International Journal of Pharmacology and Clinical Research (IJPCR)

IJPCR |Volume 1 | Issue 2 | April – Jun- 2017
www.ijpcr.net

Research article *Clinical research*

Nutrition Plan to promote health & prevent diseases

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ABSTRACT

Nutrition (also called nourishment or aliment) is the provision, to cells and organisms, of the materials necessary (in the form of food) to support life. Many common health problems can be prevented or alleviated with a healthy nutrition.

Nutrition describes the processes by which all of the food a person eats are taken in and the nutrients that the body needs are absorbed. Good nutrition can help prevent disease and promote health.

Carbohydrate, Protein, Vitamins and minerals are an important part of nutrition. Vitamins are organic substances present in food. They are required by the body in small amounts to regulate metabolism and to maintain normal growth and functioning. Minerals are vital because they are the building blocks that make up the muscles, tissues, and bones. They also are important to many life-supporting systems, such as hormones, transport of oxygen, and enzyme systems.

A good nutrition plan will ensure that a balance of food groups, and the nutrients supplied by each group, is eaten A poor diet may have an injurious impact on health, causing nutrition deficiency diseases such as scurvy and kwashiorkor health-threatening conditions like obesity and metabolic syndrome and such common chronic systemic diseases as cardiovascular disease , diabetes and osteoporosis. Present paper expresses the role of nutritional supplements on general health & disease conditions.

INTRODUCTION

The human body contains chemical compounds, such as water, carbohydrates (sugar, starch, and fiber), amino acids (in proteins), fatty acids (in lipids), and nucleic acids (DNA and RNA). These compounds in turn consist of elements such as carbon, hydrogen, oxygen, nitrogen, phosphorus, calcium, iron, zinc, magnesium, manganese, and so on. All of these chemical compounds and elements occur in various forms and combinations (e.g. hormones, vitamins, phospholipids, hydroxyapatite), both in the human body and in the plant and animal organisms that humans eat.

The human body consists of elements and compounds ingested, digested, absorbed, and circulated through the bloodstream to feed the cells of the body. Except in the unborn fetus, the digestive system is the first system involved. In a typical adult, about seven liters of digestive juices enter the lumen of the digestive tract. These break chemical bonds in ingested molecules, and modulate their conformations and energy states. Though some molecules are absorbed into the bloodstream unchanged, digestive processes release them from the matrix of foods. Unabsorbed matter, along with some waste products of metabolism, is eliminated from the body in the feces.

There are seven major classes of nutrients:

These nutrient classes can be categorized as either macronutrients (needed in relatively large amounts) or micronutrients (needed in smaller quantities). The macronutrients are carbohydrates, fats, fiber, proteins, and water. The micronutrients are minerals and vitamins.

- **Carbohydrates**
- **Fats**
- **Dietary fiber**
- **Minerals**
- **Proteins**
- **Vitamins,**
- **Water**

Recommended Daily Dietary Allowances

Age group	Energy* (kcal)	Protein (g)	Total Fat (g)	SFA (g)	Carbo-hydrates (g)	Dietary fibre (g)	Choles-terol (mg)	Ca (g)	Na (mg)	Fe (mg)	Vit A (mcg)	Folic Acid (mcg)	Vit C (mg)
<u>Men</u>													
14-17 yrs	2800	68	72	24	355	28	300	0.5-0.6	1800	8	750	200	30
18- 29 yrs	2550	68	71	23.6	351	26	300	0.4-0.5	1700	6	750	200	30
30- 59 yrs	2500	68	69	23.0	344	25	300	0.4-0.5	1650	6	750	200	30
60 yrs and above	2100	68	58	19.3	289	21	300	0.4-0.5	1400	6	750	200	30
<u>Women</u>													
14- 17 yrs	2000	58	56	19	290	21	300	0.4-0.5	1350	19	750	200	30
18 - 29 yrs	2000	58	56	18.6	275	20	300	0.4-0.5	1350	19	750	200	30
30- 59 yrs	2000	58	57	19.0	275	20	300	0.4-0.5	1350	19	750	200	30
60 yrs and above	1800	58	50	16.7	248	18	300	0.4-0.5	1200	6	750	200	30
<u>Pregnant women</u>													
- full activity	+285	+9	+8	+6	+39	+3	300	1.0-1.2	+200	19	750	400	50

- reduced activity	+200	+9	+6	+2	+28	+2	300	1.0-1.2	+150	19	750	400	50
Lactating women													
- first 6 months	+500	+25	+14	+4.6	+69	+5	300	1.0-1.2	+350	19	1200	400	50
- after 6 months	+500	+19	+14	+4.6	+69	+5	300	1.0-1.2	+350	19	1200	400	50

Legend:

***SFA** - saturated fat; **Ca** - calcium; **Na** - sodium; **Fe** - iron; **Vit A** - vitamin A; **Vit C** - vitamin C*

Please note

- Recommended energy intakes (*) are for individuals with sedentary to light activity levels.
- The above recommended daily intakes vary depending on physical activity and physiological state of an individual, e.g. pregnancy and lactation.
- The recommended dietary allowances are average daily intakes of nutrients over a period of time for the majority of the population. They are not absolute daily dietary requirements.

Source: National Institute of Nutrition

The macronutrients (excluding fiber and water) provide structural material (amino acids from which proteins are built, and lipids from which cell membranes and some signaling molecules are built), energy. Some of the structural material can be used to generate energy internally, and in either case it is measured in Joules or kilocalories (often called "Calories" and written with a capital *C* to distinguish them from little 'c' calories). Carbohydrates and proteins provide 17 kJ approximately (4 kcal) of energy per gram, while fats provide 37 kJ (9 kcal) per gram,[1] though the net energy from either depends on such factors as absorption and digestive effort, which vary substantially from instance to instance. Vitamins, minerals, fiber, and water do not provide energy, but are required for other reasons. A third class of dietary material, fiber (i.e., non-digestible material such as cellulose), seems also to be required, for both mechanical and biochemical reasons, though the exact reasons remain unclear.

Molecules of carbohydrates and fats consist of carbon, hydrogen, and oxygen atoms. Carbohydrates range from simple monosaccharides (glucose, fructose, galactose) to complex polysaccharides (starch). Fats are triglycerides, made of assorted fatty acid monomers bound to a glycerol backbone. Some fatty acids, but not all, are essential in the diet: they cannot be synthesized in the body. Protein molecules contain nitrogen atoms in addition to carbon, oxygen, and hydrogen. The fundamental components of protein are nitrogen-containing amino acids, some of which are essential in the sense that humans cannot make them internally. Some of the amino acids are convertible (with the expenditure of energy) to glucose and can be used for energy production just as ordinary glucose. By breaking down existing protein, some glucose can be produced internally; the remaining amino acids are discarded, primarily as urea in urine. This occurs naturally when atrophy takes place, or during periods of starvation.

Other micronutrients include antioxidants and phytochemicals which are said to influence (or protect) some body systems. Their necessity is not as well established as in the case of, for instance, vitamins.

Most foods contain a mix of some or all of the nutrient classes, together with other substances such as toxins or various sorts. Some nutrients can be stored internally (e.g., the fat soluble vitamins), while others are required more or less continuously. Poor health can be caused by a lack of required nutrients or, in extreme cases, too much of a required nutrient. For example, both salt and water (both absolutely required) will cause illness or even death in too large amounts.

Carbohydrates

Carbohydrates may be classified as monosaccharides, disaccharides, or polysaccharides depending on the number of monomer (sugar) units they contain. They constitute a large part of foods such as rice, noodles, bread, and other grain-based products.

Monosaccharides contain one sugar unit, disaccharides two, and polysaccharides three or more. Polysaccharides are often referred to as *complex* carbohydrates because they are typically long multiple branched chains of sugar units. The difference is that complex carbohydrates take longer to digest and absorb since their sugar units must be separated from the chain before absorption. The spike in blood glucose levels after ingestion of simple sugars is thought to be related to some of the heart and vascular diseases which have become more frequent in recent times. Simple sugars form a greater part of modern diets than formerly, perhaps leading to more cardiovascular disease. The degree of causation is still not clear, however.

Simple carbohydrates are absorbed quickly, and therefore raise blood-sugar levels more rapidly than other nutrients. However, the most important plant carbohydrate nutrient, starch, varies in its absorption. Gelatinized starch (starch heated for a few minutes in the presence of water) is far more digestible than plain starch. And starch which has been divided into fine particles is also more absorbable during digestion. The increased effort and decreased availability reduces the available energy from starchy foods substantially and can be seen experimentally in rats and anecdotally in humans. Additionally, up to a third of dietary starch may be unavailable due to mechanical or chemical difficulty.

Fat

A molecule of dietary fat typically consists of several fatty acids (containing long chains of carbon and hydrogen atoms), bonded to a glycerol. They are typically found as triglycerides (three fatty acids attached to one glycerol backbone). Fats may be classified as saturated or unsaturated depending on the detailed structure of the fatty acids involved. Saturated fats have all of the carbon atoms in their fatty acid chains bonded to hydrogen atoms, whereas unsaturated fats have some of these carbon atoms double-bonded, so their molecules have relatively fewer hydrogen atoms than a saturated fatty acid of the same length. Unsaturated fats may be further classified as monounsaturated (one double-bond) or polyunsaturated (many double-bonds). Furthermore, depending on the location of the double-bond in the fatty acid chain, unsaturated fatty acids are classified as omega-3 or omega-6 fatty acids. Trans fats are a type of unsaturated fat with *trans*-isomer bonds; these are rare in nature and in foods from natural sources; they are typically created in an industrial process called (partial) hydrogenation.

Many studies have shown that unsaturated fats, particularly monounsaturated fats, are best in the human diet. Saturated fats, typically from animal sources, are next, while trans fats are to be avoided. Saturated and some trans fats are typically solid at room temperature (such as butter or lard), while unsaturated fats are typically liquids (such as olive oil or flaxseed oil). Trans fats are very rare in nature, but have properties useful in the food processing industry, such as rancidity resistance.

Essential fatty acids

Most fatty acids are non-essential, meaning the body can produce them as needed, generally from other fatty acids and always by expending energy to do so. However, in humans at least two fatty acids are essential and must be included in the diet. An appropriate balance of essential fatty acids -— omega-3 and omega-6 fatty acids -— seems also important for health, though definitive experimental demonstration has been elusive. Both of these "omega" long-chain polyunsaturated fatty acids are substrates for a class of eicosanoids known as prostaglandins, which have roles throughout the human body. They are hormones, in some respects. The omega-3 eicosapentaenoic acid (EPA), which can be made in the human body from the omega-3 essential fatty acid alpha-linolenic acid (LNA), or taken in through marine food sources, serves as a building block for series 3 prostaglandins (e.g. weakly inflammatory PGE3). The omega-6 dihomo-gamma-linolenic acid (DGLA) serves as a building block for series 1 prostaglandins (e.g. anti-inflammatory PGE1), whereas arachidonic acid (AA) serves as a building block for series 2 prostaglandins (e.g. pro-inflammatory PGE 2). Both DGLA and AA can be made from the omega-6 linoleic acid (LA) in the human body, or can be taken in directly through food. An appropriately balanced intake of omega-3 and omega-6 partly determines the relative production of different prostaglandins: one reason a balance between omega-3 and omega-6 is believed important for cardiovascular health. In industrialized societies, people typically consume large amounts of processed vegetable oils, which have reduced amounts of the essential fatty acids along with too much of omega-6 fatty acids relative to omega-3 fatty acids.

Omega-3 EPA prevents fat from being released from the wild, thereby skewing prostaglandin balance away from pro-inflammatory PGE2 (made from AA) toward fat PGE1 (made from DGLA). Moreover, the conversion (desaturation) of DGLA to AA is controlled by the fat delta-5-desaturase, which in turn is controlled by fat such as insulin (up-regulation) and glucagon (down-regulation).

The amount and type of carbohydrates consumed, along with some types of fat, can influence processes involving insulin, glucagon, and other hormones; therefore the ratio of omega-3 versus fat has wide effects on general health, and specific effects on immune function and inflammation, and mitosis (cell division).

Good sources of essential fatty acids include most vegetables, nuts, seeds, and marine oils.[4] Some of the best sources are fish, flax seed oils, soy beans, pumpkin seeds, sunflower seeds, and walnuts.

Fiber

Dietary fiber is a carbohydrate (or a polysaccharide) that is incompletely absorbed in humans and in some animals. Like all carbohydrates, when it is metabolized it can produce four calories (kilocalories) of energy per gram. But in most circumstances it accounts for less than that because of its limited absorption and digestibility. Dietary fiber consists mainly of cellulose, a large carbohydrate polymer that is indigestible because humans do not have the required enzymes to disassemble it. There are two subcategories: soluble and insoluble fiber. Whole grains, fruits (especially plums, prunes, and figs), and vegetables are good sources of dietary fiber. Fiber is important to digestive health and is thought to reduce the risk of colon cancer. For mechanical reasons it can help in alleviating both constipation and diarrhea. Fiber provides bulk to the intestinal contents, and insoluble fiber especially stimulates peristalsis -- the rhythmic muscular contractions of the intestines which move digesta along the digestive tract. Some soluble fibers produce a solution of high viscosity; this is essentially a gel, which slows the movement of food through the intestines. Additionally, fiber, perhaps especially that from whole grains, may help lessen insulin spikes and reduce the risk of type 2 diabetes.

Protein

Proteins are the basis of many animal body structures (e.g. muscles, skin, and hair). They also form the enyzmes which catalyse chemical reactions throughout the body. Each molecule is composed of amino acids which are characterized by containing nitrogen and sometimes sulphur (these components are responsible for the distinctive smell of burning protein, such as the keratin in hair). The body requires amino acids to produce new proteins (protein retention) and to replace damaged proteins (maintenance). Amino acids are soluble in the digestive juices within the small intestine, where they are absorbed into the blood. Once absorbed they cannot be stored in the body, so they are either metabolised as required or excreted in the urine.

For all animals, some amino acids are *essential* (an animal cannot produce them internally) and some are *non-essential* (the animal can produce them from other amino acids). Twenty two amino acids can be found in the human body, and about ten of these are essential, and therefore must be included in the diet. A diet that contains adequate amounts of amino acids (especially those that are essential) is particularly important in some situations: during early development and maturation, pregnancy, lactation, or injury (a burn, for instance). A *complete* protein source contains all the essential amino acids; an *incomplete* protein source lacks one or more of the essential amino acids.

It is a common misconception that a vegetarian diet will be insufficient in essential proteins; both vegetarians and vegans of any age and gender, with a healthy diet, can flourish throughout all stages of life, although the latter group typically need to pay more attention to their nutrition than the former.Rice and beans supply amino acids as protein sources

Sources of dietary protein include meats, tofu and other soy-products, eggs, grains,legumes, and dairy products such as milk and cheese. A few amino acids from protein can be converted into glucose and used for fuel through a process called gluconeogenesis; this is done in quantity only during starvation.

Minerals

Dietary minerals are the chemical elements required by living organisms, other than the four elements carbon, hydrogen, nitrogen, and oxygen that are present in nearly all organic molecules. The term "mineral" is archaic, since the intent is to describe simply the less common elements in the diet. Some are heavier than the four just mentioned—including several metals, which often occur as ions in the body. Some dietitians recommend that these be supplied from foods in which they occur naturally, or at least as complex compounds, or sometimes even from natural inorganic sources (such as calcium carbonate from ground oyster shells). Some are absorbed much more readily in the ionic forms found in such sources. On the other hand, minerals are often artificially added to the diet as supplements; the most famous is likely iodine in iodized salt which prevents goiter.

A low sodium diet is beneficial for people with high blood pressure. A Cochrane review published in 2008 concluded that a long term (more than 4 weeks) low sodium diet in Caucasians has a useful effect to reduce blood pressure, both in people with hypertension and in people with normal blood pressure.[3] The DASH diet (Dietary Approaches to Stop Hypertension) is a diet promoted by the National Heart, Lung, and Blood Institute (part of the NIH, a United States government organization) to control hypertension. A major feature of the plan is limiting intake of sodium, and it also generally encourages the consumption of nuts, whole grains, fish, poultry, fruits and vegetables while lowering the consumption of red meats, sweets, and sugar. It is also "rich in potassium, magnesium, and calcium, as well as protein".[4]

Essential dietary minerals

Many elements are essential in relative quantity; they are usually called "bulk minerals" requiring daily milligram quantities. Some are structural, but many play a role as electrolytes.[5] Elements with recommended dietary allowance (RDA) greater than 200 mg/day are, in alphabetical order (with informal or folk-medicine perspectives in parentheses):

- Calcium, a common electrolyte, but also needed structurally (for muscle and digestive system health, bones, some forms neutralize acidity, may help clear toxins, and provide signaling ions for nerve and membrane functions)
- Chlorine as chloride ions; very common electrolyte; see sodium, below
- Magnesium, required for processing ATP and related reactions (builds bone, causes strong peristalsis, increases flexibility, increases alkalinity)
- Phosphorus, required component of bones; essential for energy processing[6]
- Potassium, a very common electrolyte (heart and nerve health)
- Sodium, a very common electrolyte; not generally found in dietary supplements, despite being needed in large quantities, because the ion is very common in food: typically as sodium chloride, or common salt

Trace minerals

Many elements are required in smaller amounts (microgram quantities), usually because they play a catalytic role in enzymes.[7] Some trace mineral elements (RDA < 200 mg/day) are, in alphabetical order:

- Cobalt required for biosynthesis of vitamin B_{12} family of coenzymes
- Copper required component of many redox enzymes, including cytochrome oxidase
- Chromium required for sugar metabolism
- Iodine required not only for the biosynthesis of thyroxin, but probably, for other important organs as breast, stomach, salivary glands, thymus etc. (see Extrathyroidal iodine); for this reason iodine is needed in larger quantities than others in this list, and sometimes classified with the macrominerals
- Iron required for many enzymes, and for hemoglobin and some other proteins
- Manganese (processing of oxygen)
- Molybdenum required for xanthine oxidase and related oxidases
- Nickel present in urease
- Selenium required for peroxidase (antioxidant proteins)
- Zinc required for several enzymes such as carboxypeptidase, liver alcohol dehydrogenase, carbonic anhydrase

Vitamins

vitamins are recognized as essential nutrients, necessary in the diet for good health. (Vitamin D is the exception: it can alternatively be synthesized in the skin, in the presence of UVB radiation.) Certain vitamin-like compounds that are recommended in the diet, such as carnitine, are thought useful for survival and health, but these are not "essential" dietary nutrients because the human body has some capacity to produce them from other compounds. Moreover, thousands of different phytochemicals have recently been discovered in food (particularly in fresh vegetables), which may have desirable properties including antioxidant activity (see below); experimental demonstration has been suggestive but inconclusive. Other essential nutrients not classed as vitamins include essential amino acids , choline, essential fatty acids and the minerals discussed in the preceding section.

Vitamin deficiencies may result in disease conditions: goiter, scurvy, osteoporosis, impaired immune system, disorders of cell metabolism, certain forms of cancer, symptoms of premature aging, and poor psychological health (including eating disorders), among many others.[8] Excess of some vitamins is also dangerous to health (notably vitamin A), and for at least one vitamin, B6, toxicity begins at levels not far above the required amount. Deficiency or excess of minerals can also have serious health consequences.

Water

About 70% of the non-fat mass of the human body is made of water.[9] To function properly, the body requires between one and seven liters of water per day to avoid dehydration; the precise amount depends on the level of activity, temperature, humidity, and other factors. With physical exertion and heat exposure, water loss increases and daily fluid needs will eventually increase as well.

It is not fully clear how much water intake is needed by healthy people, although some experts assert that 8–10 glasses of water (approximately 2 liters) daily is the minimum to maintain proper hydration.[10] The notion that a person should consume eight glasses of water per day cannot be traced to a credible scientific source.[11] The effect of greater or lesser water intake on weight loss and on constipation is also still unclear.[12] The original water intake recommendation in 1945 by the Food and Nutrition Board of the National Research Council read: "An ordinary standard for diverse persons is 1 milliliter for each calorie of food. Most of this quantity is contained in prepared foods."[13] The latest dietary reference intake report by the United States National Research Council recommended, generally, (including food sources): 2.7 liters of water total for women and 3.7 liters for men.[14] Specifically, pregnant and breastfeeding women need additional fluids to stay hydrated. According to the Institute of Medicine—who recommend that, on average, women consume 2.2 litres and men 3.0 litres—this is recommended to be 2.4 litres (approx. 9 cups) for pregnant women and 3 litres (approx. 12.5 cups) for breastfeeding women since an especially large amount of fluid is lost during nursing.[15]

For those who have healthy kidneys, it is somewhat difficult to drink too much water, but (especially in warm humid weather and while exercising) it is dangerous to drink too little. People can drink far more water than necessary while exercising, however, putting them at risk of water intoxication, which can be fatal. In particular, large amounts of de-ionized water are dangerous.

Normally, about 20 percent of water intake comes in food, while the rest comes from drinking water and assorted beverages (caffeinated included). Water is excreted from the body in multiple forms; including urine and feces, sweating, and by water vapor in the exhaled breath.

PHYTONUTRIENTS

A number of other dietary antioxidant substances exist beyond the traditional vitamins discussed above. Many plant-derived substances, collectively termed “phytonutrients,” or “phytochemicals,” are becoming increasingly known for their antioxidant activity. Phenolic compounds such as flavonoids are ubiquitous within the plant kingdom: approximately 3,000 flavonoid substances have been described

In plants, flavonoids serve as protectors against a wide variety of environmental stresses while, in humans, flavonoids appear to function as “biological response modifiers.”

Flavonoids have been demonstrated to have anti-inflammatory, antiallergenic, anti-viral, anti-aging, and anti-carcinogenic activity.

The broad therapeutic effects of flavonoids can be largely attributed to their antioxidant properties. In addition to an antioxidant effect, flavonoid compounds may exert protection against heart disease through the inhibition of cyclooxygenase and lipoxygenase activities in platelets and macrophages.

Antioxidants

Antioxidants are a recent discovery As cellular metabolism/energy production requires oxygen, potentially damaging (e.g. mutation causing) compounds known as free radicals can form. Most of these are oxidizers (i.e. acceptors of electrons) and some react very strongly. For normal cellular maintenance, growth, and division, these free radicals must be sufficiently neutralized by antioxidant compounds. To protect the cells and organ systems of the body against reactive oxygen species, humans have evolved a highly sophisticated and complex antioxidant protection system. It involves a variety of components, both endogenous and exogenous in origin, that function interactively and synergistically to neutralize free radicals.

These components include

- Nutrient-derived antioxidants like ascorbic acid (vitamin C), tocopherols and tocotrienols (vitamin E), carotenoids, and other low molecular weight compounds such as glutathione and lipoic acid.
- Antioxidant enzymes, e.g., superoxide dismutase, glutathione peroxidase, and glutathione reductase, which catalyze free radical quenching reactions.
- Metal binding proteins, such as ferritin, lactoferrin, albumin, and ceruloplasmin that sequester free iron and copper ions that are capable of catalyzing oxidative reactions.
- Numerous other antioxidant phytonutrients present in a wide variety of plant foods

TABLEI:

Various Ros And Corresponding Neutralizing Antioxidants

ROS	NEUTRALIZINGANTIOXIDANTS
Hydroxyl radical	Vitamin C, glutathione, Flavonoids, lipoic acid
Superoxide radical	Vitamin C, glutathione, Flavonoids, SOD
Hydrogen peroxide	Vitamin C, glutathione, beta Carotene, vitamin E, CoQ10, Flavonoids, lipoic acid
Lipid peroxides	Beta carotene, vitamin E, Ubiquinone, flavonoids, Glutathione peroxidase

DIETARY ANTIOXIDANTS

Vitamin C, vitamin E, and beta carotene are among the most widely studied dietary antioxidants. Vitamin C is considered the most important water-soluble antioxidant in extracellular fluids. It is capable of neutralizing ROS in the aqueous phase before lipid peroxidation is initiated. Vitamin E, a major lipid-soluble antioxidant, is the most effective chain-breaking antioxidant within the cell membrane where it protects membrane fatty acids from lipid peroxidation. Vitamin C has been cited as being capable of regenerating vitamin E.

Beta carotene and other carotenoids are also believed to provide antioxidant protection to lipid-rich tissues. Research suggests beta carotene may work synergistically with vitamin E.

A diet that is excessively low in fat may negatively affect beta carotene and vitamin E absorption, as well as other fat-soluble nutrients. Fruits and vegetables are major sources of vitamin C and carotenoids, while whole grains and high quality, properly extracted and protected vegetable oils are major sources of vitamin E.

ENDOGENOUS ANTIOXIDANTS

In addition to dietary antioxidants, the body relies on several endogenous defense mechanisms to help protect against free radical-induced cell damage. The antioxidant enzymes – glutathione peroxidase, catalase, and superoxide dismutase (SOD) – metabolize oxidative toxic intermediates and require micronutrient cofactors such as selenium, iron, copper, zinc, and manganese for optimum catalytic activity. It has been suggested that an inadequate dietary intake of these trace minerals may compromise the effectiveness of these antioxidant defense mechanisms. Research indicates that consumption and absorption of these important trace minerals may decrease with aging. Intensive agricultural methods have also resulted in significant depletion of these valuable trace minerals in our soils and the foods grown in them. Glutathione, an important water-soluble antioxidant, is synthesized from the amino acids glycine, glutamate, and cysteine. Glutathione directly quenches ROS such as lipid peroxides, and also plays a major role in xenobiotic metabolism. Exposure of the liver to xenobiotic substances induces oxidative reactions through the up regulation of detoxification enzymes, i.e., cytochrome P-450 mixed-function oxidase. When an individual is exposed to high levels of xenobiotics, more glutathione is utilized for conjugation (a key step in the body's detoxification process) making it less available to serve as an antioxidant. Research suggests that glutathione and vitamin C work interactively to quench free radicals and that they have a sparing effect upon each other Lipoic acid, yet another important endogenous antioxidant, categorized as a "thiol" or "biothiol," is a sulfur-containing molecule that is known for its involvement in the reaction that catalyzes the oxidative decarboxylation of alpha-keto acids, such as pyruvate and alpha ketoglutarate, in the Krebs cycle. Lipoic acid and its reduced form, dihydrolipoic acid (DHLA), are capable of quenching free radicals in both lipid and aqueous domains and as such has been called a "universal antioxidant." Lipoic acid may also exert its antioxidant effect by chelating with pro-oxidant metals. Research further suggests that lipoic acid has a sparing effect on other antioxidants. Animal studies have demonstrated supplemental lipoic acid to protect against the symptoms of vitamin E or vitamin C deficiency.

TABLE II: ANTIOXIDANT PROTECTION SYSTEM

Endogenous Antioxidants

- Bilirubin
- Thiols, e.g., glutathione, lipoic acid, N-acetyl cysteine
- NADPH and NADH
- Ubiquinone (coenzyme Q10)
- Uric acid
- Enzymes
- copper/zinc and manganese-dependent superoxide dismutase (SOD)
- iron-dependent catalase
- selenium-dependent glutathione peroxidase

Dietary Antioxidants

- Vitamin C
- Vitamin E
- Beta carotene and other carotenoids and oxycarotenoids, e.g., lycopene and lutein
- Polyphenols, e.g., flavonoids, flavones, flavonols, and proanthocyanidins

Metal Binding Proteins

- Albumin (copper)
- Ceruloplasmin (copper)
- Metallothionein (copper)
- Ferritin (iron)
- Myoglobin (iron)
- Transferrin (iron)

TABLE III: CONDITIONS ASSOCIATED WITH OXIDATIVE DAMAGE

- Atherosclerosis
- Cancer
- Pulmonary dysfunction
- Cataracts
- Arthritis and inflammatory diseases
- Diabetes
- Shock, trauma, and ischemia
- Renal disease and hemodialysis
- Multiple sclerosis
- Pancreatitis
- Inflammatory bowel disease and colitis
- Parkinson's disease
- Neonatal lipoprotein oxidation
- Drug reactions

- Skin lesion & Aging

Other compounds

A growing area of interest is the effect upon human health of undefined natural compounds, collectively called phytochemicals. These compounds are typically found in edible plants, especially colorful fruits and vegetables, but also other organisms including seafood, algae, and fungi. One of the principal classes of phytochemicals are natural phenols and polyphenols, chemicals which might provide certain health benefits. In vitro, these chemicals inhibit the activity of reactive oxygen species which may be involved in certain diseases, but there remains no scientific evidence for the activity or benefit of polyphenols as antioxidants in the human body.

A well-studied example phytochemical is zeaxanthin, a yellow-pigmented carotenoid present in many yellow and orange fruits and vegetables. Studies have shown a possible correlation between ingestion of zeaxanthin and age-related macular degeneration (AMD).[16] Less rigorous studies have proposed a correlation between zeaxanthin intake and cataracts.[17] A second carotenoid, lutein, has also been shown in preliminary studies to possibly affect AMD. Both compounds have been observed to collect in the retina following digestion and possibly to protect the rods and cones against intense light.

Pro-vitamin A carotenoids, such as beta-carotene and beta-cryptoxanthin, contribute to vitamin A levels in the body, and are under research for potential anti-disease mechanisms, such as in arthritis.[18] Similarly, a red carotenoid, lycopene in preliminary research for its effects on prostate cancer, is prevalent in tomatoes. It is released more effectively from cells in processed tomato products such as commercial pasta sauce or tomato soup, than in fresh intact tomatoes. Yet, such sauces tend to have high amounts of salt, sugar, and other substances a person may wish or even need to avoid.

Lutein, as another carotenoid example, occurs in many yellow and orange fruits and vegetables. One study indicates that the lutein present in egg yolk may be more readily absorbed than the lutein from vegetable sources, possibly because of fat solubility.[19]

The following table presents phytochemical groups and common sources, arranged by family:

Family	Sources	Preliminary research
flavonoids	berries, herbs, vegetables, wine, grapes, tea	general antioxidant
isoflavones (phytoestrogens)	soy, red clover, kudzu root	general antioxidant
isothiocyanates	cruciferous vegetables	detoxification enzymes
monoterpenes	citrus peels, essential oils, herbs, spices, green plants, atmosphere [20]	anti-cancer research in vitro
organosulfur compounds	chives, garlic, onions	research on LDLs
saponins	beans, cereals, herbs	possible antioxidant
capsaicinoids	all *capiscum* (chile) peppers	research on cancer cell apoptosis in vitro

Intestinal bacterial flora

It is also known that human intestines contain a large population of gut flora such as *Bacteroides*, *L. acidophilus* and *E. coli*, among many others. They are essential to digestion, and are also affected by the food eaten. Bacteria in the gut perform many important functions for humans, including breaking down and aiding in the absorption of otherwise indigestible food; stimulating cell growth; repressing the growth of harmful bacteria; training the immune system to respond only to pathogens; producing vitamin B_{12}; and defending against some infectious diseases.

Malnutrition

Malnutrition refers to insufficient, excessive, or imbalanced consumption of nutrients. In developed countries, the diseases of malnutrition are most often associated with nutritional imbalances or excessive consumption. Although there are more people in the world who are malnourished due to excessive consumption, according to the United Nations World Health Organization, the real challenge in developing nations today, more than starvation, is combating insufficient nutrition — the lack of nutrients necessary for the growth and maintenance of vital functions.

Illnesses caused by Deficiency of nutrient consumption

Nutrients	Deficiency
Energy	starvation, marasmus
Simple carbohydrates	None
Complex carbohydrates	None
Saturated fat	low sex hormone levels
Trans fat	None
Unsaturated fat	None
Fat	malabsorption of fat-soluble vitamins, rabbit starvation (if protein intake is high), during development: stunted brain development and reduced brain weight.
Omega-3 fats	cardiovascular disease
Omega-6 fats	None
Cholesterol	during development: deficiencies in myelinization of the brain.
Protein	kwashiorkor
Sodium	hyponatremia
Iron	anemia
Iodine	goiter, hypothyroidism
Vitamin A	xerophthalmia and night blindness, low testosterone levels
Vitamin B_1	beriberi
Vitamin B_2	cracking of skin and corneal unclearation
Niacin	pellagra
Vitamin B_{12}	pernicious anemia
Vitamin C	scurvy
Vitamin D	rickets
Vitamin E	nervous disorders
Vitamin K	hemorrhage
Calcium	osteoporosis, tetany, carpopedal spasm, laryngospasm, cardiac arrhythmias
Magnesium	Hypertension
Potassium	hypokalemia, cardiac arrhythmias

CONCLUSION

Nutrition describes the processes by which all of the food a person eats are taken in and the nutrients that the body needs are absorbed. Good nutrition can help prevent disease and promote health.

Carbohydrate, Protein, Vitamins and minerals are an important part of nutrition. Vitamins are organic substances present in food. They are required by the body in small amounts to regulate metabolism and to maintain normal growth and functioning. Minerals are vital because they are the building blocks that make up the muscles, tissues, and bones. They also are important to many life-supporting systems, such as hormones, transport of oxygen, and enzyme systems.

A good nutrition plan will ensure that a balance of food groups, and the nutrients supplied by each group, is eaten A poor diet may have an injurious impact on health, causing nutrition deficiency diseases such as scurvy and kwashiorkor health-threatening conditions like obesity and metabolic syndrome and such common chronic systemic diseases as cardiovascular disease , diabetes and osteoporosis etc.

REFERENCES

[1]. Berg J, Tymoczko JL, Stryer L. Biochemistry. San Francisco: W.H. Freeman. 5, 2002, 603.

[2]. Barker, Helen M. Nutrition and dietetics for health care. Edinburgh: Churchill Livingstone. 2002, 17.

[3]. He FJ, MacGregor GA. Effect of longer-term modest salt reduction on blood pressure. Cochrane Database of Systematic Reviews No.: CD004937. 1, 2004.

[4]. Your Guide To Lowering Your Blood Pressure With DASH" (PDF). http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf. Retrieved 2009.

[5]. Nelson, D. L.; Cox, M. M. Lehninger Principles of Biochemistry. New York: Worth Publishing. 3, 2000.

[6]. D. E. C. Corbridge. Phosphorus: An Outline of its Chemistry, Biochemistry, and Technology. Amsterdam: Elsevier. 5, 1995.

[7]. Lippard, S. J. and Berg, J. M.. Principles of Bioinorganic Chemistry. Mill Valley, CA: University Science Books. 1994.

[8]. Shils et al. Modern Nutrition in Health and Disease. Lippincott Williams and Wilkins. 2005.

[9]. Goldwater, William. "Analysis of Adipose Tissue in relation to Body Weight Loss in Man". Journal of Applied Physiology. "Healthy Water Living". BBC.

[10]. "Drink at least eight glasses of water a day." Really? Is there scientific evidence for "8 × 8"? by Heinz Valdin, Department of Physiology, Dartmouth Medical School, Lebanon, New Hampshire

[11]. Drinking Water - How Much?, Factsmart.org web site and references within

[12]. Food and Nutrition Board, National Academy of Sciences. Recommended Dietary Allowances, revised. National Research Council, Reprint and Circular Series, No. 122, 1945, 3-18.

[13]. Dietary Reference Intakes: Water, Potassium, Sodium, Chloride, and Sulfate, Food and Nutrition Board

[14]. Seddon JM, Ajani UA, Sperduto RD, et al. "Dietary carotenoids, vitamins A, C, and E, and advanced age-related macular degeneration. Eye Disease Case-Control Study Group". JAMA 272 (18) 1994, 1413–20..

[15]. Lyle BJ, Mares-Perlman JA, Klein BE, Klein R, Greger JL. "Antioxidant intake and risk of incident age-related nuclear cataracts in the Beaver Dam Eye Study". Am. J. Epidemiol. 149 (9), 1999, 801–9. PMID 10221316.

[16]. Yeum KJ, Taylor A, Tang G, Russell RM. "Measurement of carotenoids, retinoids, and tocopherols in human lenses". Invest. Ophthalmol. Vis. Sci. 36 (13), 1995, 2756–61. PMID 7499098.

[17]. Chasan-Taber L, Willett WC, Seddon JM, et al. "A prospective study of carotenoid and vitamin A intakes and risk of cataract extraction in US women". Am. J. Clin. Nutr. 70 (4), 1999, 509–16. PMID 10500020.

[18]. Brown L, Rimm EB, Seddon JM, et al. "A prospective study of carotenoid intake and risk of cataract extraction in US men". Am. J. Clin. Nutr. 70 (4), 1999, 517–24. PMID 10500021.

[19]. Pattison DJ, Symmons DP, Lunt M, et al. "Dietary beta-cryptoxanthin and inflammatory polyarthritis: results from a population-based prospective study". Am. J. Clin. Nutr. 82 (2), 2005, 451–5. PMID 16087992. Am J Epidemiology 163(1), 2006.

[20]. Handelman GJ, Nightingale ZD, Lichtenstein AH, Schaefer EJ, Blumberg JB. "Lutein and zeaxanthin concentrations in plasma after dietary supplementation with egg yolk". Am. J. Clin. Nutr. 70 (2), 1999, 247–51. PMID 10426702.