



This Food Science Fact Sheet is one of a series compiled by Institute of Food Science and Technology, providing clear, concise and scientifically reliable information on key food science topics for consumers.

Food Processing

What is food processing?

Covers a wide range of activities which transform agricultural produce into ingredients, food and drinks. Also refers to the basic preparation of foods for consumption, cooking and storage.

How processed is our food?

One way of differentiating is:

Primary - minimal alteration to the natural state e.g. washing, peeling, chopping, milling wheat, pasteurising milk, and modified atmosphere packaging for meat products.



Processed intermediates - (added to other foods rather than eaten in their own right) relates to extracting food ingredients from agricultural produce e.g. pressing seeds for oil.

Secondary - transforming minimally processed or unprocessed food products into more complex foods. Refers to cooking methods that can be carried out on a small (at home) or large (in factory) scale e.g. baking. Also refers to simple preservation methods such as fermenting, drying, salting, smoking and canning.

Tertiary - carried out during the manufacturing of more complex foods, from a recipe e.g. ready-to-eat (RTE) and pre-packaged frozen meals. They may include functional additives (not used in home cooking) to improve texture, appearance, taste, safety and nutrient composition (fortification). These are sometimes referred to as ultra processed foods (UPF) - a synonym for food which is energy dense, speedily digestible and nutritionally poor i.e. 'junk food'. However, the term is vague and there is not a scientific consensus on its definition.

Examples of processed foods

Primary	Minimally processed: fruits, vegetables, eggs, meat, grains Processed intermediates: flour, sugar, salt, butter, vegetable oil, vinegar
Secondary	Home-made meals, unpackaged bread, canned/tinned foods (fruits, vegetables and fish), salted nuts, cheese
Tertiary	Ice cream, flavoured potato crisps, packaged bread, breakfast cereals, infant formula, biscuits, sausages, fruit yogurts, carbonated soft drinks, weight loss products e.g. meal replacement shakes

What are the benefits?

Food safety - reduce risks that can occur during storage and transport of food, including the growth of pathogens such as E. coli and Salmonella which can cause diseases. For example canned food is safe to consume for years. Also, the risks of naturally occurring toxins such as lectin in pulses and other physical/chemical contaminations.

Food waste reduction - some by-products (seeds, fibre, peel) can be processed to make innovative and healthy food ingredients and end products, thereby reducing food waste. As does selecting different processing methods, such as making smoothies from whole fruits as opposed to juicing.

Preservation - extends shelf life and conserves the quality (taste, texture, appearance and nutritional value) and safety of food that would otherwise deteriorate more quickly due to the action of enzymes or oxidation. Examples include blanched or frozen vegetables.

Appeal - transforming or combining raw materials to offer consumers a variety in taste, texture, and

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nutrition. For example, corn flakes and tortilla chips (from maize) and freeze-dried raspberries which might present novel textures, or smoked meat for new flavours.

Overcoming seasonality limitations - normally crops are available based on the particular harvest season, however, processing extends their availability to all-year round. Livestock or crops (e.g. pineapple, avocado, coconut, cinnamon, vanilla, dates) can be grown in one country and be available elsewhere in the world leading to greater variety.

Livelihoods - the food sector is a huge employer and encompasses farmers, retailers, chefs, food scientists and technologists among other roles.

Convenience - helps save time e.g. home cooking with vegetables that have already been peeled, washed and chopped, compared with cooking from scratch. Also, ready-prepared meals you just have to cook from frozen.

Food fortification - addition of important micronutrients (vitamins and minerals) that may not be readily available or to achieve public health goals, e.g.: infant cereals and formula fortified with iron to prevent anaemia; wheat flour with folic acid to prevent birth defects; and iodine in salt to prevent goitre.

Promote inclusivity - for people with allergies, intolerances (such as lactose) and other health considerations, processing provides them options, e.g. milk alternatives (soy and pea), lactose-free milk, gluten-free foods for coeliac disease patients, and sugar-free desserts for diabetics.

What other considerations are there?

Foods high in saturated fat, salt and sugar (HFSS) - scientific studies investigating consumption found association, not necessarily causation, between intake of HFSS food and non-communicable diseases (NCDs) such as obesity, diabetes and heart disease. The guidelines for adults define 'high' (per 100g) as more than 5g for saturated fat, 22.5g for sugars and 1.5g for salt.

Additives - some emulsifiers, artificial sweeteners and preservatives can cause adverse reactions. For example: (i) six EU-authorized food colours are linked to hyperactivity in some children; (ii) excessive consumption of polyols could cause laxation; (iii) phenylalanine (from aspartame), hence labelling of foods containing them include necessary warnings.

Energy release and density - HFSS foods which have most of the fibre removed are quickly digested and cause larger number of calories to be released into the body. Coupled with the palatability (moreish), they may induce overeating. Also, the extent of processing could have an effect on digestibility, for example when foods such as nuts are eaten whole, the body absorbs less of the fat than when they are ground down and the oils are released.

Nutrient loss - can occur during food processing. For example, the loss of fibre when potato peels are removed and loss of the water-soluble vitamin C through washing, cooking or exposure to light. Also, loss of vitamins (B and E) and minerals (iron and magnesium) when some whole grains are processed.

Contamination risks - globally a large amount of ingredients are processed industrially, increasing the risk of pathogens entering the system if not properly managed. Also, physical contamination can occur from machinery such as broken metal parts. Hence strict controls through food safety management plans are put in place, and monitored, to address these potential issues.

How to achieve a balanced diet?

Processing is a means of ensuring a safe, stable food supply system. Rather than excluding all processed foods from one's diet, it is important to think about the balance and ensure that it includes adequate whole foods, fruits, vegetables, water and make time for home cooking. Also, understanding nutrition information on food packaging labels can help you make informed decisions. Traffic light colour-coding for saturated fat, sugar and salt informs consumers, as those labelled green and amber make for healthier choices than red.



Resources

<https://www.nhs.uk/live-well/eat-well/how-to-eat-a-balanced-diet/what-are-processed-foods/>

<https://www.bhf.org.uk/information-support/heart-matters-magazine/news/behind-the-headlines/ultra-processed-foods>

[Position statement on the concept of ultra-processed foods \(UPF\) - British Nutrition Foundation](#)

<https://www.fao.org/3/ca5644en/ca5644en.pdf>