

## Unbalanced nutrition and diseases

### Malnutrition

Malnutrition refers to insufficient, excessive, or imbalanced consumption of nutrients by an organism. In developed countries, the diseases of malnutrition are most often associated with nutritional imbalances or excessive consumption.

### Insufficient

Under consumption generally refers to the long-term consumption of insufficient sustenance in relation to the **energy** that an organism expends or expels, leading to poor health.

### Excessive

Over consumption generally refers to the long-term consumption of excess sustenance in relation to the energy that an organism expends or expels, leading to poor health and, in animals, **obesity**. It can cause excessive hair loss, brittle nails, and irregular premenstrual cycles for females

### Unbalanced

When too much of one or more nutrients is present in the diet to the exclusion of the proper amount of other nutrients, the diet is said to be unbalanced.

### Illnesses caused by improper nutrient consumption

Nutrients	Deficiency	Excess
<b>Macronutrients</b>		
<b>Calories</b>	<b>Starvation, marasmus</b>	<b>Obesity, diabetes mellitus, cardiovascular disease</b>
<b>Simple carbohydrates</b>	<b>None</b>	<b>Obesity, diabetes mellitus, cardiovascular disease</b>
<b>Complex</b>	<b>Micronutrient</b>	<b>Obesity, cardiovascular disease (high</b>

<b>x carboh ydrates</b>	<b>deficiency</b>	<b>glycemic index foods)</b>
<b>Protein</b>	<b>Kwashiorkor</b>	<b>Rabbit starvation, ketoacidosis (in diabetics)</b>
<b>Saturat ed fat</b>	<b>None</b>	<b>Obesity, cardiovascular disease</b>
<b>Trans fat</b>	<b>None</b>	<b>Obesity, Cardiovascular Disease</b>
<b>Unsat rated fat</b>	<b>Fat- soluble vitamin deficiency</b>	<b>Obesity, cardiovascular disease</b>
<b>Micronutrients</b>		
<b>Vitamin A</b>	<b>Xerophthalmia an d night blindness</b>	<b>Hypervitaminosis A (cirrhosis, hair loss)</b>
<b>Vitamin B<sub>1</sub></b>	<b>Beri-Beri</b>	<b>?</b>
<b>Vitamin B<sub>2</sub></b>	<b>Skin and corneal lesions</b>	<b>?</b>
<b>Niacin</b>	<b>Pellagra</b>	<b>Dyspepsia, cardiac arrhythmias, birth defects</b>
<b>Vitamin B<sub>12</sub></b>	<b>Pernicious anemia</b>	<b>?</b>

<b>Vitamin C</b>	<b>Scurvy</b>	<b>Diarrhea causing dehydration</b>
<b>Vitamin D</b>	<b>Rickets</b>	<b>Hypervitaminosis D (dehydration, vomiting, constipation)</b>
<b>Vitamin E</b>	<b>Neurological disease</b>	<b>Hypervitaminosis E (anticoagulant: excessive bleeding)</b>
<b>Vitamin K</b>	<b>Hemorrhage</b>	<b>?</b>
<b>Omega 3 Fats</b>	<b>Cardiovascular Disease</b>	<b>Bleeding, Hemorrhages, Hemorrhagic stroke, reduced glycemic control among diabetics</b>
<b>Omega 6 Fats</b>	<b>None</b>	<b>Cardiovascular Disease, Cancer</b>
<b>Cholesterol</b>	<b>None</b>	<b>Cardiovascular Disease</b>
<b>Macrominerals</b>		
<b>Calcium</b>	<b>Osteoporosis, tetany, carpopedal spasm, laryngospasm, cardiac arrhythmias</b>	<b>Fatigue, depression, confusion, nausea, vomiting, constipation, pancreatitis, increased urination, kidney stones</b>
<b>Magnesium</b>	<b>Hypertension</b>	<b>Weakness, nausea, vomiting, impaired breathing, and hypotension</b>

<b>Potassium</b>	<b>Hypokalemia, cardiac arrhythmias</b>	<b>Hyperkalemia, palpitations</b>
<b>Sodium</b>	<b>Hyponatremia</b>	<b>Hypernatremia, hypertension</b>
<b>Trace minerals</b>		
<b>Iron</b>	<b>Anemia</b>	<b>Cirrhosis, hepatitis C, heart disease</b>
<b>Iodine</b>	<b>Goiter, hypothyroidism</b>	<b>Iodine toxicity (goiter, hypothyroidism)</b>

### **Mental agility**

**Research indicates that improving the awareness of nutritious meal choices and establishing long-term habits of healthful eating have a positive effect on cognitive and spatial memory capacity, potentially increasing a student's potential to process and retain academic information.**

**Better nutrition has been shown to have an impact on both cognitive and spatial memory performance; a study showed those with higher blood sugar levels performed better on certain memory tests.<sup>[65]</sup> In another study, those who consumed yogurt performed better on thinking tasks when compared to those who consumed caffeine free diet soda or confections.<sup>[66]</sup> Nutritional deficiencies have been shown to have a negative effect on learning behavior in mice as far back as 1951.<sup>[67]</sup>**

**"Better learning performance is associated with diet induced effects on learning and memory ability".<sup>[68]</sup>**

**The "nutrition-learning nexus" demonstrates the correlation between diet and learning and has application in a higher education setting.**

**"We find that better nourished children perform significantly better in school, partly because they enter school earlier and thus have more time to learn but mostly because of greater learning productivity per year of schooling."<sup>[69]</sup>**

**91% of college students feel that they are in good health while only 7% eat their recommended daily allowance of fruits and vegetables.**<sup>[64]</sup>

**Nutritional education is an effective and workable model in a higher education setting.**<sup>[70][71]</sup>

### **Mental disorders**

**Nutritional supplement treatment may be appropriate for major depression, bipolar disorder, schizophrenia, and obsessive compulsive disorder, the four most common mental disorders in developed countries.**<sup>[73]</sup> **Supplements that have been studied most for mood elevation and stabilization include eicosapentaenoic acid and docosahexaenoic acid (each of which are an omega-3 fatty acid contained in fish oil, but not in flaxseed oil), vitamin B12, folic acid, and inositol.**

### **Cancer**

**Cancer is now common in developing countries. According to a study by the International Agency for Research on Cancer, "In the developing world, cancers of the liver, stomach and esophagus were more common, often linked to consumption of carcinogenic preserved foods, such as smoked or salted food, and parasitic infections that attack organs." Lung cancer rates are rising rapidly in poorer nations because of increased use of tobacco. Developed countries "tended to have cancers linked to affluence or a 'Western lifestyle' — cancers of the colon, rectum, breast and prostate — that can be caused by obesity, lack of exercise, diet and age."**<sup>[74]</sup>

### **Metabolic syndrome**

**Several lines of evidence indicate lifestyle-induced hyperinsulinemia and reduced insulin function (i.e. insulin resistance) as a decisive factor in many disease states. For example, hyperinsulinemia and insulin resistance are strongly linked to chronic inflammation, which in turn is strongly linked to a variety of adverse developments such as arterial microinjuries and clot formation (i.e. heart disease) and exaggerated cell division (i.e. cancer).**

Hyperinsulinemia and insulin resistance (the so-called **metabolic syndrome**) are characterized by a combination of abdominal **obesity**, elevated **blood sugar**, elevated **blood pressure**, elevated **blood triglycerides**, and reduced HDL **cholesterol**. The negative impact of hyperinsulinemia on prostaglandin PGE1/PGE2 balance may be significant.

The state of **obesity** clearly contributes to insulin resistance, which in turn can cause **type 2 diabetes**. Virtually all obese and most type 2 diabetic individuals have marked insulin resistance. Although the association between overweight and insulin resistance is clear, the exact (likely multifarious) causes of insulin resistance remain less clear. Importantly, it has been demonstrated that appropriate exercise, more regular food intake and reducing **glycemic load** (see below) all can reverse insulin resistance in overweight individuals (and thereby lower blood sugar levels in those who have type 2 diabetes).

Obesity can unfavourably alter hormonal and metabolic status via resistance to the hormone **leptin**, and a vicious cycle may occur in which insulin/leptin resistance and obesity aggravate one another. The vicious cycle is putatively fuelled by continuously high insulin/leptin stimulation and fat storage, as a result of high intake of strongly insulin/leptin stimulating foods and energy. Both insulin and leptin normally function as satiety signals to the **hypothalamus** in the brain; however, insulin/leptin resistance may reduce this signal and therefore allow continued overfeeding despite large body fat stores. In addition, reduced leptin signalling to the brain may reduce leptin's normal effect to maintain an appropriately high metabolic rate.

There is a debate about how and to what extent different dietary factors— such as intake of processed carbohydrates, total protein, fat, and carbohydrate intake, intake of saturated and trans fatty acids, and low intake of vitamins/minerals—contribute to the development of insulin and leptin resistance. In any case, analogous to the way modern man-made pollution may potentially overwhelm the environment's ability to maintain **homeostasis**, the recent explosive

introduction of high **glycemic index** and processed foods into the human diet may potentially overwhelm the body's ability to maintain homeostasis and health (as evidenced by the metabolic syndrome epidemic).

### **Hyponatremia**

Excess water intake, without replenishment of sodium and potassium salts, leads to **hyponatremia**, which can further lead to **water intoxication** at more dangerous levels. A well-publicized case occurred in 2007, when **Jennifer Strange** died while participating in a water-drinking contest.<sup>[75]</sup> More usually, the condition occurs in long-distance endurance events (such as **marathon** or **triathlon** competition and training) and causes gradual mental dulling, headache, drowsiness, weakness, and confusion; extreme cases may result in coma, convulsions, and death. The primary damage comes from swelling of the brain, caused by increased osmosis as blood salinity decreases. Effective fluid replacement techniques include water aid stations during running/cycling races, trainers providing water during team games, such as soccer, and devices such as Camel Baks, which can provide water for a person without making it too hard to drink the water.

### **Antinutrient**

Antinutrients are natural or synthetic compounds that interfere with the absorption of nutrients. Nutrition studies focus on antinutrients commonly found in food sources and beverages.

### **Processed foods**

Since the **Industrial Revolution** some two hundred years ago, the food processing industry has invented many **technologies** that both help keep foods fresh longer and alter the fresh state of food as they appear in nature. Cooling is the primary technology used to maintain freshness, whereas many more technologies have been invented to allow foods to last longer without becoming spoiled. These latter technologies include **pasteurisation, autoclavation, drying, salting,** and separation of various components, all of which appear to alter the original nutritional contents of

food. Pasteurisation and autoclavation (heating techniques) have no doubt improved the safety of many common foods, preventing epidemics of bacterial infection. But some of the (new) food processing technologies undoubtedly have downsides as well.

Modern separation techniques such as **milling**, **centrifugation**, and **pressing** have enabled concentration of particular components of food, yielding flour, oils, juices and so on, and even separate fatty acids, amino acids, vitamins, and minerals. Inevitably, such large scale concentration changes the nutritional content of food, saving certain nutrients while removing others. Heating techniques may also reduce food's content of many heat-labile nutrients such as certain vitamins and phytochemicals, and possibly other yet to be discovered substances.<sup>[76]</sup> Because of reduced nutritional value, processed foods are often 'enriched' or 'fortified' with some of the most critical nutrients (usually certain vitamins) that were lost during processing. Nonetheless, processed foods tend to have an inferior nutritional profile compared to whole, fresh foods, regarding content of both sugar and high GI starches, **potassium/sodium**, vitamins, fiber, and of intact, unoxidized (essential) fatty acids. In addition, processed foods often contain potentially harmful substances such as oxidized fats and trans fatty acids.

A dramatic example of the effect of food processing on a population's health is the history of epidemics of **beri-beri** in people subsisting on polished rice. Removing the outer layer of rice by polishing it removes with it the essential vitamin **thiamine**, causing beri-beri. Another example is the development of **scurvy** among infants in the late 19th century in the United States. It turned out that the vast majority of sufferers were being fed milk that had been heat-treated (as suggested by **Pasteur**) to control bacterial disease. Pasteurisation was effective against bacteria, but it destroyed the vitamin C.