

**CEC ARTICLE 1, 2010: Sports Nutrition: Part 3: Vitamins, Minerals, and Supplements Putting It All Together**  
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Vitamins and minerals are important to healthy functioning of the body. Deficiencies can stunt growth, cause severe health problems and even death. Overdosing on vitamins is termed a megadose and may cause damage to the hair, skin, bones and kidneys. A megadose is generally considered five times the recommended dietary allowance for vitamins A, D, E and K and ten times the allowance of water-soluble vitamins. Overdosing on minerals can also have adverse health affects. Knowing what the vitamins and minerals do, their (RDA recommended daily allowance), and what are their food sources is helpful in understanding how you should eat and how they developed the food pyramid.

Vitamins and Minerals

**Vitamin A:** Maintains normal vision and healthy skin. normal growth, formation of enamel

RDA - 900 micrograms for men, 700 for women. Upper limit - 3,000 micrograms. Overdosing can cause headache, vomiting, hair loss, bone abnormalities, liver damage, death

Orange and yellow fruits and vegetables, egg yolks, beef, liver, fortified milk and margarine, butter, yellow vegetables, dried apricots, cantaloupe, peaches.

**Thiamin(B1):** Role in energy production, detoxification, heart function and nervous system health Involved in energy production and central nervous system function.

RDA 1-1.2 mg for adults.

Wheat germ, ham, peas, enriched grains and cereals, beef, beans, nuts, pork, organ meats, legumes.

**Roboflavin(B2):** Involved in energy production, maintenance of healthy skin.

RDA 1.1-1.3 mg for adults.

Beef, poultry, fish, milk products, broccoli, asparagus, spinach, enriched grains and cereals, organ meats, eggs, leafy green vegetables.

**Niacin:** Involved in energy production from carbohydrates, maintenance of healthy skin.

RDA 14-16 mg for adults.

Meats, fish, poultry, whole grains, enriched grains and cereals, beans.

**Vitamin B6 (Pyridoxine):** Role in protein synthesis, hormone manufacture, red blood cell production, enzyme production, hormone regulation, brain function, skin health and immune system health Aids in energy production.

RDA 1.3-1.5 mg for adults. Overdosed can cause sensory neuropathy.

Chicken, fish, kidney, liver, pork, eggs, unmilled rice, soybeans, oats, whole-wheat products, peanuts and walnuts.

**Vitamin B12:** Involved in red blood cell development, maintenance of nerve tissue, formation of DNA.

RDA - 2.4 micrograms, the amount in 3 ounces of beef. Many people over 50 lose the ability to absorb B12 from natural food sources and so should consider fortified foods, like cereals, or a supplement.

Animal products, milk products, eggs, seafood.

**Vitamin C:** Antioxidant, forms collagen, aids in iron adsorption, immune function.

RDA - 75 milligrams for women, 90 for men. Eight ounces of orange juice yields a day's supply. Smokers need 35 more milligrams. Upper limit - 2,000 milligrams; more can cause diarrhea.

Citrus fruits, green leafy vegetables, peppers, strawberries, tomatoes, melons, potatoes, broccoli.

**Vitamin C can increase iron absorption.** Tea and coffee at meals can interfere with iron absorption. Cook with cast iron cookware often; animal protein such as chicken and turkey, dark meat, lean beef, pork, and lamb are readily absorbed sources of iron. Increase dark leafy green vegetables, legumes, strawberries, watermelons, raisins, dried apricots and prunes.

**Vitamin D:** Maintain blood calcium levels, bone formation and maintenance.

RDA - 200 international units for most people; 400 IUs for people ages 51 to 70. Fortified milk, egg yolk, shrimp, salmon. Synthesized in the body with help of sunlight. This is the most toxic vitamin. Overdoses can cause renal damage, cardiovascular damage, high blood pressure, calcium deposits in soft tissue.

Fish-liver oils, Fortified milk, skin synthesis with sunlight.

**Vitamin E:** Antioxidant, healthy function of nervous system, healthy skin.

RDA – healthy red blood cells 15 milligrams. Upper limit - 1,000 milligrams; higher levels risk uncontrolled bleeding.

Vegetable oils, wheat germ and whole grains, nuts, legumes, green leafy vegetables.

**Folic Acid:** Regulates cell division and the transfer of inherited traits, supports the health of gums, red blood cells, teeth, skin, gastrointestinal tract, and immune system.

RDA - 400 micrograms. Because folic acid in the first days of pregnancy prevents certain birth defects, women of childbearing age are routinely advised to take a supplement. Upper limit - 1 milligram a day; more can cause nerve damage.

Spinach, green leafy vegetables, organ meats, lean beef, eggs, fish, dry beans, lentils, asparagus, yeast, orange juice, and fortified foods.

- Vitamin K:** Blood clotting, blood calcium levels  
RDA - 120 micrograms for men, 90 for women.  
Green leafy vegetables, cabbage, cauliflower, tomatoes, wheat bran, milk,  
(adults produce it in their intestines).
- Iron:** Carries oxygen in the blood, helps the immune system.  
RDA - 8 milligrams for men and postmenopausal women. Premenopausal  
women need 18 milligrams; pregnant women 27 milligrams. Upper limit - 45  
milligrams or stomach upset can occur.  
Meat, liver, eggs, legumes, fortified cereal, whole grains.
- Zinc:** Involved in metabolic pathways, wound healing, immune function.  
RDA - 11 milligrams for men, 8 for women. Upper limit - 40 milligrams;  
more can block absorption of another vital nutrient, copper.  
Meat, liver, eggs, seafood, whole grain products, cereal products.
- Calcium :** Foundation of bone and teeth, blood clotting, muscle function,  
nerve function.  
RDA for most adults - 1,000 milligrams daily; for teen-agers - 1,300  
milligrams; for those over age 50 - 1,200 milligrams.  
Highest food sources are dairy and calcium-fortified orange juice. Green  
leafy vegetables, canned fish with bones. To increase calcium intake, add nonfat  
dry milk to recipes for casseroles, soups, sauces, meatloaf, puddings, pie fillings,  
muffins, creamy salad dressings, etc. Substitute non-fat or low-fat yogurt for sour  
cream. Increase the  
consumption of broccoli, dark leafy vegetables and soy products.
- Phosphorus:** Essential component of bone mineral, involved in chemical  
reactions throughout the body.  
RDA for most adults 700 mg  
Milk, meat, poultry, fish, cereal products.
- Magnesium:** Involved in nerve and heart function, energy metabolism of carbohydrate  
and fat, protein synthesis, water balance, muscle contractions.  
RDA 420 mg for men 320 mg for women  
Nuts, seeds, whole grains, dried bean and peas, fruits, green leafy  
vegetables, soy milk.
- Potassium:** Maintains water and electrolyte balance, involved in muscle  
contraction, protein formation, carbohydrate metabolism, blood pressure lowering  
RDA - 4700 mg  
Tomatoes, potatoes, bananas, orange juice, avocado, dried figs and dates,  
raisins, legumes, soybeans, milk, yogurt, beef
- Sodium:** Muscle and nerve health

RDA – less than 2300 mg  
Salt, added to almost all processed food.

Supplements are different than vitamins and minerals and supplements. Supplements do not have the research and backing of the food and drug administration. They should be used with care and with advice from your doctor. A list of common supplements and what they claim to benefit is listed below.

### Common Supplements-Herbs

**Ginseng** – Believed to improve endurance, reduce rating of perceived exertions, promote recovery. Shown to alleviate the symptoms of hot flashes and menopausal symptoms, lower risk of some cancers, build resistance to stress, counter clogging arteries, and help regulate blood sugar.

Precautions – Can produce allergic reactions, prolonged use can increase blood pressure and cause insomnia. Not recommended for those pregnant or nursing.

**Garlic** – Believed to inhibit the production of cholesterol by the liver and reducing the risk of stomach and colorectal cancer. Research shows that garlic may reduce the risk of heart disease by controlling levels of homocysteine which is involved in blood clotting. Only one study suggested that it may help cancer.

Precautions – Breath odor, headache, myalgia, mild abdominal pain, interactions with coumadin.

**Ginko Biloba** – Believed to improve mental focus and lower the rate of perceived exertion. Research has shown stabilization or improvement in Alzheimer's patients for 6 months to 1 year.

Precautions – Allergic reactions, gastrointestinal disturbances, headaches, interactions with coumadin.

**Goldenseal** – Believed to support the immune system and ease stress reaction. No evidence supports this.

Precautions – May stimulate uterine contractions and should not be taken while pregnant. Also avoid use if you have sensitive skin.

**Echinacea** – Believed to boost the immune system and stimulate white blood cell production. Research does show that it helps prevent colds and upper respiratory infections.

Precautions – People with autoimmune diseases or allergic reactions to daises should not take Echinacea.

**St. John's Wort** - Believed to help with mild to moderate depression, sleep promotion, bruise and wound healing, anti-viral/fungal benefits, and anti-spasmodic effects on the gastrointestinal system. Research showed that it can help with mild depression and may help with melatonin productions for sleep.

Precautions – Can cause photosensitivity, tiredness, gastrointestinal distress, irritability, sleeplessness, dry mouth and headaches. Can reduce the effectiveness of birth control pills, AIDS medications, and other medications. People taking MAIO's should avoid St. John's Wort.

### Common Supplements-Sports

**HMB** – Believed to up-regulate the ability to build muscle and utilize fat, reduce delayed muscle soreness, enhance muscle size and strength. Research shows that it does have a positive effect on building lean muscle but long term use limits its effectiveness. It may lower cholesterol and blood pressure.

Precautions – None so far.

**L-Carnitine** – Believed to increase endurance by reducing blood-lactate levels, increasing VO<sub>2</sub> max and increasing fatty acid metabolism. Research shows that it only helps when a carnitine deficiency exists. Low carnitine causes endurance problems.

Precautions – None.

**CoQ10** – Is in the body are part of the energy production cycle and is involved in immunity, normal heart function and works like an antioxidant. Research shows it may enhance aerobic performance in sedentary people, but has no effect on athletes.  
Precautions: None when taking the recommended amounts.

**Sodium Bicarbonate** – A blood buffer for lactic acid. It can help those athletes whose training builds up significant amounts of lactic acid, but it needs to be in high doses.

Precautions – Stomach cramps, explosive diarrhea, and nausea. It may increase blood pressure due to the large amount of sodium.

**Creatine** – Can stay in the muscle for up to 1 month and has been shown to enhance anaerobic performance during repeated bouts of high intensity exercise. Can increase body weight when combined with protein and carbohydrate supplements.

Precautions – Not known. Reports of acute stomach distress and muscle cramping.

**DHEA** – Believed to promote longevity and help in fat loss. The studies were inconclusive, but said it may help people over 40 with low testosterone production.

Precautions – Increased facial hair, decrease levels of HDL cholesterol, possible link to liver cancer.

**Caffeine with Ephedrine**– Believed to stimulate alertness by exciting the nervous system. It is a diuretic, excites cardiac muscle tissue, encourages thermogenesis, and increases lipolysis. Thought to increase the body’s use of fat for energy. Research shows that when combined with ephedrine does depress appetite and increase metabolic rate.

Precautions – Particularly bad for people with heart disease, high blood pressure, diabetes, thyroid disease, or enlarged prostate. Causes insomnia, irritability, elevated heart rate, elevated blood pressure, and anxiety. Caffeine causes dependency and alters physiology.

**Aspirin** – Believed to enhance ephedrine’s fat burning effects because it increases the release of norepinephrine. Research is unclear. It is used for anti-inflammatory pain relief and in the prevention of heart disease, stroke and colon cancer.

Precautions – Can thin blood.

After including the vitamins and minerals and the information from the first 2 articles we can putting it all together. What we come up with is the food pyramid and the caloric recommendations of the Food and Drug Administration. They used the calculations for calories needed per day based on body weight.

Males calories/day =  $66.47 + 13.75 \times (\text{weight in kg}) + 5 \times (\text{height in cm}) - 6.76 \times (\text{age in years})$

Females calories/day =  $655.1 + 9.65 \times (\text{weight in kg}) + 1.84 \times (\text{height in cm}) - 4.68 \times (\text{age in years})$

To convert lb to kg divide your weight in lb by 2.2

To convert inches to cm multiply your height by 2.54.

For basic active energy calculations, we can multiply the resting calories by the activity factor and the fraction of the day spent in that activity mode.

Mode	Male Factor	Female Factor
Resting/Sleeping	1	1
Sedentary/Reading	1.3	1.3
Light/Walking	1.6	1.5
Moderate/Dancing	1.7	1.6
Very Active/Hiking uphill with backpack	2.1	1.9
Extremely Active/Sawing Down a tree or Construction	2.4	2.2

Female Total Calories/day =  $(\text{Hours sleeping} \times 1 + \text{Hours Sedentary} \times 1.3 + \text{Hours Light} \times 1.5 + \text{Hours Moderate} \times 1.6 + \text{Hours of very active} \times 1.9 + \text{Hours of Extremely Active} \times 2.2) \times \text{Resting Energy} / 24 \text{hours}$

Male Total Calories/day = (Hours sleepingx1+Hours Sedenaryx1.3+Hours Lightx1.6+Hours Moderate x1.7+Hours of very activex2.1+Hours of Extremely Activex2.4)xResting Energy/24

The protein calculation which averages to 0.5 g/lb of body weight.  
 The carbohydrate calculation which is probably 2.0 g/lb of body weight for the average sedentary individual.  
 The fat was about 25-30 % of our total calories left.

So if we assume we calculated that we needed 1800 cal/day and we weigh 135 lb:  
 we would need  $0.5 * 135 = 67.5$  grams of protein which is 270 calories (15% of 1800 total),  
 we would need  $2.0 * 135 = 270$  grams of carbohydrates which is 1080 calories (60% of the 1800 total), and  
 the remainder would be 25% of 1800 calories from fat or 450 calories which is 50 grams of fat.

The servings from each of the groups is to achieve this calorie split and get the vitamins and minerals needed. So here is your proof of the complexity that went into the simplicity of the food pyramid, the calorie breakdown, the calorie calculation for the average person.

Bread and Grain Group	6-11 servings (1 slice of bread, 1 oz of cereal, 1/2 c rice)
Vegetable Group	3-5 servings (1 c. raw spinach, 1/2 c chopped vegetables)
Fruit Group	2-4 servings (1 apple, 1 orange, 1/2 c grapes)
Meat and Protein Group	2-3 servings (2-3 oz of cooked lean meats ( <i>the size of deck of cards</i> ), 1 egg, 2 TBL peanut butter)
Milk Group	2-3 servings (1 c milk or yogurt, 1.5 oz cheese)
Fats, Oils, and Sugars	sparingly

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1. What vitamins and minerals are in

Breads                      Grains                      Cereals                      Nuts                      Seeds

2. What vitamins and minerals are in

Green leafy vegetable                      Legumes                      Peppers                      Asparagus

3. What vitamins and minerals are in

Citrus Fruits                      Bananas                      Mangos                      Berries

4. What vitamins and minerals are in

Beef                      Pork                      Poultry                      Fish                      Organ Meat

5. What vitamins and minerals are in

Milk products                      Yogurt                      Kefir

6. Which supplements have no known side effects?

7. Which supplements do not do what they claim to do?

8. What is a megadose for fat soluble and water soluble vitamins?

9. Which are some side effects from megadoses of vitamins and minerals?

10. Which vitamins and minerals are good for your skin, hair, and nails?
11. Which vitamins and minerals are good for your immune system?
12. Which vitamins and minerals are good for your metabolism?
13. Which vitamins and minerals are good for your bones and teeth?
14. Where did the food pyramid come from and what is it based on?