# The Pros and Cons of Food Processing and Nutrition –An Optimal Better Health Channel

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# Abstract

Processed foods are generally thought to be inferior to unprocessed foods. They may bring to mind a packaged food item containing many ingredients, perhaps even artificial colors, flavors, or other chemical additives. Often referred to as convenience or pre-prepared foods, processed foods are suggested to be a contributor to the obesity epidemic and rising prevalence of chronic diseases like heart disease and diabetes. Food processing is an essential element of food systems around the world. It provides people access to safe and nutritious food and it is a key tool for curbing food loss and waste, increasing food affordability, diversifying diets, and scaling up sustainable production practices. Processing helps build resilience into complex food systems and continued advances in processing is at the center of food supply and demand. Nearly all food consumed, whether in low- or high-income countries, rural or urban areas, is processed in some way to allow for the availability and affordability of safe, nutritious foods yearround. Food processing ranges from simple techniques used by individuals to large-scale industry operations that involve cutting-edge science and technology. USAID and its partners are involved in an array of food processing activities from large scale food fortification to activities involving small and medium-sized enterprises (SMEs) in smaller-scale processing activities.

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# Introduction

# **Processed Foods and Health**

The processing of food began many years ago in order to ensure the availability of edible food. Some of the earliest recorded examples of food processing include drying of cereals and meat, threshing of grains, smoking of venison and fermentation of milk into curds. In present day, food is processed for numerous reasons, ranging from convenience to nutrient enhancement. The role of food processing in food and nutrition security is well established but what role does nutrition play in food processing? Food processing has a number of important benefits, such as creating products that have a much longer shelf life than raw foods. Also, food processing protects the health of the consumer and allows for easier shipment and the marketing of foods by corporations. However, there are certain drawbacks. Food processing can reduce the nutritional content of raw ingredients. For example, canning involves the use of heat, which destroys the vitamin C in canned fruit. Also, certain food additives that are included during processing, such as high fructose corn syrup, can affect the health of a consumer. However, the level of added sugar

can make a major difference. Small amounts of added sugar and other sweeteners, about 6 to 9 teaspoons a day or less, are not considered harmful

# **Food Processing**

Food is processed in some way before it is eaten. Commercially, the main reasons to process food are to eliminate micro-organisms (which may cause disease) and to extend shelf life. Simply cooking or combining a food with other foodstuffs to create a recipe is also considered a form of food processing. Whatever the case, the nutrient value of any food is often altered by the processing.

# What's a Whole Food?

A whole food is one that is consumed in its natural form without any physical change or additives whatsoever. Truly whole foods would be consumed in their raw form: like fruit and salad vegetables. However, the term does usually allow for minimal processing like cooking and basic milling as long as there's no combining of foods and nothing taken away. Examples of whole foods include unpolished grains, beans, fruit, nuts, vegetables, meat, eggs and non-homogenised milk.

# Is there Anything Wrong with Processed Foods?

We process foods every day when we prepare meals for ourselves, yet we frequently hear the term 'processed food' bandied about in a negative fashion, suggesting that processed foods are in some way inferior to their unprocessed counterparts. It's true that a large amount of processed foods contain unwanted food additives that may not be ideal for our bodies. But think about it, looking at the definition above again, even foods like canned fruit in its own juice is a processed food; the process of separating the edible fruit from the skin and putting it into an airtight can is a 'process'. There's nothing wrong with this, indeed, the canning process helps to retain some labile micronutrients.

On the other end of the spectrum, we have ready-meals in plastic trays containing preservatives and a quick blast in the microwave oven gives us a hot meal. And we have jelly sweets and other confectionery laden with sugars, colours and flavourings. Neither of these are nutritionally particularly desirable.

# **Benefits of Food Processing**

There are numerous benefits of food processing, These include:

- Food safety food processes remove harmful bacteria and toxins.
- **Preservation** food processing enables the shelf-life of foods to be extended hugely. This allows for better transport of food, convenience and choice. Man has been preserving food since prehistoric times with processes like the addition of salt to meat.
- **Nutrient conservation** some nutrients are inhibited when food is in its whole form, but are released when the food is processed. For example, grinding or soaking of flaxseed breaks them down so the body can digest the omega-3 fats.
- **Palatability** food processing helps enhance the taste of food and can improve the mouthfeel.
- Attractiveness foods can be processed to be presented in an appealing way.
- **Benefits to people on special diets** food processing allows diabetics, coeliacs and people with food allergies or other conditions which mean they have to follow a specific diet a less restrictive and more entertaining food selection.
- **Boosted nutrition** food processing can also add extra nutrients, eg the fortification of breakfast cereals.



# **Favoured Processed Foods**

- 100% whole grains, like oats, barley, buckwheat, quinoa
- Pre-chopped fruit and vegetables
- Canned fruit, vegetables and legumes
- Dried fruit, vegetables and legumes
- Frozen fruit, vegetables and meat
- Fresh fruit juice
- Nut and seed butters without added sugar and salt
- Fortified plant milks
- Meat alternatives such as mycoprotein
- Canned fish
- Plain Greek yoghurt
- Soy products such as tofu
- Soaked beans
- Ground seeds such as flaxseed
- Couscous
- High fibre, no added sugar breakfast cereals
- Wholemeal pastas
- Huel Products



# **Unfavoured Processed Foods**

- Confectionery items such as sweets and chocolate
- Most fast foods from take-aways such as burgers, fries, and doner kebabs
- Crisps
- Soda pops and other sugary drinks
- High fat and sugar baked goods such as cakes and pastries



# Effects of processing and storage of food

Some vitamins are more stable (less affected by processing) than others. Water-soluble vitamins (**B-group** and C) are more unstable than fat-soluble vitamins (K, A, D and E) during food processing and storage.

#### The most unstable vitamins include:

- folate
- thiamine
- vitamin C.

# More stable vitamins include:

- niacin (vitamin B3)
- vitamin K
- vitamin D
- biotin (vitamin B7)
- pantothenic acid (vitamin B5).

# Processes affecting food nutrient content

A variety of things can happen during the growing, harvesting, **storage** and **preparing of food** that can affect its nutritional content. Processes that expose foods to high levels of heat, light or oxygen cause the greatest nutrient loss.

#### Fertilisers

Most plant crops are produced with the aid of fertilised soils. High use of nitrogen fertilisers tends to reduce the vitamin C content in many fruit and vegetable crops. It does not seem to make any difference to the plant's nutrient value whether the fertiliser is organic or not.

# Milling

**Cereals** such as wheat can be ground to remove the fibrous husks. The husks contain most of the plant's **dietary fibre**, B-group vitamins, phytochemicals and some minerals.

That is why products such as white bread are less nutritious than wholemeal varieties, even if they have been artificially fortified with some of the nutrients that were lost after milling.

It is impossible to add back everything that is taken out, especially the phytochemicals. The 'fibre' that is added back to some products is often in the form of resistant starch, which may not be as beneficial as the fibre removed.

#### Blanching

Before a food is canned or frozen, it is usually heated very quickly with steam or water. The water-soluble vitamins, including vitamin C and B-complex, are sensitive and easily destroyed by blanching.

#### Canning

Food is heated inside the can to kill any dangerous micro-organisms and extend the food's shelf life. Some types of micro-organisms require severe heat treatment and this may affect the taste and texture of the food, making it less appealing. Preservatives are generally not needed or used in canned foods.

Water-soluble vitamins are particularly sensitive to high temperatures. Many people believe that canned foods are not as nutritious as their fresh counterparts, but this is not always the case, as fresh food often deteriorates more rapidly than canned foods.

#### Freezing

The nutrient value of a food is retained when it is frozen. Any nutrient losses are due to the processing prior to freezing and the cooking once the frozen food is thawed.

#### Pasteurisation

Pasteurisation involves heating liquid foods such as <u>milk</u> and fruit juices to specific temperatures to destroy microorganisms. The nutrient value of milk is generally unaffected. In the case of pasteurised fruit juices, some losses of vitamin C can occur.

#### High pressure processing

This alternative preservation method subjects a food to elevated pressures, with or without the use of heat to kill micro-organisms. This method has been used in foods such as fruit juices. As heat is not required, this process impacts less on the vitamin content, flavour and colour of foods.

#### Dehydrating

Drying out foods such as fruits can reduce the amount of vitamin C they retain, but it can also concentrate other nutrients, particularly fibre in plant foods. Dehydrating food also makes food products more energy dense, which may contribute to weight gain.

If a dehydrated food is reconstituted and cooked with water, further nutrients are leached out of the food and lost in the cooking water.

# **Preparation of vegetables**

Most vegetables are peeled or trimmed before cooking to remove the tough skin or outer leaves. But most nutrients, such as vitamins, tend to lie close to the skin surface, so excessive trimming can mean a huge reduction in a vegetable's nutrient value.

# Losing nutrients through cooking

Some vitamins dissolve in water, so you lose your vitamins to the cooking water if you prefer to boil your vegetables. For example, boiling a potato can cause much of the potato's B and C vitamins to migrate into the boiling water.

It is still possible to benefit from these nutrients if you consume the liquid, for example, by turning the potato and the liquid into a soup. Alternative cooking methods such as grilling, roasting, steaming, stir-frying or microwaving generally preserve a greater amount of vitamins and other nutrients.

# **Benefits of cooking food**

It would be inaccurate to say that cooking food always lessens the nutrient value. Cooking can be advantageous in many ways, including:

- making the food tastier
- breaking down parts of vegetables that would otherwise be indigestible
- destroying bacteria or other harmful micro-organisms
- making phytochemicals more available, for instance, phytochemicals are more available in cooked tomatoes than in raw tomatoes. (Phytochemicals are chemicals produced by plants).

# Preserving the nutrient value of vegetables

Some suggestions to retain the maximum nutrition in the foods you cook include:

- Store foods properly, such as keeping cold foods cold and sealing some foods in airtight containers.
- Keep vegetables in the crisper section of the refrigerator.
- Try washing or scrubbing vegetables rather than peeling them.
- Use the outer leaves of vegetables like cabbage or lettuce unless they are wilted or unpalatable.
- Microwave, steam, roast or grill vegetables rather than boiling them.
- If you boil your vegetables, save the nutrient-laden water for soup stock.
- Use fresh ingredients whenever possible.
- Cook foods quickly.

# Ultra-processed foods

Ultra-processed foods and beverages are products formulated from industrial processes and/or contain industrially derived ingredients.

The processing techniques used in ultra-processed foods differ from the more basic and traditional methods described above. Industrial techniques include fractionation, hydrogenation, hydrolysis, extrusion, moulding and pre-frying.

Ultra-processed foods are typically highly convenient and palatable, and tend to be high in added **sugars**, **salt**, oils and **fats**. They also contain ingredients and **additives** that can't usually be found in a home pantry, such as artificial colours and flavours, emulsifiers, and inverted sugars.

Some common examples of ultra-processed foods include:

- carbonated soft drinks and energy drinks
- confectionary, biscuits, pastries
- sweetened breakfast cereals
- pre-prepared meat, cheese, pasta and pizza dishes
- sausages, burgers, hot dogs and other reconstituted meat products
- powdered and packaged 'instant' soups, noodles and desserts.

#### Ultra-processed food and health

Consumption of ultra-processed foods can lead to increased energy intake, resulting in weight gain.

A high proportion of ultra-processed foods in the diet is also linked to:

- obesity
- cardiovascular and metabolic diseases
- cancer
- gastrointestinal disorders
- depression.

The mechanisms explaining the association between consumption of ultra-processed foods and chronic disease are still unclear. However it is likely explained in part by increased intake of sugar, salt, fats and oils, increased energy intake due to their hyperpalatable nature, and the displacement of meals prepared from nutritious unprocessed and minimally processed foods.

# **Preservation and food safety**

Over time, yeasts, molds, bacteria, and other forces cause food to spoil, making it foul-tasting, less nutritious, and potentially unsafe to eat. Many of the oldest food processing techniques, such as drying fruit, pickling vegetables, salting meat, and fermenting dairy (e.g., to make cheese or yogurt) remain important to this day because they preserve food, delaying spoilage.<sup>2</sup> Preservation allows people to ship foods over greater distances, stock them in stores longer, and enjoy them for a greater part of the year with more nutrients intact.

Processing can also help to inhibit or destroy pathogens (disease-causing organisms) that may contaminate food. Preservation techniques such as refrigeration, fermentation, dehydration, and the use of salt, sugar, or chemical preservatives can slow or stop the growth of pathogens. Heat processes, such as pasteurization and cooking, are used to destroy them.<sup>1</sup>

# **Drawbacks of Food Processing**

There can be some nutritional losses during some methods of processing, especially of some of the labile micronutrients like potassium and vitamin C.Some food additives may have links to causing adverse reactions and there is a lot of negativity about E numbers. There are particular concerns regarding some food colours and preservatives causing urticaria and hyperactivity implying that they have almost drug-like effects! There is legislation regarding some artificial colourants and preservatives (including benzoates) . Indeed, some people are affected so much that they follow benzoate-free or azo-free diets.During blending and mixing of food, there is a risk of cross contamination with other foods: this can be a potential danger to people with food allergies. As a result food labelling laws are put in place to ensure this is made clear and visible to the consumer. Plus processing requires strict regulation and, in some cases, unwanted ingredients may slip through and not be present on the label (eg the horse meat scandal). There is also a risk of contaminants from machinery like plastic and metals; so there's strict legislation in place to ensure that the risk of contamination is minimal.Raw meat may be a whole food, but as soon as anything is added, it's processed. Meats are cured to drastically increase their shelf life and this is very successful

in preventing food poisoning and bacterial spoilage, but there are links that the sodium nitrites formed during the curing process can form nitrosamines with links to cancers<sup>-</sup>

Indeed, the overcooking of some meats is also undesirable. Frying in some oils can lead to the fats in the oils oxidising which makes them more atherosclerotic (plaque-forming) and increases the risk of cardiovascular diseases and some cancers. Plus when some meats and fish are cooked to extreme temperatures through excessive frying or in heating in an open flame, heterocyclic amines (HCAs) and polycyclic aromatic hydrocarbons (PAHs) can be formed which have been shown to be mutagenic and can increase the risk of cancers.

# **Conclusion:**

The term 'food processing' could be described as 'the transformation of raw ingredients by physical or chemical means into food'. Food processing combines raw food ingredients either through physical mechanisms or through the inclusion of additives to produce marketable food products that can be easily prepared and served by the consumer.

The relationship between food processing and diets can be complex, but through a food systems approach that is considerate of the many actors, processes, and perspectives involved, food processing activities can positively influence diets and nutrition. The goal for this brief is to inform and inspire conversation around food processing activities for improved diets towards stronger program design and effective collaboration with food processors.

Food processing is any method used to turn fresh foods into food products.<sup>1</sup> This can involve one or a combination of various processes including washing, chopping, pasteurising, freezing, fermenting, packaging, cooking and many more.Food processing also includes adding ingredients to food, for example to extend shelf life.Food processing includes traditional (heat treatment, fermentation, pickling, smoking, drying, curing) and modern methods (pasteurisation, ultra-heat treatment, high pressure processing, or modified atmosphere packaging).

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