Food Groups in Human Nutrition

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Introduction

A healthy diet that includes a variety of foods from each food group is important for the maintenance of good health and prevention of disease.

Food groups include; vegetables and fruit, grain products, milk and alternatives, meat and alternatives, plus a small amount of added fats and oils [1]. In addition to the types of foods consumed, the amount and/or portion sizes are also important in maintaining a healthy body weight. Together healthy eating and physical activity can help reduce the risk of obesity and prevent chronic diseases such as type 2 diabetes, heart disease, certain types of cancer and osteoporosis [1].

Fat, protein and carbohydrates, as well as minerals, vitamins and water must be consumed in adequate amounts to meet nutrient needs. Consuming a diet that includes a variety of foods from all food groups is important to prevent deficiencies and decrease the risk of chronic disease.

Food definition: According the EU legislation (Regulation EC No. 178/2002) "food" (or "foodstuff") means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans. "Food" includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment.

Grain Products

Grain products are a staple food in most diets. In developing countries cereals make up a significant portion of the calorie and nutrient intake, compared to developing countries. Examples of cereal grains include; corn, rice, wheat oats, rye, barley, millet, and sorghum. Nutrients provided by grain products include carbohydrate, B vitamins (e.g., thiamin, riboflavin, niacin and folate), iron, zinc, magnesium and other components such as fibre. Whole grains are typically higher in vitamins, fibre, minerals and phytochemicals than refined grains. Micronutrient deficiencies such as pellagra and beri beri occur primarily among poor populations usually in emergency situations where a single cereal grain is the main nutrient source for extended periods of time.

Pellagra, caused by niacin deficiency, typically occurs in very poor population groups or in emergency situations among refugees in Africa and Asia who rely on maize as a main staple. Niacin is present in maize but bound in a form that humans cannot utilize. The liver can synthesize niacin from tryptophan. However, tryptophan is present only in limited quantities in maize and this leads to niacin deficiency. Despite the fact that maize is a main staple among Native Americans, historically pellagra was not a problem in this population due to traditional treatment of maize with lime or wood ashes which liberates the bound niacin [3].

In populations relying primarily on milled or polished rice as a main staple, thiamine (vitamin B1) deficiency known as beri beri may occur. Similar to pellagra, beri beri usually occurs only in very poor population group, in emergency situations and/or among refugees [4]. Through the milling process both the bran and germ layers are removed from the rice leaving only the endosperm that mainly consists of starch. Unlike brown rice, milled rice is less nutritious and contains less protein, fat, vitamins and minerals.

Vegetables and Fruit

Vegetables and fruit are an important source of vitamins, minerals and fibre. A diet rich in vegetables and fruit is important for good health and is associated with decreased risk of cardiovascular disease and certain types of cancer [1]. Vegetables and fruit are typically low in fat and it is recommended that these foods make up the largest part of the diet.

Roots and tubers are a dietary staple and main source of energy for millions of people in developing countries around the world [5]. Roots and tubers provide a variety of nutrients including carbohydrate, vitamins, minerals,

fiber and important non-nutritive components such as phytochemicals.

Cassava is among the most widely produced crop in this group, which also includes yam, potatoes and a variety of aroids. Following maize and rice, cassava represent one of the most important dietary staples for people living in the tropics. This starchy, drought resistant crop grows well even in poor soil conditions and plays an important role in food security for millions of poor people globally. It must be prepared carefully before consuming as it contains cyanogenic glycoside linamarin that can cause serious illness [5-6]. The roots are traditionally ground, washed and dried to hydrolyze the major part of this toxin.

In the western world, potatoes represent the main tuber consumed. Potatoes are a good source of energy with calories mainly from starch. This tuber is a good source of B vitamins, vitamin C, potassium, iron, and fibre. In the Czech Republic and some other countries, potatoes represent a major source of dietary Vitamin C. During food preparation such as boiling, roasting, etc. some vitamin C is lost due to the heat sensitive nature of this vitamin. Potato chips do not contain vitamin C.

Sugar beet is a root crop, which is processed to sucrose (table sugar).

Similar to other root vegetables, turnips, carrots, beetroot, and parsnips have a high water content and contain both simple and complex carbohydrates. They are a poor source of protein, but also contain important micronutrients and non-nutritive components. The antioxidant, β – carotene, is found in deep yellow/orange vegetables and fruits and dark green leafy vegetables. β -carotene is readily converted to Vitamin A, which plays any important role normal growth and development, immune system function, and vision [7].

Leafy vegetables such as lettuce, kale, swiss chard, and spinach are loaded with vitamins, minerals and non nutritive components including phytochemicals, fiber and antioxidants. Due to their high water content leafy vegetables are relatively low in energy density. Leafy vegetables are a rich source of micronutrients, but food preparation methods such as boiling, freezing, canning and drying can lead to significant micronutrient losses.

Fruits are typically higher in natural sugar and water than vegetables, and are a good source of fiber. The calories in fruit mainly come from carbohydrate in the form of naturally occurring sugars such as sucrose, glucose and fructose. Fruits provide little or no protein and fat, with the exception of avocado which is rich in heart healthy polyunsaturated fat. Fruits, similar to vegetables, are an important source of micronutrient, especially Vitamin C. The micronutrient content of fruits can vary widely depending on season, processing, storage methods, etc.

Similar to deep yellow and orange vegetables, bright coloured fruits such as apricots, cantaloupes, papayas, mangoes, nectarines, and peaches are a good source of β carotene; a precursor of vitamin A.

As part of a balanced diet, fruits and vegetables play not only in preventing micronutrient deficiencies (such as scurvy), but also in preventing obesity and non-communicable chronic diseases such as heart disease, cancer and diabetes [8]. In 2002 the WHO estimated that low intake of vegetables and fruits contributes to 31% of ischaemic heart disease, 11% of stroke and 19% of gastrointestinal cancer worldwide [8].

Milk & Alternatives

Milk and alternatives include milk, fortified soy beverage, canned or evaporated milk, cheese, yogurt and powdered milk. These foods are an important source of dietary protein and fat, as well as calcium and vitamin D. These micronutrients play an important role in the development of healthy bones and teeth, and reduce the risk of osteoporosis [1]. Vitamin D deficiency is rare in developed countries because mothers are recommended to give infants supplements of vitamin D and breast milk substitutes are fortified.

Meat & Alternatives

Meat and alternatives include eggs, fish, legumes such as chick peas, kidney beans and lentils, meat, nuts and seeds, poultry, shellfish and tofu. These foods provide a good source of protein and fat, as well as iron, B vitamins, zinc and magnesium [1].

Meat alternatives such as beans, lentils, and tofu are some of the best vegetarian sources of protein. Many legumes are low in fat, rich in antioxidants, and a good source of fibre. Legumes are a source of B vitamins, folic acid and non-heme iron, although the bioavailability is lower than heme iron from animal sources [9].

Meat, fish and poultry are good sources of heme iron, but these foods tend to be higher in fat than vegetarian alternatives. Therefore, lean or extra lean cuts of meat prepared with little or no added fat are recommended as

part of a healthy diet [1].

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