



Editorial Article

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Public health and natural toxins in foods

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Food contains various chemical components including carbohydrates (sugars), proteins, fats, vitamins, minerals and water. Some of chemical compounds may be toxic if to be used in large amounts. Some herbs may contain chemical compounds that are toxic to humans and animals. Some of these chemical compounds exist in plants to protect them from plant diseases, insects and other organisms (1). A small number of these chemical compounds, such as the Hydrazine compounds that are present in few mushrooms, are carcinogenic at very low doses (2).

However, chemical compounds of plants have some adverse effects that can interfere with detoxification mechanisms, allergic reactions, metabolic processes, and the availability of nutrients in humans and animals.

Many natural toxins are found in the main foods of human diet such as plants, algae, fish and types of molds. Some of these are discussed below.

Plant Natural Toxins

Furocoumarins are a class of chemical compounds, which are produced by many plants such as the families Leguminosae, Rutaceae, Apiaceae and Moraceae. Eating these plants by humans may lead to complications from coumarin use. Adverse effect of furocoumarins include gastrointestinal problems in susceptible people and photo-toxicity (3).

Lectin proteins (phytohaemagglutinins) are one of plant toxins that are produced only by cereals and legumes and very low in fruits, raw vegetables, tomatoes and nuts. When untreated lectins are

ingested, red blood cells agglutinate by them and they can bind to the intestinal epithelium that end cause impairing nutrient absorption. Fortunately, heat destroys the toxicity of this plant toxin (4). In plants such as lima beans, cassava, butter beans, sorghum and the seeds of some fruits such as bitter almonds and peach kernels, macadamia, flax and apricot kernels, cyanogenic glycosides are found. Cyanide is formed following the hydrolysis of cyanogenic glycosides, which can cause dizziness, headache, nausea and vomiting, rapid breathing, convulsions, low blood pressure, lung injury, respiratory failure and ultimately death (5).

Solanine and chaconine (steroidal glycoalkaloids) are plant toxins produced only by solanacea plants, which include tomatoes, potatoes, and eggplants. While levels are generally low, higher concentrations are found in potato sprouts and bitter-tasting peel and green parts, as well as in green tomatoes. Plants produce, solanine and chaconine by reacting with stress such as bruises, UV light, microorganisms and attacks from insect pests and plants (6).

In the plants of the families Asteraceae, Boraginaceae and Fabaceae, pyrrolizidine alkaloids (PAs) are produced. Eating the plants from such families by humans may lead to complications raised by PAs. Adverse effect of PAs include acutely toxic and of main concern is the DNA-damaging potential and potentially leading to cancer (7).

Some plant foods like food plants such as chick peas and vetch are found in chemical compounds (Lathyrogens). Lathyrogens are derivatives of amino acids that act as metabolic antagonists of glutamic acid which is a neurotransmitter in the brain. When food

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plants containing lathrogens are eaten by humans, they cause a crippling paralysis of the lower limbs and death (8).

Protease inhibitors are particularly found in the Fabaceae, cereal grains and herbal tubers. These inhibit activity of enzymes chymotrypsin and trypsin. For example, raw soybean contains a protein that inactivates trypsin, and also increases the size of the pancreas and thus increase its secretion activity (8).

A mycotoxin is a toxic secondary metabolite that is naturally produced by certain types of molds and is capable of causing disease and death in both humans and other animals. Mycotoxins can grow on cereals, dried fruits, nuts and spices before harvest or after harvest, during storage in the food itself often under damp, humid and warm conditions. Mycotoxins can cause acute and chronic intoxications (mycotoxicosis), allergies, tumors and immune system deficiency diseases in human (9).

Poisonous mushrooms (wild mushrooms) may contain several toxins, such as muscimol muscarine and, to higher amounts of arsenic and other toxic metals, which can cause vomiting, diarrhea, confusion, visual disturbances, salivation, hallucinations, cancer and death. Toxins are not activated by cooking or peeling operation. It is advisable to avoid eating wild fungi unless clearly identified as non-poisonous (10).

Marine Natural Toxins

Algal toxins are classified in a specific group from marine toxins that are generated during blooms of particular naturally occurring algal species. Eating mussels, scallops and oysters and fish by humans may lead to complications from algal toxins. Adverse effect of algal toxins include diarrhea, vomiting, tingling and paralysis (11).

Ciguatoxins are determined in a specific group from marine toxins that are produced only by certain strains of *Gambierdiscus toxicus*. Ciguatera fish poisoning (CFP) which is due to the consumption of fish contaminated with dinoflagellates that produce ciguatoxins. Some fish known to harbor ciguatoxins include black grouper, barracuda, snapper, dog and king mackerel. Adverse effect of ciguatera poisoning include gastrointestinal disorder such as nausea, vomiting and neurologic symptoms, such as tingling sensation on fingers and toes (11).

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