cu):

Copper in its functions is closely related to iron. It wasn't until 1960 that copper was first discovered to be essential by uncovering deficiencies in humans.

Absorption inhibitors:

The body absorbs about 50% of dietary copper in the intestines. Some amino acids aide in absorption and iron and zinc can hamper absorption. Copper is best absorbed in an acidic environment so antacids can interfere with copper absorption.

Absorption Regulators:

The higher the intake, the lower the absorption of copper. It appears that the body does a good job of regulating the uptake and excretion of excess copper to keep levels at or near normal. This action takes place in the intestines.

RDA:

Adult men; .9 mg and women; .9 mg. UL; 10 mg and the body has about .1 gram.

Sources:

It is widely distributed in foods such as: shellfish, organ meats, nuts, beans, and whole grains. Copper is also in drinking water, especially from copper pipes. Other excellent sources are chocolate and some variety of mushrooms.

Deficiencies:

In healthy humans, deficiency is extremely rare and most often occurs in premature infants that are poorly fed. The symptoms include anemia and bone abnormalities.

Toxicity:

It is very rare as copper is relatively nontoxic. In some people, a rare genic disorder called Wilsons disease can cause the body to hold onto excess copper and cause anemia; and if it is allowed to develop, liver and neurological problems.

Functions:

Copper acts as an antioxidant and is part of the electron transport chain. It aides in iron absorption and is a critical component in the production of energy in the mitochondria. It allows crosslinking between collagen and elastin to help form strong connective tissue. Normal copper levels are needed for the normal absorption of Iron and zinc.

Fluoride (F):

It is well known that fluoride helps prevent dental cavities, but it is also important to the structural stability of both bones and teeth. This is done through interactions with calcium.

Absorption inhibitors:

It is readily absorbed in the intestines and that absorption is regulate well by the kidneys.

RDA:

From the ages of 19 to 30; 2 to 3 mg and from 30 on in men; 4 mg and women; 3 mg. The UL is 10 mg daily.

Sources:

Most municipal water systems in this country put fluoride in water used for consumption. There are exceptions however and some food sources are teas, and gelatins. The ocean has fluoride in it so most fish and other seafood contain fluoride.

Deficiencies:

It is extremely rare but it can happen (usually in rural communities where the water does not have fluoride added to it). In those places, deficiencies can happen and the symptoms are a high number of cavities, weak teeth and bones.

Toxicity:

Acute toxicity symptoms include headaches, nausea, and abnormal heart rhythm. Fluoride has been used in research to help prevent osteoporosis but even though it has been shown to increase density it also seems to make bone more brittle thus easier to break.

Functions:

Fluoride functions in the mouth to slow demineralization during eating. It also speeds demineralization just after eating helping the teeth stay strong and disease free.

Iodine (I):

The ancient Chinese were the first to record descriptions of iodine deficiency. As late as the early 1900's goiter was common in the United States but then, in 1922, scientists discovered that adding iodine to table salt it dramatically reduced the goiter symptoms. This action led to the fortification of table salt with iodine.

Absorption inhibitors:

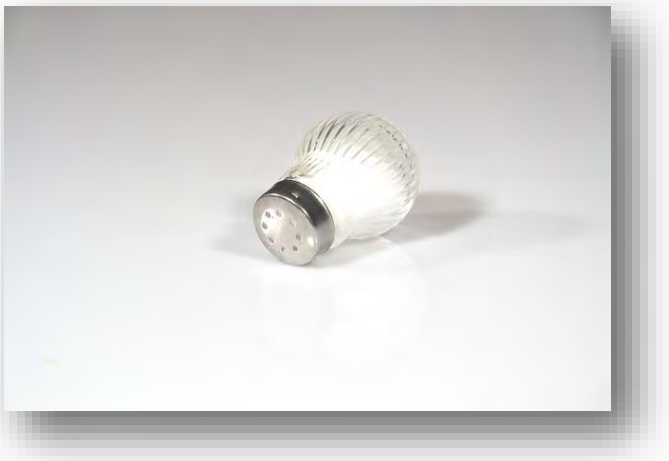
The body is very efficient at absorbing iodine; most of which is absorbed by the intestines. The kidneys excrete the excess iodine in urine and some can be lost in sweat.

Absorption Regulators:

The amount of bio-available iodine passing though the intestines is absorbed at about 95 to 100 percent. The kidneys will excrete excess, however toxicity is possible through high doses of supplementation.

RDA:

For both men and women adults; .15 mg and a UL of 1.1 mg. The body stores 0.011 grams.



Sources:

Our main source of iodine is fortified table salt. You can also find iodine in some seafood and dairy products with kelp being the main vegetable product.

Deficiencies:

In the early stages an enlarged thyroid is present. If this condition is not corrected, especially in the young, developing brains can be damaged and the myelination of nerves can be severely affected. In adults, response times and impaired mental function will a result. Fatigue, weight gain, cold intolerance and constipation are also symptoms of iodine deficiency.

Toxicity:

Too much iodine can actually cause goiter (it has the same effect on the thyroid) and therefore supplementation must be handled very carefully.

Functions:

It is critical for the production of energy in our systems. Iodine is essential in the production of the thyroid hormones that control our metabolic rate.

Iron (Fe):

Iron is one of the most abundant minerals on earth and yet about one third of the world's population suffers from iron deficiency. Iron is very useful because it can change between its two oxidative states easily making it essential for many oxidative actions.

Absorption inhibitors:

Only about 10 to 20% of ingested iron is absorbed into the body. The body is fairly efficient at knowing what it needs and regulates the absorption of iron in the intestines.

Regulation of absorption: In the upper intestinal tract, the cells that absorb iron know how much iron the body needs and will either put up a barrier to it or they will absorb the amount needed to satisfy the bodies needs thus preventing a toxic situation.

RDA:

For adult males; 8 mg and for women; 18 mg. The UL is 45 mg. The RDA for children varies but is slightly higher than adults because of body changes and growth.

Sources:

Iron rich foods include; meats such as beef, pork, liver and other organ meats. Poultry and shellfish are also good sources, as well as; green leafy vegetables, legumes and iron fortified foods such as white bread.

Deficiencies:

Anemia is the most common mineral deficiency. Since the body uses iron to make hemoglobin in our blood it is our main oxygen carrier. A lack of this mineral is going to have a big effect on the body's ability to perform work of any kind. It begins with decreased physical performance and then moves to impair cognitive function and a reduced tolerance for physical activity.

Toxicity:

Iron poisoning is a leading cause of death in young children. It is usually caused by over supplementation and even the over the counter supplements can be dangerous. Symptoms include nausea, vomiting, rapid heartbeat, and confusion.

Iron overload in adults is generally caused by a genetic condition the causes the body to retain too much iron. Over time, this can cause severe damage to the body. Severe organ damage and death can occur.

Functions:

The major function of iron is to transport oxygen in the blood to feed the cells of the body. Therefore, it is very important for athletes who do cardiovascular training to have a regular supply of iron.

Manganese (Mn):

It is both essential and toxic and is derived from the Greek word meaning magic. As an essential nutrient not a lot is known about the effects of this mineral. It does have several industrial applications in the production of iron and steel, dry cell batteries, paints, inks and dyes.

Absorption inhibitors:

Specific manganese absorption and transport systems have not been determined. It has been shown that iron and manganese may share similar transport systems. It has also been shown that as iron increases, manganese decreases. Additionally, iron levels affect intestinal absorption.

Absorption Regulators:

Execration, not absorption, seems to be how the body regulates manganese levels. When excess is absorbed the body quickly dumps the excess back in the intestines in bile.

RDA:

Adult men; 2.3 mg. Women; 1.8 mg. UL; 11 mg. The body holds .012 grams.

Sources:

Excellent sources include nuts, leafy vegetables, whole grains and tea. Other good sources include instant oatmeal, some fruits and brown rice.

Deficiencies:

They are rare and are usually are caused by certain disorders. The symptoms include bone demineralization, stunted growth in children, and a slight glucose intolerance.

Toxicity:

Manganese toxicity is usually as a result of inhaling dust and usually takes time before symptoms become evident. Symptoms include irritability, hallucinations and severe lack of coordination. In the extreme, it can result in a permanent neurological disorder similar to Parkinson's disease.

Functions:

Manganese works in many different processes as part of enzymes acting as catalysis's. It acts as an antioxidant in the mitochondria and helps metabolize carbohydrates. It works as a co-factor to enzymes in bone development and is a required element in the development of collegian.

Molybdenum (Mo):

Molybdenum is a metallic element that is found in certain nitrogen-fixing bacteria. It is essential for humans and is used mainly as an enzyme co-factor involved in the metabolism of fats and carbohydrates.

Absorption inhibitors:

The body readily absorbs molybdenum at a rate as high as 80 to 90 percent and it losses it easily through the kidneys as urine. Copper is the only significant inhibitor of molybdenum absorption.

Absorption Regulators:

As intake increases, the kidneys tend to excrete the excess just as efficiently.

RDA:

For both adult men and women; .045 mg. UL; 2 mg. The body hold .009 grams.

Sources:

Depending on the soil in which they were grown, good sources for molybdenum are; beans, peas, lentils, and green leafy vegetables. Also, some cereals and liver are considered good sources.

Deficiencies:

Deficiencies are unheard of in people with normal diets. However, in very rare cases of deficiency, symptoms include weakness, mental confusion and night blindness.

Toxicity:

Toxicity is also very rare, though in some cases, gout like symptoms have been reported.

Functions:

Its main function is to serve as a co-factor for the enzymes that are involved in the breakdown of the amino acids.

Selenium (Se):

It wasn't until 1957 that science first showed evidence that Selenium was essential for humans. Chinese scientists showed that low Selenium levels and Kashans disease were linked. Keshans disease is a heart disease that affects children mainly in the Kashan province of China.

Absorption inhibitors:

The body will readily absorb selenium and is only affected by the bio-availability of the foods that are consumed. Therefore, it is believed that the inhibition is done at the cellular level where selenium is converted to its metabolically active form.

Absorption Regulators:

Absorption of selenium in the body is unregulated and is only varied by the type being ingested. Testing done on animals suggests that the kidneys excreting selenium in urine may be used to maintain homeostasis but not a lot is known about human absorption and the excreting of selenium.

RDA:

Adult men and women; 0.055 mg. UL of .4 mg. Amount in adult body; 0.013 grams.

Sources:

Organ meats and seafood contain a constant amount of selenium because it accumulates over time. Plant foods vary greatly because they are subject to the amount found in the soils they were grown in. The typical diet contains adequate amounts of selenium.

Deficiencies:

Chronic deficiency will result in Keshans disease and its consequences. Short term or near deficiencies limit people's ability to fight viral infections and may have an effect on certain cancer risks.

Toxicity:

Acute and fatal toxicities have occurred with gram sized doses of selenium. Taking larger than recommended doses of selenium over time can cause toxicity. Common symptoms include hair and nail brittleness and loss, skin rashes, garlic breath, fatigue, and irritability. Nervous system disorders have also been observed.

Functions:

It acts as a powerful antioxidant preventing cell damage from free radicals. Selenium is also a component of enzymes involved with iodine and thyroid metabolism. It also acts in the immune system by helping to build white blood cells to fight infection.

Zinc (Zn):

Zinc is one of the essential trace minerals. It is vitally important in certain body functions and to maintain good health. It was only discovered to be important to human health about 50 years ago.

Absorption inhibitors:

The body absorbs small doses better than large ones. The body also seems to self-regulate when absorbing zinc by absorbing more when there is a need. Phytates, found in plant foods, can bind zinc and stop absorption so those on a vegetarian diet may need to supplement.

Absorption Regulators:

Zinc is regulated in the small intestine through absorption.

RDA:

Adult men; 11 mg and women; 8 mg, UL; 40 mg. The body has 2 gram

Sources:

Excellent absorbable sources are red meat and some sea foods. Chicken is a good source, especially the dark meat. Whole grains are a good source but aren't very absorbable. Zinc is one nutrient that vegetarians have a hard time getting enough.

Deficiencies:

Zinc deficiencies are fairly uncommon in developed countries. Things that can lead to a deficiency include mal-absorption disorders, alcoholism, and some diuretics. Some symptoms include loss of appetite, hair loss in patches, sluggishness and irritability. People suffering from a zinc deficiency may have their immune system compromised.

Toxicity:

Because our bodies are so good at regulating zinc absorption toxicity is very rare. However, it can happen, usually from chronically supplementing elevated amounts of zinc. Symptoms include nausea, vomiting and diarrhea. Chronic over consumption can cause a condition in which a reduction of copper and anemia can occur.

Functions:

Zinc has many functions but probably is best known as a way to prevent a cold. Some other less known functions include; helping to treat some eye diseases such as cataracts, and night blindness. Zinc is also used to treat diabetes, high blood pressure, and psoriasis. This is just to name a few.

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