UNIT-3

Basics of Nutrition-II

Learning Outcomes

By the end of this unit the learner will be able to:

- ✓ Discuss what Micro- Nutrients are
- ✓ Discuss why do we need vitamins and minerals in our diet.
- ✓ Identify good sources of different types of vitamins.

Unit 3

Basics of Nutrition-II

Micronutrients

Micronutrients are vital for our health but we only need these in very small amounts: milligrams or micrograms, rather than grams. These micronutrients are **vitamins and minerals.**

What Vitamins and Minerals Do?

Vitamins and minerals are nutrients, which act as coenzymes or cofactors in important metabolic activities, which occur in our body. As a coenzyme, a vitamin helps an enzyme to work. Enzymes are special proteins that change the rate of chemical reactions in our body. Enzymes are their own energy source which means they do not need any outside sources of energy to work and they don't need to change their forms while they are working.
Enzymes are very specific. Each enzyme works on only one substance. For example, the digestive enzyme lipase only works on metabolising fat: it will not help with metabolising carbohydrates or protein. Some enzymes need to have specific vitamin present to do their work.

Vitamins

Vitamins are necessary to run many of the body processes properly. Vitamin deficiency may result in different diseases. A well known vitamin deficiency disease is scurvy, which is caused by the deficiency of vitamin C.

The Fat Soluble Vitamins

Fat soluble vitamins are A, D, E, and K. ''Fat soluble' means that they are found in the fatty component of vegetable and animal sources of foods. Fat soluble vitamins can be stored in our body tissues and therefore, it is possible to take in toxic amounts of these vitamins as supplements and food, if taken excessively.

Vitamin A

Functions

- maintains integrity of epithelial membranes ;
- maintains resistance to infections; and
- necessary for formation of rhodopsin and prevention of night blindness

Deficiency

Mild deficiency may result in:

- retarded growth;
- increased susceptibility to infection;
- abnormal function of gastro intestinal, genitourinary, and respiratory tracts due to altered epithelial membranes;

- dry, shrivelled, and thickened skin; and
- night blindness

Severe deficiency may result in:

- Xerophthalmia – An eye disease and other local infections

Characteristics

- fat-soluble;
- not destroyed by ordinary cooking temperatures;
- destroyed by high temperatures when oxygen is present;
- marked capacity for storage in liver; and
- carotene is a precursor to vitamin A

Good Sources

Retinol: milk fats, butter, cheese, cream, whole milk, egg yolk, liver, and fatty fish.

Carotene: green leafy vegetables, carrots, fruits – specifically those which are yellow and red.

Food	Quantity	mcg RAE
Egg	1 medium	118
Milk (non-fat)	1 cup	149
Nectarine	1 medium	50
Watermelon	1 piece	27

Recommended daily Allowances

(DRV 700 microgram for men, 600 for women)

Vitamin D

Functions

Regulates absorption of calcium and phosphorus from the intestinal tract

Deficiency

Mild

- interferes with the utilization of calcium and phosphorus in bone and teeth formation;
- irritability;and
- weakness

Severe

- rickets in young children;
- childhood deficiency disease marked especially by soft deformed bones; and
- osteomalacia in adults

Characteristics

- soluble in fats and organic solvents;
- relatively stable under refrigeration;
- stored in the liver; and
- precursor: UV-activated 7-dehydro-cholesterol

Good Sources

- Natural;
- Butter;
- egg yolks;
- oily fish;
- salmon, tuna fish, herring, sardines, mackerel, bluefish, and catfish;
- oysters;
- liver;
- exposure to sunlight; and
- formed in the skin

Food	Quantity	mcg	IUs
Cheese, cheddar	1 oz	0.075	3
Egg	1 large	0.675	27
Milk, non-fat	1cup	2.5	100
Red Salmon (canned)	1/2 cup	23.5	940
Cat Fish (cooked)	3 oz	14.25	570
Multivitamins (most brands)	1 tablet	10	400

Vitamin E

Functions

- Prevents damage to cell membrane
- Active in maintaining
    - Involuntary Nervous System;
    - Vascular System; and
    - Involuntary Muscles

Deficiency

- Red blood cell resistance to rupture is decreased

Characteristics

- fat soluble
- stable to heat in absence of oxygen

Good Sources

Natural

- whole grains;
- green, leafy vegetables;
- vegetable oils, margarine;
- nuts, seeds;
- brown rice;
- olives; and
- asparagus

Food	Quantity	mg
Brussels sprouts, boiled	1/2 cup	0.7
Spinach, boiled	1 cup	0.675
Almonds	1 oz	7.5

Recommended Daily Allowances (RDA)

- Males (11 yrs. and older)
  - 15 mg
  - 8-10 mg
- Females (11 yrs. and older)
  - 15 mg
  - 8 mg
- Pregnant females
  - 15 mg
  - 10 mg
- Lactating females
  - 15 mg
  - 11 mg
- Children
  - 10-15 mg
- Infants

- 5 mg
- Varied values reflect different references

Vitamin K

Functions

- coenzyme in synthesis of fatty acids and glycogen;
- important in blood clotting; and
- aids in bone formation

Deficiency

- haemorrhagic problems
- 30 percent higher risk of hip fractures

Characteristics

- fat soluble

Good Sources

- green leafy vegetables;
- Broccoli;
- Peas;
- Soybeans; and
- Potatoes

Adequate Intakes (AI)

- Males (Adult)
  - 120 mcg
- Females (Adult)
  - 90 mcg

Water Soluble Vitamins

Water Soluble Vitamins are divided into vitamin C and the B complex group of vitamins. The B complex includes B1 (thiamine, B2 (riboflavin), B3 (niacin), B5 (pantothenic acid), B6 (pyridoxine), B12 (cyanocobalamine), folic acid and biotin. The water soluble vitamins are not stored by the body and therefore excess of these vitamins is generally washed from our body through our urine.

Vitamin C

Functions

- formation of intracellular cement substances in a variety of tissues;
  - skin, dentin, cartilage, and bone matrix
  - important in healing of wounds and fractures of bones
- increases resistance to infections; and
- Facilitates in the absorption of iron

Deficiency

Mild

- lowered resistance to infections;
- joint tenderness; and
- susceptibility to dental caries, pyorrhoea, and bleeding gums

Severe

- hemorrhage;
- anaemia ; and
- scurvy

Characteristics

- soluble in water;
- easily destroyed by oxidation;
  - heat hastens process
- lost in cooking
  - particularly if the water in which food was cooked is discarded
- loss is greater if cooked in iron or copper utensils;
- quick-frozen foods lose little; and
- stored in the body to limited extent

Good Sources

Natural

- Most fresh fruits and vegetables:
- Fruits
  - citrus fruit, strawberries, and cantaloupe
- Vegetables
  - tomatoes, peppers, broccoli, potatoes, kale, cabbage, cauliflower, and brussels sprouts

Food	Quantity	mg
Orange	1 medium	70
Green pepper	1/2 cup	56
Broccoli, raw	1 cup	82
Tomato juice	8 oz	44

Recommended Daily Allowances (RDA)

- Males (11 yrs. and older)
  - 90 mg
  - 50-60 mg
- Females (11 yrs. and older)

- 75 mg
- 50-60 mg
- Pregnant females
  - 80 mg
- Lactating females
  - 100 mg
- Children
  - 45 mg
- Infants
  - 35 mg

B1 (Thiamine)

Overview:

Vitamin B-1, which is otherwise known as thiamine, is necessary for most every cellular reaction in the body as a participant in an enzyme system known as thiamine pyrophosphate. It is vital to normal functioning of the nervous system and metabolism. It can be found in meat, whole grains, fish, and nuts.

How This Vitamin Works in the Body:

- Maintains health of mucous membranes;
- Keeps normal workings of nervous system, heart, and muscles;
- Helps treat herpes zoster and beriberi;
- Supports normal growth and development;
- Restores deficiencies caused by alcoholism, cirrhosis, overactive thyroid, infection, breastfeeding,
- absorption diseases, pregnancy, prolonged diarrhoea, and burns;
- Reduction of depression, fatigue, and motion sickness; and
- Potential improvement in appetite and mental alertness

Symptoms of Deficiency:

Symptoms include fatigue, depression, decreased mental functioning, muscle cramps, nausea, heart enlargement, and eventually, beriberi. Alcoholics have an increased risk of deficiency.

The Following May Benefit from this Vitamin:

Alcohol or other substance abusers can benefit because this vitamin causes metabolism acceleration;
Those with poor nutritional dietary intake;
Anybody other than 55 years old;
Women who are breastfeeding or pregnant;
Recent surgery patients; and
Those with liver disease, overactive thyroid, or prolonged diarrhoea

Good Sources:

Baked Potatoes;
Beef kidney/liver;
Brewer's Yeast;
Flour - rye and whole grain;
Garbanzo Beans (chickpeas), dried;
Ham;
Kidney beans, dried;
Navy beans, dried;
Orange Juice;
Oranges;
Oysters;
Peanuts;
Peas;
Raisins;
Rice - brown and raw;
Wheat germ and products made up of wheat grains

Recommended Daily Intakes

Men: 1.2 mg
Women: 1.1 mg
Pregnancy: 1.4 mg
Lactation: 1.5 mg

B2 (riboflavin)

Overview:

Vitamin B-2, otherwise known as riboflavin, is readily absorbed from foods, such as meat, dairy products, and fortified grains. This vitamin is essential to energy generation, nerve development, blood cell development, and the regulation of certain hormones.

How This Vitamin Works in the Body:

Releases food energy;
Normal growth and development;
Keeps healthy mucous membranes linings together with vitamin A;
Maintains healthy brain and nervous system, skin, hair, and blood cells;
Essential for iron, pyridoxine, and niacin functions; Increases growth of body during important developmental stages; and
Potential treatment for cheilitis

The Following may Benefit from this Supplement:

People who need nutritional supplements;
Pregnant or breastfeeding women;
Substance abusers;
People with excess stress or who have undergone a recent surgery/surgeries;
Hyperthyroidism sufferers; and
Participants in vigorous physical activity

Good Sources

Bananas;
Beef liver;
Dairy products;
Eggs;
Enriched breads;
Fortified cereals;
Ham;
Mixed vegetables;
Pork;
Tuna; and
Wheat germs

Recommended Daily Intakes

Men: 1.3 mg
Women: 1.1 mg
Pregnancy: 1.4 mg
Lactation: 1.6 mg

B3 (niacin)

Overview:

Vitamin B-3, otherwise known as niacin, acts like other B vitamins to create enzymes that are essential to metabolic cell activity, synthesize hormones, repair genetic material, and maintain normal functioning of the nervous system. Great sources of this vitamin may be found in meat, fish, and whole grains.

How This Vitamin Works in Your Body:

May treat pellagra;
Decreases cholesterol and triglycerides in blood;
Large doses dilate blood vessels;

Helps with ringing ears and dizziness;
Essential for genetic material repair;
Potential reduction in heart attacks, depression, and migraine headaches; and
Poor digestion could be improved

The Following may Benefit from this Supplement:

Anyone with poor dietary intake;
Pregnant or breastfeeding women;
Substance abusers;
Patients who have suffered severe burns or injuries; and
Infants with congenital metabolic disorders

Good Sources:

- Beef liver;
- Brewer's Yeast;
- Chicken - white meat
- Dried beans/peas
- Fortified cereals
- Halibut
- Peanut butter
- Peanuts
- Pork/ham
- Potatoes
- Salmon
- Soybeans
- Swordfish
- Tuna
- Turkey

Recommended Daily Intakes

- Men: 16 mg
- Women: 14 mg
- Pregnancy: 18 mg
- Lactation: 17 mg

B5 (Pantothenic Acid)

Overview:

Vitamin B-5, which is otherwise known as Pantothenic Acid, is a coenzyme involved in energy metabolism of carbohydrates, protein, and fat. Great sources of this vitamin include eggs, nuts, and whole-wheat products.

How This Vitamin Works in Your Body:

Helps normal growth and development;
Helps release food energy;
Hastens the healing of wounds in animals;
May relieve stress; and
May lessen fatigue

The following may Benefit most from this Supplement:

Those with increased nutritional needs;
Pregnant or breastfeeding women;
Substance abusers;
Those under prolonged stress;
Those having undergone recent surgery; and
People with vigorous physical activity levels.

Good Sources:

Avocados;
Bananas;
Blue cheese;
Broccoli;
Chicken;
Collard greens;
Eggs;
Lentils;
Liver;
Lobster;
Meats, all kinds;
Milk;
Oranges;
Peanut butter;
Peanuts;
Peas;

Soybeans;
Sunflower seeds;
Wheat germ; and
Whole-grain products

Recommended Daily Intakes

Men: 5 mg
Women: 5 mg
Pregnancy: 5 mg
Lactation: 5 mg

B6 (Pyridoxine)

Overview:

Vitamin B-6, which is otherwise known as Pyridoxine, performs as a coenzyme to carry out metabolic processes that affect the body's use of protein, carbohydrates, and fat. It helps to convert tryptophan to niacin, and may be found in meat, fish, eggs, milk, and whole grain foods.

How This Vitamin Works in Your Body:

Promotes healthy cardiovascular, nervous, and immune systems;
Supports healthy skin, hair, and normal red-blood-cell formation;
Assists in production of food energy;
Can be used in anaemia treatment;
Treatment of cycloserine and isoniazid poisoning;
Keeps normal homocysteine levels;
Functions as a tranquilizer;
Important for healthy nerve and muscle functioning;
Blood cholesterol may decrease;
Inflammation of arthritis and carpal-tunnel syndrome may be reduced;
Reduction of PMS symptoms;
May reduce asthma symptoms; and
Increases levels of serotonin to ease sleep

The following people may Benefit from taking this Supplement:

Those with increased nutritional needs;
Pregnant or breastfeeding women;
Substance abusers;
Those who have long periods of excess stress/ P.T.S.D;
Oestrogen and oral contraceptive users;

Hyperthyroidism sufferers; and
Those with high homocysteine levels

Good Sources:

Avocados;
Bananas;
Beef liver;
Chicken;
Fortified cereals;
Ground beef;
Ham;
Hazelnuts (filberts);
Lentils;
Potatoes;
Salmon;
Shrimp;
Soybeans;
Sunflower seeds;
Tuna; and
Wheat germ

Recommended Daily Intakes

Men: 1.3 mg
Men (Over 50): 1.7 mg
Women: 1.3 mg
Women (Over 50): 1.5 mg
Pregnancy: 1.9 mg
Lactation: 2.0 mg

B9 (Folic Acid)

Overview:

Vitamin B-9, which is otherwise known as Folic Acid, serves as a coenzyme during the creation of DNA. This vitamin is also very important to the growth and reproduction of all body cells, including red blood cells. Great food sources of vitamin B-9 include liver and dark green leafy vegetables.

How This Vitamin Works in the Body:

Aids in the formation of red blood cells;
Creation of genetic material;

Promotes a healthy pregnancy by regulating the nervous system development of the foetus; Helps treat anaemic patients resulting from folic acid deficiency; Functions to metabolize proteins; and Cervical dysphasia may be reduced

The Following People May Benefit from the Consumption of This Vitamin:

Those with increased nutritional needs;
Pregnant or breastfeeding women or those planning to become pregnant;
Oral contraceptive users;
Substance abusers; and
Those who have undergone partial removal of the gastrointestinal tract

Good Sources:

- Asparagus;
- Avocados;
- Bananas;
- Beans;
- Beets;
- Brewer's Yeast;
- Brussels sprouts;
- Cabbage;
- Calf liver;
- Cantaloupe;
- Citrus fruits/juices;
- Endive;
- Fortified grain products;
- Garbanzo beans (chickpeas);

Green, leafy Vegetables, such as,

- Lentils;
- Sprouts; and
- Wheat germ

Recommended Daily Intakes

- Men: 400 mg
- Women: 400 mg
- Pregnancy: 600 mg
- Lactation: 500 mg

B12 (Cyanocobalamin)

Overview:

Vitamin B-12, which is otherwise known as Cyanocobalamin, performs as a coenzyme for the creation of DNA material. It also promotes growth and cell development and is important to fat, carbohydrate, and protein metabolism. Although vitamin B-12 is not found in plant foods, good sources of this supplement include meats, fish, eggs, and dairy products.

How This Vitamin Works in the Body:

Growth and development of nerve, skin, hair, and blood cells;
Produces genetic material;
Metabolizes amino and fatty acids;
Works to release food energy;
Helps treat Alzheimer's disease;
May help sufferers of nervous disorders;
Could improve immune system; and
May see increase in energy and memory

The Following May Benefit from the Consumption of This Vitamin:

Vegans;
Those with increased nutritional needs;
Substance abusers;
Those with chronic illnesses or recently undergone surgery, especially, those who have had a surgery to remove of portions of
gastrointestinal tract;
Burn and recently injured patients; and
Those with malignancies of the pancreas or bowels

Good Sources:

- Beef;
- Beef liver;
- Blue cheese;
- Clams;
- Dairy products;
- Eggs;
- Flounder;
- Herring;
- Liverwurst;
- Mackerel;

- Milk;
- Oysters;
- Sardines;
- Snappers; and
- Swiss cheese

Recommended Daily Intakes

- Men: 2.4 mcg
- Women: 2.4 mcg
- Pregnancy: 2.6 mcg
- Lactation: 2.8 mcg

Minerals

Calcium

Functions

- bones and teeth formation
- nerves and muscles function
- blood clotting
- activation of enzymes that convert food to energy

Deficiency

- muscle cramps
- Children

o rickets (soft, deformed bones)
o poor growth in children

- Adults

o osteoporosis

Good Sources

Natural

- milk and dairy products
- dark-green, leafy vegetables
- spinach, collard greens, mustard greens, and turnip greens
- broccoli
- soybean products

- tofu
- garbanzo beans
- bean sprouts
- nuts
- almonds, chestnuts, filberts
- sunflower and sesame seeds
- fish (with tiny bone particles)
- (canned salmon, sardines, or jack mackerel)
- oysters
- kelp
- figs

Food	Quantity	mg
Sardines, Atlantic	3 oz	325
Milk, fat free	1 cup	301
Cheese	1 oz	204
Yogurt	8 oz	452
Book Choy, cooked	1 cup	330

Adequate Intakes (AI)

- Males and Females

o Adults
1,000 mg
o 11-24 years
1,200 mg
o 25 years. and older
800 mg

- Pregnant/Lactating females

o 1,200 mg

- Children (1-10 yrs)

o 800 mg

- Infants

o 7 months to 1 year
600 mg
o birth-6 months
400 mg

Chloride

Functions

- nerve and muscle function
- water balance (with sodium)

Deficiency

- impaired electrolyte balance

Good Sources

- Salt

Adequate Intakes (AI)

Males and Females (Adults)
2.3 g

Chlorium

Functions

- Glucose metabolism

Deficiency

- Adult-onset diabetes

Good Sources

Natural

- Meats
  o beef, chicken, pork, lamb, liver, oyster, and shrimp
- Vegetables
  o black pepper, green pepper, potato, spinach, parsnips, fresh chilli, and carrots
- Fruit
  o apple, banana, orange, and blueberries
- cheese
- egg
- whole grains
- beans
- beer

Food	Quantity	mcg
Beef, round	3.5 oz	57
Whole wheat bread	1 slice	12
Green pepper	3.5 oz	19
Cheese, Swiss	3.5 oz	11

Adequate Intakes (AI)

- Males (Adult)
  - o 35 mcg
- Female (Adult)
  - o 25 mcg

Selenium

Functions

- To protect immune system
- To prevent free radical formation

Good Sources

- Brazil nuts
- Seafood
- Meat
- grains

Copper

Functions

- helps in formation of red blood cells
- helps keep bones, blood vessels, nerves, and immune system healthy
- enzyme function
- energy production

Deficiency

- anaemia
- Menkes' Syndrome

Good Sources

Natural

- meat
- poultry
- liver
- seafood, fish, and oysters
- green vegetables
- whole grains
- legumes, peas
- nuts
- raisins, papayas, and apples
- mushrooms, carrots, and turnips
- vegetable oils
- butter
- gelatine
- black pepper, thyme, paprika, bay leaves, and ginger roots

Food	Quantity	mcg
Raisins, seedless	2/3 cup	310
Pistachios, dry roasted	1 oz	340
Mushrooms	1/2 cup	390
Oyster, cooked	1 medium	670
Pork loin	3.5 oz	400

Recommended Daily Allowances (RDA)

- Males and Females
  - o 900 mcg

Fluoride

Functions

- bone and teeth growth

Deficiency

- tooth decay
- possibly osteoporosis

- Good Sources

Natural Sources

- fish, seafood
- milk
- tea

Artificial sources

- fluoridated drinking water

Recommended Daily Allowances (RDA)

- Males (adults)
  - 4 mg
- Females (adults)
  - 3 mg
- Pregnant females
  - 1.6 mg
- Lactating females
  - 1.7-1.8 mg
- Children
  - 0.8-1.2 mg
- Infants
  - 0.4-0.5 mg

Iodine

Functions

- thyroid hormone formation
- regulates oxidation in cells

Deficiency

- hypothyroidism
  - disturbance in thyroid function
- goitre
  - enlargement of thyroid gland
- cretinism
  - stunting and mental retardation
  - in infants / new born

Good Sources

Natural

- seafood
  - o salt-water fish
  - o seaweed
- dairy
  - o milk
  - o cheese
  - o butter
- whole-grain cereal

Food	Quantity	mcg
Cheese, cheddar	1 oz	12
Salt, iodized	1 tsp	400

Recommended Daily Allowances (RDA)

- Males and Females (11 yrs. and older)
  - 150 mcg
- Pregnant females
  - 175 mcg
- Lactating females
  - 200 mcg
- Children
  - 7-10 yrs.
    120 mcg
  - 4-6 yrs.
    90 mcg
  - 1-3 yrs.
    70 mcg
- Infants
  - 7 months - 1 yrs.
    50 mcg
  - birth - 6 months
    40 mcg

Iron

Functions

- oxygen transport in red blood cells production of haemoglobin and myoglobin enzyme function

Deficiency

- fatigue, weakness, headaches, and shortness of breath
- iron deficiency anaemia

Good Sources

Natural

- red meat, liver, and kidney shellfish
- egg yolks beans
- green leafy vegetables apricots
- whole grains

Food	Quantity	mg
Bread, whole wheat	1 slice	1.0
Eggs, scrambled	3 medium	2.2
Beef, lean sirloin steak, broiled	3 oz	2.6
Liver, fried	3 oz	5.3
Oatmeal, instant	1 packet	6.7

Recommended Daily Allowances (RDA)

- Males

o Adult
8 mg
o 19 years and older
12 mg
o 11-18 years
10 mg

- Females

o Adult
18 mg
o 11-50 yrs.

15 mg

o 50+ yrs.

10 mg

- Pregnant females

o 30 mg

- Lactating females

o 15 mg

o 18 mg

- Children (1-10 yrs)

o 10 mg

- Infants

o 7 months-1 yr

10 mg

o birth-6 months

6 mg

Magnesium

Functions

- essential to bone growth and production of cells and genetic material
- cofactor in enzymatic release of energy
- regulates neuromuscular sensitivity
- including regulation of normal heart rhythm

Deficiency

- muscle cramps and weakness
- twitching
- confusion
- irregular heartbeat
- insomnia
- deficiency most often seen in
  - Alcoholics
  - people taking diuretics
  - those dehydrated from prolonged diarrhoea

Good Sources

Natural

- green, leafy vegetables (raw)
- nuts

- beans
- soybeans and soy products
- whole grains
- fish, crab, oysters, and scallops
- kelp
- potato, sweet potato, and beets
- avocado
- figs, apricots, dates, prunes, raisins, bananas, blackberries, and coconuts
- this is also found in plant and animal tissues but seldom occurs in high concentrations

Food	**Quantity**	**mg**
Peanut butter	1 tbsp	28
Cashews	12	50
Potato, baked	1 medium	55
Spinach, cooked	1/2 cup	79
Kelp	1 oz	217
Buckwheat	1 oz	65

Recommended Daily Allowances (RDA)

- Males
  420 mg
  o 19 yrs. and older
  350 mg
  o 15-18 yrs.
  400 mg
  o 11-14 yrs
  270 mg

- Females
  320 mg
  o 19 yrs. and older
  280 mg
  o 15-18 yrs.
  300 mg
  o 11-14 yrs
  280 mg
- Pregnant females

o 320 mg
- Lactating females with infant
o 7 months - 1 yr
340 mg
o 1-6 months
355 mg
- Children
o 7-19 yr.
170 mg
o 4-6 yrs.
120 mg
o 1-3 yrs
80 mg
- Infants
o 7 months - 1 yr
60 mg
o birth - 6 months
40 mg

Manganese

Functions

- enzymatic function

Deficiency

- not known in humans

Good Sources

- green, leafy vegetables
- nuts
- beans
- whole grains
- fruit
- Tea

Adequate Intakes (AI)

- Males (adults)
o 2.3 mg
- Females (adults)

o 1.8 mg

Phosphorus

Functions

- formation of bones and teeth
- helps form membranes and genetic material
- activation of enzymes that convert food to energy
- maintenance of body's proper acid/base balance
- nerve/muscle function

Deficiency

- deficiency is rare
- muscular weakness
- pain in bones
- loss of appetite
-

Good Sources

Natural

- milk and dairy products
- egg yolks
- meat, poultry, and fish
- whole grains
- beans, peas, soybeans
- nuts, seeds
- green and root vegetables
- fruits
- nearly all foods

Food	Quantity	mg
Scallops	6 medium	200
Milk, non-fat	1 cup	250
Trout, broiled	3 oz	260
Cottage cheese, low fat	1 cup	340
Sunflower seeds, hulled	1 oz	240

Recommended Daily Allowances (RDA)

- Males and Females
  o Adults

700 mg
- o 25-51 yrs.
  800 mg
- o 11-24 yrs.
  1,200 mg

- Pregnant/Lactating females
  - o 1,200 g
- Children (1-10 yrs)
  - o 800 mg
- Infants
  - o 7 months-1 yr
    500 mg
  - o birth-6 months
    300 mg

Potassium

Functions

- regulation of fluid balance
  - o cells and blood
- nerve impulse transmission
- muscle contraction
- function of heart and kidneys

Deficiency

- muscle weakness
- irregular heart beat
- kidney damage
- deficiency most often seen in people
  - o taking diuretics
  - o dehydrated from prolonged diarrhoea

Good Sources

Natural

- bananas
- citrus fruits
- fresh vegetables
- potatoes
- legumes
- whole grains
- milk and dairy products
- meats, fish

- nuts, seeds

Food	Quantity	mg
Banana	1 medium	422
Milk, non-fat	1 cup	406
Potato, with skin	1 medium	610
Spinach, cooked	1/2 cup	419
Sunflower seeds	1 oz	262

Adequate Intakes (AI)

- Males and Females (19-51+ yrs.)
  4,700 mg (4.7 g)
  2,000 mg
- Children
  o 10-18 yrs.
  2,000 mg
  o 6-9 yrs.
  1,600 mg
  o 2-5 yrs.
  o 1 yr
  1,400 mg
  1,000 mg
- Infants
  o 7 months-1 yr
  700 mg
  o birth-6 months
  500 mg

Sodium

Functions

- nerve and muscle function
- fluid balance

Deficiency

- muscle cramps
- weakness
- headache

- deficiency rare in developed countries
- acute deficiency caused by extremely heavy perspiration

Good Sources

- table salt
- milk and dairy products
- also found in many processed foods
- drinking water (some locations)

Adequate Intakes (AI)

- Males and Females (19-51+ yrs.)
  1,500 mg (1.5 g)
  500 mg

- Children
  o 10-18 yrs.
  500 mg
  o 6-9 yrs.
  400 mg
  o 2-5 yrs.
  o 1 yr
  225 mg

- Infants
  o 7 months-1 yr
  200 mg
  o birth-6 months
  120 mg

Zinc

Functions

- required to produce enzymes necessary for
  o digestion
  o cell division, growth, and repair (healing)
- helps immune system function properly
- plays role in acuity of taste and smell

Deficiency

- wounds slow to heal
- loss of taste/appetite

- stunted growth and sexual development in children

Good Sources

Natural

- beef, chicken
- liver
- seafood
  o fish, shellfish
- milk and dairy products
- eggs
- whole grains
- legumes, peas
- nuts

Food	Quantity	mg
Yogurt, low-fat	8 oz	1.5
Lentils, boiled	1 cup	2.5
Turkey, dark meat, roasted	3.5 oz	4.4
Peanuts	1 oz	0.9
Beef, ground round steak	3.5 oz	5,6

Recommended Daily Allowances (RDA)

- Males (11 yrs. and older)
  o 11 mg
  o 15 mg
- Females (11 yrs. and older)
  o 8 mg
  o 12 mg
- Pregnant females
  o 30 mg
- Lactating females
  o 15 mg
- Children
  o 10 mg
- Infants
  o 5 mg

Dietary Supplements

There are three categories of vitamin and mineral supplements:

1. **Multivitamins and multiminerals**
   These usually contain about 100% of the Reference Nutrient Intake (RNI) for each vitamin.

2. **Combination of particular vitamins and minerals** marketed for specific groups of people such as school children, menopausal women, and athletes.

3. **Single vitamin and single minerals** often containing very large amounts. When levels of vitamins and minerals exceed 10 times the RNI, they are usually known as 'mega doses. Many supplements are labelled in terms of Recommended Daily Amount (RDA) which is similar to the RNI.

The majority of the people living in the UK who eat a balanced diet do not need to take vitamin and mineral supplements. But there are groups of population who are at risk of deficiency and might benefit from vitamin and mineral supplements. These include:

- Pregnant and breast feeding women
- Infants
- Children and young people
- The elderly
- Athletes
- Vegetarians particularly vegans
- Members of Asian community
- Long term travellers
- People on low income

The best choice of dietary supplement for any of these groups of people is one which contains a wide variety of vitamins and minerals and which does not contain more than the Reference Nutrient Intake (RNI) of each nutrient.

Vitamin A

Vitamin A is involved in the growth and differentiation of epithelial tissue. Low intakes of both vitamin A and beta-carotene have been associated with an increased risk of cancer at various sites including the stomach, breast and respiratory tract. Toxic effects of vitamin A are well known in both children and adults. Poisoning may occur after a single dose of 30mg of vitamin A. If taken over several months doses of 7.5 - 15 mg can cause toxicity. Large doses of vitamin A are teratogenic so vitamin A supplements should be avoided by women who are pregnant or who are likely to become so.
Beta-carotene is generally non- toxic. Excessive intake of supplements or of carrot juice can cause an orange colouration of the skin.

Vitamin B6

Mega doses of vitamin B6 have been recommended for a variety of disorders including carpal tunnel syndrome, pregnancy sickness, and asthma. Vitamin B6 has an adverse effect on the peripheral nervous system, and even in doses as low as 50 mg it may cause peripheral sensory neuropathy.

Niacin

Nicotinic Acid is licensed in the UK as a lipid-lowering drug, but it should not be recommended as a dietary supplement for this purpose. In doses exceeding 500mg a day, Nicotinic Acid has been associated with liver damage.

Folic Acid

Low levels of Folic Acid are associated with birth defects, e.g. spina bifida in infants. All women who are pregnant or intend to become pregnant should be recommended to take folic acid supplement. Doses of folic acid before conception and during pregnancy

High risk: 5mg
Low risk : 0.4 mg daily

Vitamin C

A beneficial effect of mega doses of vitamin C has been claimed for an extraordinary number of conditions including the common cold, wounds and cancer. Whilst vitamin C appears to reduce the severity of cold symptoms, this does not justify 'mega dose' intakes. High doses of vitamin C are relatively harmless, but may cause diarrhoea.

Vitamin D

Vitamin D plays an essential role in the regulation of plasma calcium and in bone mineralization and is claimed to be useful in the prevention and treatment of osteoporosis. Intakes of vitamin D exceeding 500 microgram are toxic and may lead to the development of hypocalcaemia with its associated symptoms of muscle weakness, bone pain and headaches. Vitamin D in doses exceeding 10 micro gram/ day should be avoided by mothers who are breast feeding because of the risk of hypocalcaemia in infants. Vitamin D supplements are important for those who are house bound.

Vitamin E

The primary role of vitamin E is an antioxidant helping to protect the tissues from free radical damage. But large doses of vitamin D have been advocated in cardiovascular disease. There appears to be little risk of toxicity with even quite large doses of vitamin E.

Calcium

A calcium or calcium and vitamin D supplement may be recommended to post menopausal women. A calcium supplement should provide 0.5- 1g of elemental calcium per day.

Magnesium

Magnesium supplements have been promoted for a number of conditions including premenstrual syndrome, post menopausal, osteoporosis, and chronic migraines. But actually, magnesium does not appear to be very useful as a dietary supplement.

Selenium

Like vitamins A, C, E and beta-carotene, selenium has been advocated for the prevention of cancer.

Zinc

Zinc supplements have been advocated for the treatment and prevention of colds and skin disorders such as acne, eczema and psoriasis, but evidence for a beneficial effect in these conditions is inclusive. Patients with impaired wound healing may have low zinc levels, and for such people a supplement may be helpful. High doses of zinc (>300mg a day) may decrease levels of HDL cholesterol; high levels of HDL are thought to be protective against heart disease.

Health Supplements

Fish Liver Oils and Fish Oils

Fish Liver Oils have traditionally been used because they are a rich source of vitamin A and D but they are also rich in polyunsaturated fatty acids, especially Eicosapentaenoic Acid (EPA) and Docosahexaenoic Acid (DHA). Excessive intakes of fish liver oil can lead to vitamin A and D toxicity. Cod liver oil is also rich in energy: 10 ml provides about 336 KJ (80 kcal).

Gamma Linolenic Acid

Gamma Linolenic Acid is a polyunsaturated fatty acid of the n-6 series. It is synthesised in the body from dietary linoleic acid. Evening primrose oil, borage seed oil, and black current seed oil is sold as sources of supplementary gamma-linolenic acid.

In the UK, it is prescribe able for the symptomatic relief of eczema and breast pain. Claims for a beneficial effect in other conditions, such as premenstrual tension, multiple sclerosis and asthma

Garlic

Garlic has long been used medically for centuries and is widely promoted for colds and coughs. There is growing evidence that garlic has beneficial effects in lowering serum cholesterol and in reducing platelet aggregation. Garlic may also be protective against the development of certain type of cancers. It also has an anti bacterial and anti fungal activity.

Special Nutrients

Water

Water constitutes about 70% of the total body weight and it is the medium in which almost all metabolic processes take place. A constant supply of water is therefore essential and an average adult living in a temperate climate requires about 2500ml of water a day. Water is constituent of all drinks and most foods, especially fruits and vegetables, but it is also found in solid foods such as bread, meat and fish. Most of the water requirement is supplied by drinks.

What kind of Water is the Best?

Tap water is generally safe to drink in the UK; it is monitored for safety and must meet certain standards. It is treated to keep the population safe from harmful bacteria or germs. While this is a good thing that chemicals used to kill these germs are not harmful for health. Chlorine is the most well known of these chemicals. If chlorine is consumed on regular basis, it can deplete the body of certain vitamins and can also harm the beneficial flora that we have in our intestines.

Filtered Water

Most of the chlorine and other chemicals from water can be removed by using filter jug, which has a built in filter. These filters in these systems also need to be replaced from time to time. Boiling water is also a useful practice for killing harmful germs but it does not necessarily destroy the entire harmful chemical. Infect boiling water can even concentrate these chemicals.

Well Water

Well water can be a good source for drinking water because it has beneficial minerals in it. But this water should be tested to make sure that it is free from germs and pollutants.

Hard Water

Some areas of the country have hard water. Hard water is water that naturally has a lot of minerals in it. People in those areas may install a water softener in their house.

Distilled Water

Distilled water is water which has been heated until it is steamed and then, the steam is collected and condensed. Distilled water is essentially pure water. While drinking distilled water may seem like a good idea, it isn't. Because distilled water is devoid of any minerals, it tends to attract and pull minerals from the body. Cooking foods in distilled water pulls the minerals out of the foods and makes them less nutritious.

Spring Water

Spring water is the water that comes from natural springs in the earth. Most natural water contains a lot of minerals that we need, so in one sense these waters are all mineral waters.

Fibre

Fibre is not a nutrient, but it is very important to have enough of it in the diet. The fibre found in plants comes in two forms: insoluble and soluble. Insoluble fibre is what we call 'roughage', though it does have the ability to absorb some water and therefore it gives stools more bulk and makes them softer. Insoluble fibre is a bit like a broom that sweeps through the large intestine, keeping it clean and free from a build up of toxins. In this way, insoluble fibre also decreases the time that stool remains in the large intestine and keeps things moving. Soluble fibre is more dissolvable and helps in maintaining more stable blood sugar levels.

Foods that Contain Fibre

Both soluble and insoluble fibres are found naturally in whole foods. Foods especially high in these types of fibre are wholegrain, legumes, vegetables, and fruits. Meat, although nutritionally beneficial for other reasons, has no fibre. Fat also does not have fibre. Refined foods have had their fibre removed during processing and we know that a diet of refined foods not only nutrient-depleted but is also devoid of fibre. People who eat a diet mostly consisting of refined foods often experience constipation and are at more risk of developing digestive diseases, heart disease and diabetes. In whole foods, nature has given us both kinds of fibre and in right amounts.

Further Reading:

- ✓ *User's Guide to Vitamins and Minerals, (2002), By Jack Challem, Liz Brown*
- ✓ *Prevention's Healing with Vitamins: The Most Effective Vitamin and Mineral, (1998), By Alice Feinstein*
- ✓ *The Real Vitamin and Mineral Book, 4th edition: The Definitive Guide to, (2007), By Shari Lieberman, Nancy Pauling Bruning*