Vitamins

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- Vitamins are micronutrients necessary for the maintenance of normal metabolic functions and blood cell formation.
- They are not synthesized in adequate amounts in the human body, so they have to be obtained through the diet

Of the known vitamins, four are fat-soluble. This means that fat or oil must be consumed for the vitamins to be absorbed by the body. These fat-soluble vitamins are A, D, E and K.

The others are water-soluble: these are vitamin C and the B-complex, consisting of vitamins B1, B2, B6, B12, niacin, folic acid, biotin, pantothenic acid and choline.

Vitamin Deficiency

A primary deficiency of a vitamin occurs when the vitamin is not consumed in sufficient amounts to meet the physiological needs.

A secondary deficiency develops when absorption is impaired or excess excretion occurs. Pregnant women are often at risk for marginal deficiencies of vitamins, because of increased their needs.

The elderly may also be at risk because of decreased absorptive abilities and limited economic and physical resources for food availability.

Poverty is factor affecting the nutritional status of children as well as adults, chronic alcohol and drug abuse not only alters psychological and mental capacities but limits the body's ability to absorb and use the vitamins.

Individuals dealing with long- term chronic disorders; such as AIDS or liver or kidney disorders, have special vitamin concerns because the metabolic processes of the body may be compromised by these disorders and the medications prescribed.

Vitamin B complex

Water- Soluble Vitamins

Thiamin

Function:

-Producing energy from carbohydrates
- proper nerve function
- stabilizing the appetite
- promoting growth and good muscle tone
- ATP production

Recommended Intake & Sources: the RDA is [1.2mg for men] & [1.1 mg for women]. The amount of thiamin required increases as the metabolic rate rises. Those engaged in hard physical activity burn more energy, so they require more vitamins.

All foods of animal origin and plant tissues contain thiamin; in cereals the vitamin is present mainly in the germ & outer coat of the seed. Much of the vitamin is lost when cereals are milled & refined. All green vegetables, fruits, roots and meat as well as dairy products except butter contain thiamin, but none are rich sources.

Sources of B-1

- Fish
- Liver
- Legumes
- Nuts
- Whole grain or enriched breads and cereals

- 1.25 cups corn flakes
- 1 baked potato (w/ skin)
- 0.5 cup of lentils

In the UK, white and brown bread flour are fortified with thiamin by law (and with calcium, iron and niacin).

Bioavailability of vitamin B1 There is no data on bioavailability of vitamin B1, but the levels in foods are very susceptible to heat, cooking times, and length of storage.
Vitamin B1 is also lost in the milling process, where the bran layer and some of the germ layer that contain vitamins are removed from grains.

Deficiency: Thiamin deficiency alters the nervous, muscular, gastrointestinal, and cardiovascular systems. In [beriberi], sever, chronic deficiency, characterized by muscle weakness and loss of coordination, pain, anorexia, mental disorders and tachycardia.

Persons who are chronic alcohol users may develop thiamin deficiency because of decreased food intake and reduced intestinal absorption together with an additional need for thiamin by the liver to detoxify alcohol. Others at risk for deficiency include renal patients undergoing dialysis, patients receiving parenteral nutrition, very high intake of raw fish can also produce beriberi.

B-1 DEFICIENCY

- Loss of appetite
- Weakness & Feeling tired
- Insomnia
- Loss of weight
- Depression
- Heart & Gastrointestinal problems

A different condition due to thiamin deficiency, affecting the central nervous system rather than the peripheral is sometimes seen in alcoholics and people with HIV, known as Wernicke-Korsakoff syndrome. This is caused by a combination of low intake and impairment of absorption and utilization of the vitamin.

Riboflavin

Important in:

- energy production
- carbohydrate, fat, and protein metabolism
- formation of antibodies and red blood cells

- maintenance of good vision, skin, nails, and hair
- improving eye fatigue

Bioavailability of vitamin B2 : Vitamin B2 from foods is highly available; bile salts, increase the rate of absorption of vitamin B2. Vitamin B2 is sensitive to light but remains stable under heat and refrigeration. The milling process reduces the content of vitamin B2 in cereal grains.

Recommended Intake & Sources: the RDA is [1.3 mg for men] & [1.1mg for women].

The body's need is related to total calories intake, energy needs, body size, metabolic rate and growth rate.

Conditions requiring increased protein also require increased riboflavin, such as wound healing or the growth periods during childhood, pregnancy, and lactation.

Sources of B-2

Riboflavin is found in the both plants and animal foods, milk is a major source, good plant sources are broccoli, dark leafy greens, whole grains and enriched breads and cereals.

- Large amounts in :dairy – eggs – meats
- Small amounts in :leafy green vegetables – enriched grains

Rich sources of animal origin include dairy products, meat, fish poultry and eggs.

- 1 cup plain yogurt
- 1 cup milk
- 1 egg

Light can destroy riboflavin, so purchase milk in opaque containers.

Who's at Risk?

- People with cataracts
- People with Sickle Cell Anemia
- Alcoholics

Risks related to inadequate intake of vitamin B2

Individuals whose food intake relies primarily on refined cereals, the elderly, chronic dieters, and individuals who exclude milk products from their diet are at risk for inadequate intakes.

"Vitamin B2 requirements are increased during periods of strong growth, such as in pregnancy and lactation.

Vitamin B2 deficiency co-occurs with other nutrient deficiencies and it may precipitate deficiencies in vitamin B6 and niacin.

People with cardiovascular disease, diabetes or cancer are at risk for vitamin B2 deficiency.

Deficiency: Ariboflavinosis is the name given to a group of symptoms associated with riboflavin deficiency.

- Itching and burning eyes
- Cracks and sores in mouth and lips
- Dermatitis
- Oily skin
- Digestive disturbances

The lips become swollen; cracks develop in the corner of the mouth, seborrheic dermatitis, if an individual is deficient in a nutrient like riboflavin , more than likely a deficiency of other nutrients will also be presents ; as esophageal cancer is associated with deficiencies of B2, & Zinc , particularly in Africa, Iran and China.

Niacin B3

Important in:

- energy production
- maintenance of skin and tongue
  - improves circulation
- maintenance of nervous system
- health of the digestive track

Bioavailability of vitamin B3 Absorption of niacin depends on the food source. Niacin from meat, liver, beans and fortified products is highly bioavailable. About 30% of the niacin in grains is bioavailable, though additional niacin can be released if the food undergoes alkali treatment (limewater/calcium hydroxide). Compared to other water-soluble vitamins, niacin is less susceptible to losses during food storage.

It is fairly heat resistant, so it can withstand reasonable cooking times. However, like other water-soluble vitamins, it will leach into cooking water.

Recommended Intake & Sources: Niacin is available in foods as the active vitamin or as its precursors, the amino acid tryptophan which can be converted to niacin and some niacin can be provided this way. Diets adequate in protein tend to be adequate in niacin. Protein – containing foods are good sources of niacin & tryptophan .Meat, fish, legumes, milk, and even coffee &tea are sources of niacin.

1 tbsp. peanut butter

Risks related to inadequate or excess intake of vitamin B3

Individuals whose diets to not meet their energy needs are therefore at risk of deficiency, as are individuals whose staple diet relies primarily on (untreated) maize or barley, and chronic alcoholics.

Severe niacin deficiency results in a disease called pellagra and its symptoms are dermatitis, diarrhea, dementia and eventually death.

Risk of excessive intake is unlikely if niacin is consumed from food sources.

However consumption of niacin in the form of nicotinic acid from multiple sources at high levels, including dietary supplements, pharmaceutical doses, and fortified foods, may result in adverse effects such as flushing, nausea and vomiting, liver toxicity, blurred vision and impaired glucose tolerance.

Deficiency of niacin results in the disease pellagra. It is characterized by sun-sensitive skin producing effects similar to severe sunburn.

It was usually seen in communities where maize forms the main diet as maize contains little tryptophan and the niacin that is present is in an unavailable form.

Deficiency: Pellagra, is characterized by the 3Ds

1-Diarrhea: damage to the GIT affects digestion, absorption, and excretion of food leading to glossitis, vomiting& diarrhea. loss of appetite

2-Dermatitis: a symmetrical scaly rash occurs only on skin exposed to the sun.

3-Dementia: as the CNS becomes affected in severe deficiencies, headache, confusion, anxiety, insomnia& paranoia develop. mental depression

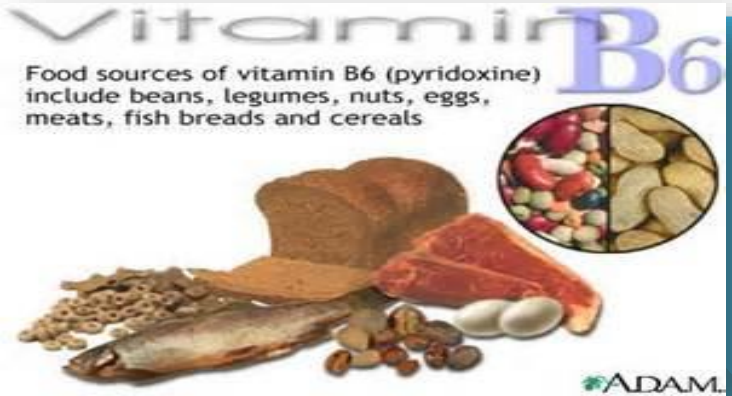
Pyridoxine B6

Important in:

- Production of red blood cells
  - conversion of tryptophan to niacin (B-3)
- immunity
- nervous system functions
- reducing muscle spasms, cramps, and numbness
- maintaining proper balance of sodium and phosphorous in the body

Recommended Intake & Sources: the RDA of B6 is [1.3 mg for men& women], these amounts are based on protein intake.

There are many good sources of vitamin B6, including chicken, liver (cattle, pig), fish (salmon, tuna).
Nuts (walnut, peanut), chickpeas, maize and whole grain cereals, and vegetables (especially green leafy vegetables), bananas, potatoes and other starchy vegetables are also good sources.



- 1 chicken breast
- 0.5 cup cooked spinach
- 1 cup brown rice
- 1 baked potato with skin
- 1 banana

Bioavailability of vitamin B6

If consuming a mixed diet, the bioavailability of vitamin B6 is about 75%. Vitamin B6 is destroyed by heat but it remains stable during storage.

Supplements of B6, folate and B12 may reduce the risk of coronary artery disease by lowering homocysteine levels

Warnings

- High doses of B-6 may be recommended to treat carpal tunnel syndrome, and sleep disorders, but continued use of high doses may result in permanent nerve damage.

- Pregnant women should always consult their doctor before taking this supplement and all others.

Deficiency: a deficiency of vit B6 rarely occurs alone, it normally accompanies low intake of other B vitamins. Symptoms include dermatitis skin lesions, arm and leg cramps, water retention. Altered nerve function, weakness, poor growth, convulsions, insomnia, and microcytic anemia due to inadequate synthesis of hemoglobin.

Of the numerous drugs that affect the bioavailability & metabolism of vit B6, oral contraceptive agents, women taking OCAs may have an increase B6 need. Prolong use of drugs such as isoniazid [for TB], cycloserine [for TB], and hydralazine [for HT] may require vit B6supplements to reduce neurological side effects and prevent deficiency during treatment. patients with kidney failure.

Folate

Folate like other B vitamins actually consists of several similar compounds. Folate, folic acid, folacin, and pteroygutamic acid. Folate is the form of this vitamin found naturally in foods.

Folic acid is a synthetic form used in vitamin supplements and for food fortification; folic acid is more available for absorption by the body.

Function: it is required for the synthesis of amino acids, DNA, RNA, heme portion of hemoglobin, and fetal neural tube formation.

Folate is essential for brain development and function.

Bioavailability of folate

Folic acid from supplements is 100% bioavailable, if taken without food, and 85% bioavailable when taken with food.

Naturally occurring folates in food are 50% bioavailable, but the natural forms are highly unstable.

Folate is easily destroyed by heat and oxygen.

Recommended Intake & Sources: the RDA reflects that some folate is stored in the liver, but generally daily supplies are needed.

The RDA for men & women is [400mcg], the physiological state generally affects folate need, during pregnancy the RDA is [600mcg], while it is [500mcg] for lactation need.

It is recommended that women of child bearing age increase their folate intake to include 400mcg of folic acid to reduce the risk of birth defects, including spina bifida.

Folate is widely available in foods particularly in leafy green vegetables, legumes, ready to eat cereals, and some fruits &juices .Folate is found in many foods containing ascorbic acid such as orange and orange juice. Folate is affected by heat, oxidation, and cooking of fresh foods reduce the amount of folate available.

Deficiency: Cells, whose normal activities require rapid cell growth and division are particularly sensitive to folate deficiency, include red blood cells and cells of the lining of GIT.

Folate deficiency results in megaloblastic anemia, other deficiency symptoms include glossitis, diarrhea, and irritability, absent-mindedness, depression and anxiety.

Because folate is critical for cell growth and repair, especially for cells with a short life span, such as cells in the mouth and digestive tract, visible signs of folate deficiency include digestive problems.

Other symptoms are tiredness, loss of appetite, fewer but larger red blood cells (megaloblastic or macrocytic anemia), and neurological problems.

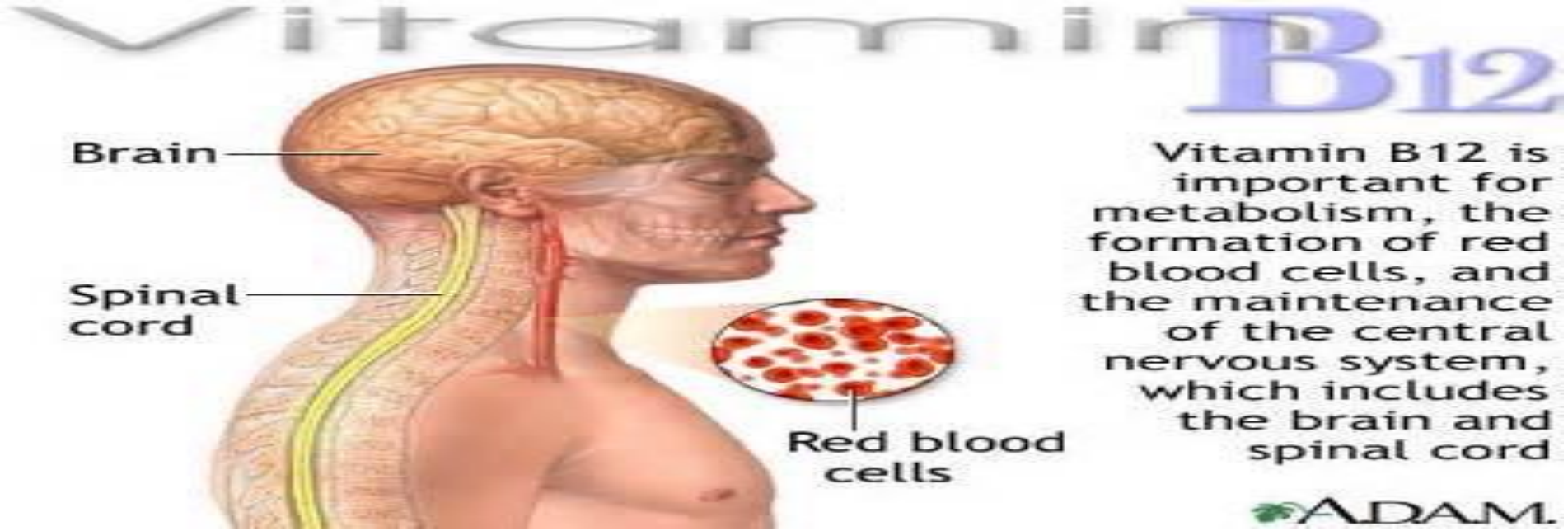
A vitamin B12 deficiency will provoke a folate deficiency because it means vitamin B12 is not available to donate its methyl group to convert folate into its active form.

Deficiency may result from conditions that require cell division to speed up, including infection, cancer, burns, blood loss, gastrointestinal damage, growth & pregnancy.

Other risk groups include those with limited intake of variety of food including elderly people with low income and persons with chronic excessive alcohol ingestion.

Numerous medications may affect folate absorption or be antagonistic to folate, these drugs are anticonvulsants, oral contraceptive, aspirin, cancer chemotherapy agents, non -steroidal anti-inflammatory medications & antacids.

Cobalamin B 12



Function: B 12 has a role in folate metabolism, metabolism of fatty acids, and amino acids. In addition, B12 develop and maintains the myelin sheaths that surround and protect nerve fibers. Vitamin B12, in conjunction with consumption of vitamin B6 and folate, appears to reduce the level of homocysteine, there by decreasing the risk of CAD.

Recommended Intake & Sources: Absorption of B12 relies on an intrinsic factor.

Both vitamin B12 & the intrinsic factor must be present for absorption.

Recommended B12 levels take into account that some vitaminB12 is stored in the liver.

The RDA for young adults is [2-3mcg] daily.

Foods of animal origin are the only reliable sources of vitamin B12; meat, fish, poultry, eggs, and dairy products are all good sources.

- 1 chicken breast
- 1 hard boiled egg
- 1 cup plain low-fat yogurt
- 1 cup milk

Bioavailability of vitamin B12

While there is insufficient data on the absorption of vitamin B12, experts assume that about 50% of vitamin B12 is absorbed by adults with a healthy digestive tract. Inadequate absorption occurs when there is not enough acid in the stomach, or when a protein called intrinsic factor is not produced in the stomach.

Conventional cooking methods involving high heat (e.g. microwave) and long cooking times may result in some vitamin B12 losses.

Deficiency:

deficiencies of B12 are usually secondary deficiencies. Pernicious anemia (from B12 deficiency) or megaloblastic anemia (from related folate dysfunction) occurs.

Additional neurological effects develop because of damage to the spinal cord as the break down of myelin sheath synthesis affects brain, optic, and peripheral nerves.

Elderly persons are more at risk for deficiency because of naturally occurring reduction in production of the intrinsic factorby the stomach mucosa.

To relieve this risk, adults over age 50 should use foods fortified with vitamin B12 or take B12 supplement to assure adequacy of the RDA for B12.

Vitamin B12 is more absorbable in this form because it is already separated from food.

However, it can take several years to develop a vitamin B12 deficiency because the body recycles much of its vitamin B12 by reabsorbing it repeatedly.

Infants born to vegan mothers are also at risk for deficiency if their mother's vitamin B12 status was low during pregnancy.

Vitamin

Function: vitamin C functions as an antioxidant and as a coenzyme. Collagen formation & wound healing depends upon ascorbic acid. As an antioxidant, vitamin C protects folate, vitamin E, and PUFAs from destruction by oxygen as they move throughout the body.

Vitamin C may have a role in reducing the risk of cancer development; as cancer of stomach, esophagus, and colon.

Bioavailability of vitamin C

Levels of vitamin C in foods depend on the growing conditions, season, stage of maturity, cooking practices, and storage time prior to consumption.

Vitamin C is easily destroyed by heat and oxygen.

Absorption levels depend on the amounts consumed. About 70–90% of vitamin C is absorbed.

If intakes exceed 1000 mg/day, absorption levels drop to 50%

Recommended Intake & Sources: the RDA of vitamin C is [60 mg] for adults, recommendations customized to specific disease and lifestyle behaviors will be determined. The metabolic use of vitamin C by the smokers is twice that of nonsmokers, so the smokers are advised to increase their intake to [100mg] daily.

Fruits and vegetables provide 95% of vitamin C we consume. Many foods are excellent sources; some of them include citrus fruits, red and green peppers, strawberries, tomatoes, potatoes, and green leafy vegetables.

Take divided doses of the vitamin twice daily to get the best results, and less excretion.

At Risk :

- Smoking, oral contraceptives, steroids, excessive alcohol consumption, and analgesics increase the need for this vitamin. Environmental stress, such as air and noise pollution, Growth (children from 0- 12 months, and pregnant women)

Deficiency: Although vitamin C deficiency is now rare, but it may still occur among persons who are chronic alcohol and drug users and those dietary intakes are extremely poor, elderly persons may have marginal intake because of difficulty in obtaining & preparing fresh foods.

Those at – risk groups may experience other vitamins & mineral deficiency as well. Scurvy represents the extreme result of vitamin C deficiency.

The symptoms include gingivitis causes gums to bleed, and teeth come loose; joints and limbs ache from muscle degeneration and lack of new connective tissues formations; bruising & hemorrhages occur as the vascular system weakens, death ultimately occurs as functioning of all body systems disintegrates.

Marginal deficiency symptoms may manifest as gingivitis, poor wound healing, increased the risk of infection as the integrity of tissues through out the body becomes compromised.

Overdoses have been shown to cause kidney stones, gout, diarrhea.

SHOULD GET VITAMINS FROM FOOD OR SUPPLEMENTS?

The American Heart Association "recommends that healthy individuals obtain adequate nutrient intakes from food eaten in variety and moderation, rather than from supplements."

- A diet high in fiber and low in fat is the best way to meet daily nutritional needs.

- If one closely follow the "food pyramid" then he should meet the RDA (Recommended Dietary Allowances) for vitamins and nutrients.

- Supplements are best when accompanied by a well-balanced diet.
- Supplements should not replace a healthy diet.

- Food provides calories and energy that are required for daily activities, vitamin supplements do not provide energy or calories.

WHAT DO MULTIVITAMINS CONTAIN?

- ✓A multivitamin should contain fat-soluble vitamins A, D, E; water-soluble vitamins B1, B2, B6, B12, niacin, pantothenic acid, biotin, folic acid , and Vitamin C.

- ✓They will also usually have minerals such as zinc, magnesium, copper, and calcium in them.

- ✓ When choosing a supplement, select one that meets 100-300% of the RDA.

Should take vitamins with food?

- ➢ It is advised to take vitamins with a snack or meal to avoid stomach irritation.

- ➢ The presence of carbohydrates and proteins stimulate digestive enzymes that will allow for better absorption of nutrients for the supplements. (Iron should be taken on an empty stomach)

What factors should consider before prescribing a vitamin supplement?

- Do the patient eat foods high in vitamins and minerals?
- Is he on dieting?
- Is he follow the Food Guide Pyramid?
- Is he smoke and/or drink regularly?
- Is she pregnant?
- Is he / she over 50 years old?
- Is he ?or she taking prescription drugs?

Although it is preferable to follow a balanced diet that covers all the vitamin needs of the body, vitamin supplements are sometimes indicated for groups of people that may be at risk of developing certain deficiencies.

Eligible candidates for vitamin supplementation may be:

- The very young, and especially premature infants
- pregnant women
- the very old
- some categories of people suffering from chronic diseases, and especially chronically undernourished patients and chronic alcoholics, who commonly develop thiamin deficiency

- injured people, given the fact that vitamins (and especially ascorbic acid) play a role in wound healing

- strict vegetarians (vegans), who may be at increased risk of developing specific vitamin deficiencies.