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FOOD SAFETY AND HYGIENE GUIDE

"INCREASING FOOD LITERACY COMPETENCIES OF ADULTS"

2020-1-TR01-KA204-092828

2022

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1. Introduction-Why are food hygiene and safety important?

For most people, preparing food at home is a common, everyday thing that we do most of the time routinely, using methods we have learned from our parents, cookbooks or now more and more often from the internet. As long as we "only" cook for ourselves, our family, or our friends- although, of course, to the best of our ability, we try to make sure we prepare healthy, safe food- it usually doesn't occur to us to read precisely the hygiene rules or perform a related training.

However, the situation is quite different when food production and food preparation is not done for our own purposes, but for the purpose of making a living and supplementing income, as this brings our food to a larger circle of consumers, which of course entails greater responsibility.

It is a matter of trust to consume food prepared by others: the consumer can rightly expect the food maker to know the relevant methods and regulations, and to exercise the utmost care in preparing the food. In this case, it is no longer enough to use home-learned or the usual raw material handling, storage, food preparation or cleaning methods, as food placed on the market for commercial purposes is subject to numerous legal regulations, directives and standards for safe production and distribution.

Navigating between these rules - without prior training-is definitely a complex and time-consuming task for those who intend to start preparing and distributing homemade food. This publication aims to help you with this.

In the textbook Food Safety and Hygiene Guide, we have collected and presented in a simple, easy-to-understand form the main guidelines, rules, methods with the knowledge and adherence of which we can start to prepare homemade foods for sale more boldly. In addition to the "dry" curriculum, the book also contains a number of practical ideas and tips for making safe and healthy meals easily.

The Guide to Food Safety and Hygiene textbook is part of a series of topics covered in the framework of the FOODTR Erasmus+ project. The rest of the series covers the following topics, which can also be of great help in the production of homemade food:

- Practical Guide for Healthy Eating
- Food Packaging and Storage Guide
- Homemade Food Products Processing Techniques
- Food Regulations Guidance
- An Entrepreneur's Guide for Homemade Food Production
- Food Labeling Guide
- Guidance on Sustainable Food System

2. About the project

The full title of the project is "Increasing Food Literacy Competencies of Adults", which shows its main goal to provide food related information and knowledge to target groups who want to improve their income situation by producing and selling homemade food.

The project is coordinated by the Central Research Institute of Food and Feed Control and funded by the Erasmus+ Program of the European Union.

Main objectives of the project are to enhance skills and competencies of adults related to food literacy, to help and encourage them to start home-based food business, to increase their knowledge about sustainable food system, food safety, hygiene, and home-made food processing techniques. With the help of the newly acquired skills and knowledge, adults can gain work and income from home and improve their labour market situation and find work easier. In addition, the knowledge provided by the project can also help to prepare healthy, safe food for ourselves or our families, thus helping to maintain health and prevent diseases.

"Food literacy" means much more than knowing what ingredients and how to make a meal. The term *food literacy* means having the knowledge, skills and attitudes necessary to access to and evaluate the information related to food and nutrition, to make appropriate choices for a healthy and balanced diet, to prevent food waste and to have positive consumption attitudes towards sustainable food systems.

The "Increasing Food Literacy Competencies of Adults" project is aimed to increase the food literacy skills of individuals, to ensure their access to healthy and reliable food and to understand the importance of food literacy within the society.

3. Key definitions – basic concepts of food safety and food hygiene

One of the basic conditions for the safe production and distribution of food is that the actors involved in them understand the same concepts and names, and that there are equally applicable, accountable rules, standards and regulations governing the production and distribution of food.

Food safety and hygiene is a shared responsibility between producers and consumers. From farm to table, everyone has a role to play in ensuring that the food we eat is safe and does not harm our health. With this in mind, let's look at some basic definitions that are essential for food to be fit for human consumption.

Acceptable daily intake (ADI)
The Acceptable Daily Intake (ADI) is the amount of pesticide residues, food additives, etc. (in milligrams per kilogram of body weight per day) that we can consume per day throughout our lives without risk of adverse health effects.

Adverse effect
A change in the health, growth, behavior or development of an organism that impairs its ability to develop or survive.

Allergen
A normally harmless substance, such as an ingredient in a foodstuff, that causes an (immediate) allergic reaction in a susceptible person.

Allergy
Allergy is an overreaction of the immune system to substances that normally do not trigger any response from the body.

Antibiotic
Secondary metabolites (secondary metabolites) produced by microorganisms that inhibit the growth of other microorganisms.

Bacteria:
Single-celled microorganisms, mostly a few micrometres long, with a variety of shapes (spherical, rod-shaped, twisted, etc.).

Chilling:
If you want to eat the food later, chill it immediately after preparation and store it in the fridge. The food cools down faster in a shallow dish.

Clean drinking water:
Only clean, good quality drinking water for food preparation.

Clean hands:
Keeping your hands clean: before preparing food, handling food, touching food, before eating, after using the toilet, after finishing or interrupting an operation, when handling raw meat, raw eggs, raw poultry, uncleaned vegetables and fruit, cleaning, handling and touching garbage, waste.

Clean kitchen:
Keep kitchen utensils, dishes and food contact surfaces clean.

Contaminant:
Any substance occurring in foodstuffs that was not added intentionally. Contaminants can arise from packaging, food processing and transportation, farming practices or the use of animal medicines.

Cross contamination:
The process by which microbes are unintentionally transferred from one substance or object to another, with harmful effect.

Disinfection:
Disinfection is any process by which pathogens introduced into the environment are destroyed or rendered non-infectious their ineffectiveness.

E number:
A number used in the European Union to identify permitted food additives. An E number means that an additive has passed safety tests and has been approved for use.

FIFO:
First in, first out; the principle of using supplies and stock in the order they were received

Flavour (in terms of food additives):
A product which is not intended to be consumed on its own but is added to food to impart or modify odour and/or taste and which is or consists of the following categories: flavourings, flavouring preparations, heat-treated flavourings, smoke flavourings, flavour precursors or other flavourings or mixtures thereof.

Flavour enhancers:

Substances that enhance the existing taste and/or smell of foods.

Food additive:
Any substance which, whether or not it has nutritional value, is not normally consumed as a food in itself and is not used as a characteristic ingredient of foods.

Food-borne illness:
An illness caused by foods or drinks which have been contaminated by toxins or harmful microbes (e.g. bacteria, viruses).

Food contact material:
Any material (e.g. packaging material, kitchen utensils, production equipment) that is designed to be used in contact with food or may come into contact with food during its manufacture.

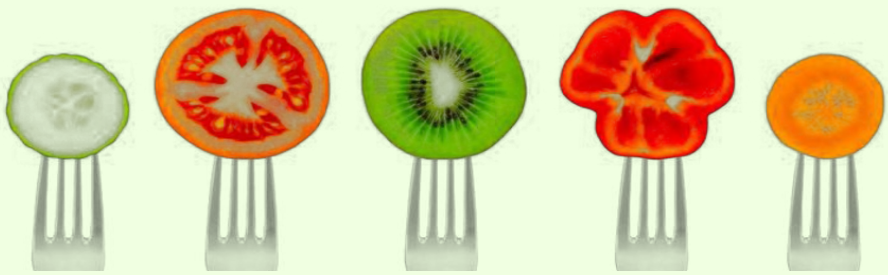
Food contamination:
Any acute adverse health effect caused by the consumption of food contaminated with a live pathogen.

Food hazard:
food that is contaminated with biological, chemical or physical agents and, if eaten, will cause ill health.

Food hygiene:
Food Hygiene, otherwise known as Food Safety can be defined as handling, preparing and storing food or drink in a way that best reduces the risk of consumers becoming sick from the food-borne disease. The principles of food safety aim to prevent food from becoming contaminated and causing food poisoning.

Food intolerance:
A food intolerance is difficulty digesting certain foods and having an unpleasant physical reaction to them. A food intolerance is not the same as a food allergy.

Food safety:
Food safety refers to routines in the preparation, handling and storage of food meant to prevent foodborne illness and injury. From farm to factory to fork, food products may encounter any number of health hazards during their journey through the supply chain.
Food poisoning: Any acute adverse health effect that occurs after ingestion of food by the organic or inorganic poisonous substance it contains.



Good hygiene practice (GHP):

A standardized way of operating which ensures that foodstuffs are produced safely and hygienically.

Good manufacturing practice:

Any practice regarding the conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

Gloves:

Plastic, latex, or rubber gloves that, when worn while handling food, will eliminate direct hand contact with the food.

GMO:

A genetically modified organism (GMO) is an organism which contains genetic material that has been deliberately altered and which does not occur naturally through breeding or selection.

HACCP:

Hazard analysis and critical control points; system to define potential areas of risk in food production and prevention methods.

Health claim:

Any practice (e.g. a statement or visual) used in food marketing to suggest that health benefits can be gained from consuming a given food, nutrient or ingredient.

Infection:

Invasion of the body by pathogenic microorganisms.

Ingredient:

Any substance deliberately added to a foodstuff which will remain in the finished product, even in an altered form.

Intoxication:

Effects on the body produced from the consumption of harmful pathogens or substances.

Impeccable raw material:

Fresh, whole, healthy raw material (e.g. pasteurized boiled milk) from a reliable source.

Impurity:

Any foreign body present in a food or feed which may arise due to errors in manufacturing, storage or transportation.

Maximum permitted level:
The maximum amount of a contaminant, naturally occurring toxin or nutrient allowed in foods or animal feeds.

Moulds:
Moulds are microscopic fungi that colonize plant or animal tissues and inanimate matter. Moulds produce toxic substances called mycotoxins, which are very potent poisons.

Non-perishable food:
Foods which are not easily spoiled or contaminated, e.g. sugar and cereals.

Pathogen:
An agent that causes disease, especially a living micro-organism such as a bacterium, virus, or fungus.

Perishable food:
food items that have a short storage life and will become spoiled or contaminated if not preserved and handled properly, e.g. meat, eggs, milk, fruits, vegetables and the like.

Personal hygiene:
Good personal hygiene involves keeping all parts of the external body clean and healthy. It is important for maintaining both physical and mental health.

Permissible level:
Maximum level of a substance or other agent to which people can safely be exposed over a specified period of time.

Preservatives:
Substances which prolong the shelf life of foodstuffs by preventing spoilage by micro-organisms and/or provide protection against pathogenic micro-organisms.

Potentially hazardous foods (PHFs):
Foods that will allow the growth or survival of pathogens OR foods that may be contaminated by pathogens.

Quality retention time:
The length of time a food retains its unique properties when properly stored.

Ready-to-eat food:
Any food that can be eaten without cooking or any other additional preparation, and is expected to be served this way.

Sanitize:
To apply heat or chemicals on a clean food contact surface (e.g., cutting board, countertop) to destroy most pathogens.

Sick worker:
Any food handler who has one or more of the following symptoms associated with a foodborne illness: sore throat with a fever, diarrhea, fever, vomiting, or jaundice; or has a sore containing pus that is open and draining

Super danger zone:
The temperature range where pathogens will grow very quickly, between 20°C and 49°C (70°F and 120°F).

Sweeteners:
Substances that impart a sweet taste to food or table-top sweeteners.

Thorough baking, cooking:
Cooking certain foods thoroughly, the high temperature destroys microbes that are dangerous to health.

Toxins:
Toxin, any substance poisonous to an organism.

Wholesome food:
Food which is sound, clean and free from harmful ingredients – it is suitable for human consumption.

4. Legal and institutional background of food safety

Although food-related problems (e.g., food spoilage, food poisoning, counterfeiting) are presumably the same age as humanity, the first regulations on food appeared relatively late.

The earliest written memoirs were usually made for two main purposes: to eliminate problems arising from the consumption of improperly prepared or stored food, and to eliminate fraud (e.g. counterfeiting, weight loss) associated with the sale of food.

We can read about the rules of eating and cooking in chapter 10 of the Chinese philosophy Lun-yu, which collected the philosophies of Confucius (551-479 BC), and in the Old Testament Bible and the third book of Moses, we find an early example of the rules on weight loss and counterfeiting (Csíki, 2015).

"As a result of industrial development and a growing urban population, the production and distribution of food on an industrial scale began to take shape in the second half of the 19th century. At the same time, the first general food legislation to protect consumers appeared, and detailed quality standards for some products were soon completed. By the middle of the 20th century, in addition to the food regulation at the national level, which was adapted to domestic trade, there was also a need for regulation at the international level". To this end, in the 1960s, the World Food and Agriculture Organization (FAO) and the World Health Organization (WHO) jointly established the international food book system, Codex Alimentarius (Codex Alimentarius Hungaricus, 2018).

4.1. International and EU food safety regulations

The concept of food chain safety includes all activities from farmland to the table, i.e. not only the production and distribution of food, but also plant protection, animal epidemiology, animal welfare, environmental protection, economic, quality protection and other aspects" (Office of the Hungarian Parliament, 2018).

The development of international standards, rules and guidelines governing food ingredients is the responsibility of the **FAO (Food and Agriculture Organization of the United Nations)** and the **WHO (World Health Organization**). All this is reflected in the Codex developed by the Codex Alimentarius Commission (CAC), which is the basis of world food regulation.

The Codex Alimentarius includes standards for all the principal foods, whether processed, semi-processed or raw, for distribution to the consumer. Materials for further processing into foods should be included to the extent necessary to achieve the purposes of the Codex Alimentarius as defined. The Codex Alimentarius includes provisions in respect of food hygiene, food additives, residues of pesticides and veterinary drugs, contaminants, labelling and presentation,

methods of analysis and sampling, and import and export inspection and certification. **Codex standards and related texts are not a substitute for, or alternative to national legislation**. Every country's law and administrative procedures contain provisions with which it is essential to comply" (fao.org).

The WHO and FAO co-operate with the **International Food Safety Authorities Network (INFOSAN)**, which has 188 member countries. WHO, through INFOSAN, assists Member States in addressing food safety risks by ensuring the rapid sharing of information in food safety emergencies to stop the spread of contaminated food from one country to another (Office of the Hungarian Parliament, 2018).

European Union

The basic rules in the European Union on the general principles and requirements of food law, establishing the **European Food Safety Authority** and laying down procedures in matters of food safety are laid down in **Regulation (EC) No 178/2002** of the European Parliament and of the Council.

European food safety policy aims are twofold: to **protect human health and consumers' interests**, and to foster the smooth operation of the European single market. The EU thus ensures that control standards are established and adhered to in the areas of feed and food-product hygiene, animal health, plant health and the prevention of food contamination from external substances. The Union also regulates labelling for food and feed products. (EU Factsheets, 2021).

In addition to ensuring the principle of free movement of goods in the Member States of the European Union, there is a strong emphasis on consumer protection, which means not only protecting the economic interests of the consumer, but also, among other things, **supplying food with a safe composition**. To achieve this, compliance with quality and hygiene requirements must be examined not only in the field of production and marketing, but also in the case of **pre-production and post-marketing activities**, i.e. the tracing of raw materials from the field to the table. In order to protect consumer health, the European Union published a "**White Paper on Food Safety**" in January 2000, which set out the **principles of the Union's food safety and nutrition policy**. Its main substantive aspects are set out **in Regulation (EC) No 178/2002**. The principle of food law in the European Union is to ensure the free movement of healthy and safe food in the internal market.

"The regulation places the responsibility for the primary observance of food law on the food business operator. The food business operator must have a traceability system based on the so-called **one-step-back, one-step-forward principle**. This is set out in Article 18 (2) and (3) of **Regulation (EC) No 178/2002** of the European Parliament and of the Council. According to this, entrepreneurs must ensure that they can identify the persons from whom they receive the raw material for food production (one step back) and also be able to identify afterwards the businesses to which their products have been delivered (one step forward).

Member States are primarily responsible for implementing EU law. Member States carry out official controls, the rules of which are laid down in **Regulation (EC) No 882/2004** of the European Parliament and of the Council" (Office of the Hungarian Parliament, 2018).

In all Member States of the European Union, the basic requirement to comply with food hygiene standards shall be fulfilled in accordance with **Regulation (EC) No 852/2004** of the European Parliament and of the Council of 29 April 2004 on the **hygiene of foodstuffs**.

4.2. Legal background of food safety in FOODTR partner countries

The following section introduces the main regulations, institutions, food safety management systems of FOODTR partner countries.

4.2.1. Turkey

Key national food regulations:

As a candidate country for membership in the EU, Turkey harmonizes all food regulations with those of EU. The Ministry of Agriculture and Forestry, is in charge of food safety and they provide their mission as "to ensure access to safe food and high-quality agricultural products needed by Turkey and world markets" among other responsibilities. The Ministry is the agency in charge of developing and enforcing food and agricultural policy and regulations, as well as serving as a point of contact for international organizations working on these problems. On June 13, 2010, the Turkish Government issued Law No. 5996 on Veterinary Services, Phytosanitary, Food, and Feed with the goal of protecting and ensuring public health, food and feed safety, animal health and welfare, plant health and consumer rights, while also taking environmental regulation into account, as part of the EU harmonization process. Another significant law is Law No. 5977 on Biosafety and the goal of this law is to create and implement a biosafety system to prevent potential risks from "GMOs" and their products obtained through modern biotechnological means in the context of scientific and technological developments; to protect human, animal, and plant health; and to protect and ensure the sustainable use of the environment and biological diversity and to determine the procedures and principles governing the control, regulation and monitoring of these activities. It governs all activities, including, but not limited to, the research, development, processing, placement on the market, monitoring, utilization, importation, exportation, transportation, preservation, packaging, labeling, and storage regarding genetically engineered products and products thereof. It regulates all aspects of genetically modified organisms and their products, including research, development, processing, marketing, monitoring, use, importation, exportation, transportation, preservation, packaging, labeling, and storage. All food regulations except national ones are harmonized with EU ones (such as pesticide, food information to

consumers, materials and articles intended to come into contact with food, food supplements etc.).

The Ministry of Agriculture and Forestry is the competent authority in the fields of food safety, veterinary and phytosanitary. General Directorate of Food Control (GDFC) is the main central service unit of the Ministry in charge of controlling and regulating food safety, veterinary and phytosanitary sectors. GDFC is the contact point for international organizations such as Codex Alimentarius Commission (CAC), EFSA (European Food Safety Authority), EPPO (European and Mediterranean Plant Protection Organization), OIE (World Organization for Animal Health), WTO (World Trade Organization) and IPPC (International Plant Protection Convention). Turkey also became a member of CAC on October 01, 1963. The Codex Contact Point of Turkey is also GDFC under the Ministry of Agriculture and Forestry. Under GDFC, there is a risk assessment

Institutional background in a nutshell

The institution itself has research and reference laboratories across the country helping the control and inspection of food safety as well as reviewing and updating the current regulations and laws about food safety constantly (https://www.tarimorman.gov.tr/GKGM/Menus/79/Departments). Besides, there are many institutes under General Directorate of Agricultural Research and Policies. The aim of General Directorate of Agricultural Research and Policies is to provide economic, social and environmental benefits to Turkey through including high quality agricultural, food and livestock researches that meets the country needs.

(https://www.tarimorman.gov.tr/TAGEM/Sayfalar/EN/AnaSayfa.aspx).

Food safety management systems used in Turkey

Turkish Food Codex Regulations, Turkish Standards Institute (in case there is no any relevant food codex regulations), ISO.

Important national websites

- Ministry of Agriculture and Forestry, General Directorate of Food Control is responsible from preparation of Turkish food codex regulations (Codex Department), food analysis and auditing (Food Control and Laboratories Department), risk assessment (Risk assessment department), food imports (Department of Border Inspection for Animals and Animal Products, Department of Border Inspection for Plants and Plant Products etc.) and etc. https://www.tarimorman.gov.tr/GKGM/Menus/79/Departments
- Ministry of Health is responsible from authorization of health claim regulation and of regulation on water ıntended for human consumption and of regulation on dietary foods for special medical purposes) https://www.saglik.gov.tr/?_Dil=2

- TUSIAD (Turkish Industry and Business Association): The umbrella organization which is responsible from export of all products. On account of the institutions represented by its members, TÜSİAD has a significant representative capacity of the economic activity in Turkey in many spheres such as production, value added, employment and foreign trade. TÜSİAD's activities are aimed at creating a social cohesion based on the competitive market economy, sustainable development and participatory democracy. https://tusiad.org/tr/
- TGDF (Federation of Food and Drink Industry Associations of Turkey): The umberalle organization which is responsible from export of food products. With its 26 sectoral member associations, TGDF operates as the largest non-governmental organization of the sector in our country, representing 95% of the production, employment, export and import of the Turkish food and beverage industry.
  https://www.tgdf.org.tr/
- Turkish Food Standard Insitutues: Turkish Standards Institution (TSE) is managed according to special law provisions. For execution of the duties given it by the law, a structuring exists between all units in a way so as to ensure financial and administrative independence. TSE, the sole authorized body for standardization in Turkey, operates in diverse fields of the quality infrastructure that includes certification, testing, training as well as surveillance and inspection activities. https://en.tse.org.tr/Hakkimizda

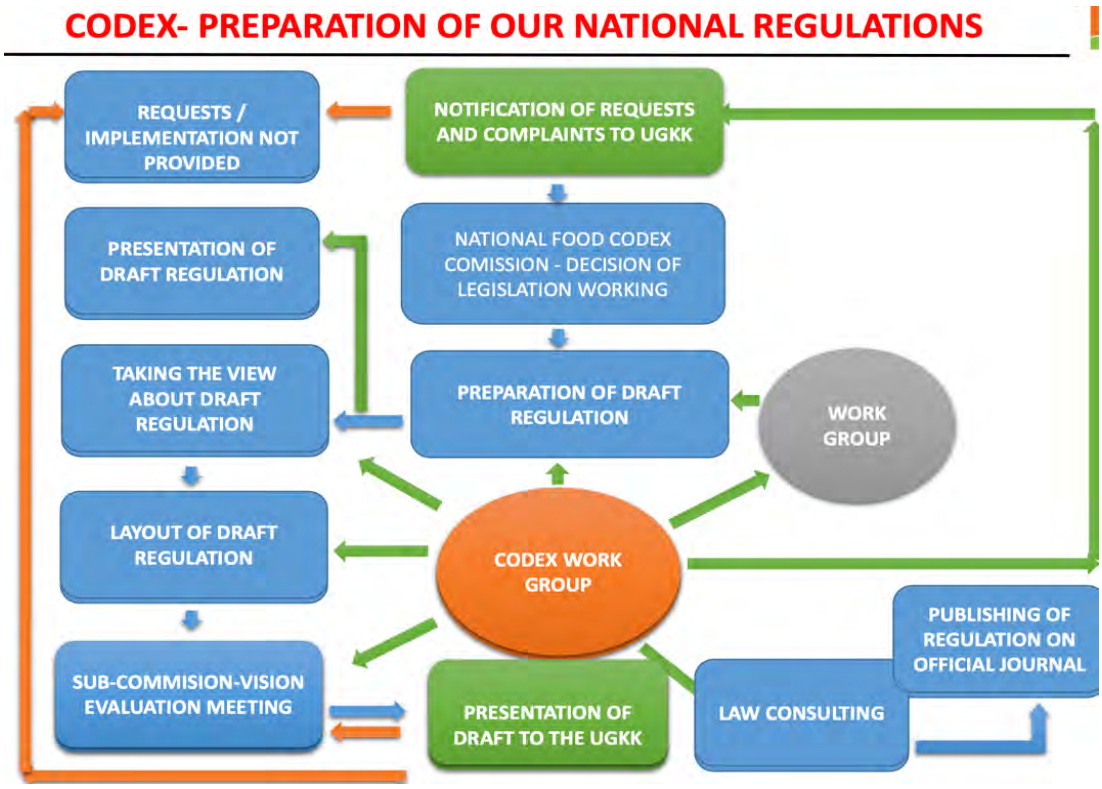
Special regulations for national/local food specialties

Special national regulation examples: Bread regulation, rice regulation, drinking milk regulation, spice regulation, bulgur regulation, cheese regulation, Turkish delight regulation, tea regulation, pekmez regulation, tahin regulation, lentil regulation, semolina regulation, wheat flour regulation etc.

The list of regulations:

https://www.tarimorman.gov.tr/GKGM/Belgeler/Mevzua...

The working principle of Turkish Food Codex Department during the preparation of regulations:



4.2.2. Estonia

Key national food regulations, short list of key legislation

- National food law (legislation about food producing, self-control methods, food safety, novel foods, special foods, food additives, frozen foods, food fraud, hygiene, import, export, etc): https://www.riigiteataja.ee/akt/750600?leiaKehtiv
- Legislation governing protected names of food groups
  - Coffee and chicory https://www.riigiteataja.ee/akt/125112014014?leiaKehtiv
  - Cocoa products, chocolate products https://www.riigiteataja.ee/akt/111112014010?leiaKehtiv
  - Casein and caseinates https://www.riigiteataja.ee/akt/103122014011?leiaKehtiv
  - Sugar products https://www.riigiteataja.ee/akt/125112014013?leiaKehtiv
  - Condensed milk and milk powder https://www.riigiteataja.ee/akt/103122014013?leiaKehtiv
  - Honey https://www.riigiteataja.ee/akt/125112014015?leiaKehtiv
  - Juice products https://www.riigiteataja.ee/akt/111112014009?leiaKehtiv
  - Jams https://www.riigiteataja.ee/akt/112112014001?leiaKehtiv

Regulations about safety (biological, chemical), storage, labelling, additives are based on acts and recommendations from European Commission, European Parliament, European Council and EFSA.

Institutional background in a nutshell

- Agriculture and Food Board
- Ministry of Rural Affairs
- Tax and Customs Board
- Consumer Protection and Technical Regulatory Authority

Food safety management systems used in Estonia

- HACCP standard
- ISO 22 000
- BRC
- IFS
- SQF 2000 and SQF 1000

Important national food websites

- Ministry of Rural Affairs, biological safety: https://www.agri.ee/et/eesmargid-tegevused/toiduohutus/bioloogiline-ohutus/mikrobioloogilised-nouded
- Ministry of Rural Affairs, storage guidelines: https://www.agri.ee/et/eesmargid-tegevused/toiduohutus/bioloogiline-ohutus/sailitamisnouded
- Ministry of Rural Affairs, chemical safety: https://www.agri.ee/et/eesmargid-tegevused/toiduohutus/keemiline-ohutus
- Ministry of Rural Affairs, additives: https://www.agri.ee/et/eesmargid-tegevused/toiduohutus/keemiline-ohutus/lisaained
- Ministry of Rural Affairs, food groups: https://www.agri.ee/et/eesmargid-tegevused/toiduohutus/toidugrupid
- Ministry of Rural Affairs, information about Codex Alimentarius: https://www.agri.ee/et/eesmargid-tegevused/toiduohutus/codex-alimentarius
- National nutrition and exercise recommendations: https://intra.tai.ee/images/prints/documents/149019033869_eesti%20toitumis-%20ja%20liikumissoovitused.pdf
- Estonian Food Industry Association, references to legislation: https://toiduliit.ee/oigusloome
- Ministry of Rural Affairs, information about EFSA: https://www.agri.ee/et/eesmargid-tegevused/toiduohutus/euroopa-toiduohutusamet-efsa
- Agriculture and Food Board: https://pta.agri.ee/
- Agriculture and Food Board, food sales: https://pta.agri.ee/toidu-muuk

Agriculture and Food Board, organic farming https://pta.agri.ee/pollumehele-ja-maaomanikule/mahepollumajandus

4.2.3. Hungary

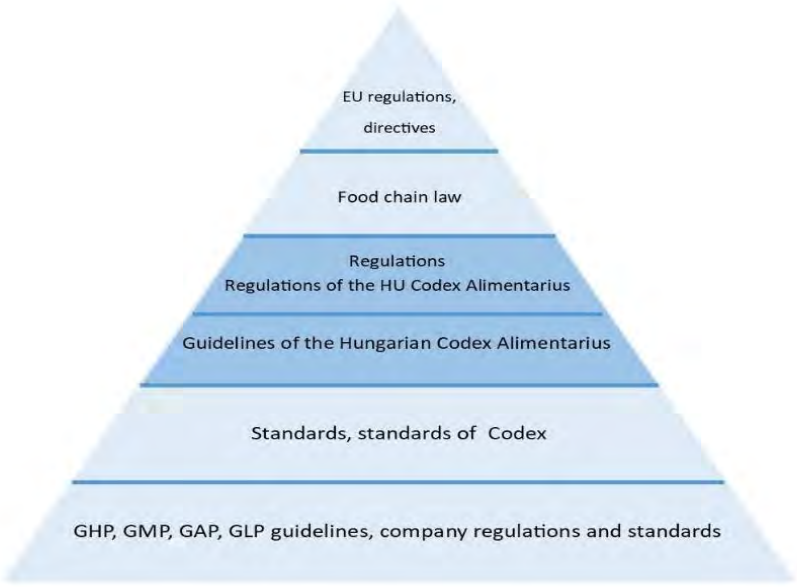
Key national food regulations and institutions of Hungary

In addition to the common **EU food regulations** mentioned above, the following national provisions regulate the operation of the Hungarian food safety system:

The legal bases of food safety in Hungary are laid down in **XLVI. Act on the Food Chain and Official Supervision**. "The law brings together the basic areas of food chain safety: animal health, feed safety, food production, production, distribution safety and plant health. **Government Decree 22/2012 (II. 29.**) established the National Food Chain Safety Office (NÉBIH), which **monitors compliance with food chain security rules with national competence**, fights against food counterfeiting and the black economy" (Office of the Hungarian Parliament, 2018).

"Since its establishment, Hungary has been a member of the Codex Alimentarius Commission established by the World Food and Agriculture Organization (FAO) and the World Health Organization (WHO) in 1963, of which 196 countries are currently members. The set of documents developed by the committee is Codex, which serves as the basis for international and national food regulations. Based on this, the three-volume Hungarian food book (**Codex Alimentarius Hungaricus**) has been prepared and is being modified to constantly monitor the changes:

- Volume 1: Standards and national product specifications transposing European Union directives;
- Volume 2: Recommendations of international organizations and recommended guidelines taking into account domestic conditions;
- Volume 3: Official Collection of Food Test Methods.



GHP=good hygiene practice, GMP=good manufacturing practice, GAP=good agricultural practice, GLP=good laboratory practice

The place of the Hungarian Food Book in the Hungarian regulatory system. Source: Codex Alimentarius Hungaricus, 2018

The **Codex Alimentarius Hungaricus**, which dates back four decades, "is a collection of **regulations and guidelines for foodstuffs sold in Hungary**. It includes regulations and guidelines for food quality, food labelling, food safety (food hygiene) and methods to be applied in the examination of food for individual foods, food groups or groups of food ingredients. Its main goal is to provide guidance to producers and to inform the public about the expected fair quality, fair products, their compositional characteristics and the technologies and test methods required for their production and control. Its aim and task is also to provide the opportunity to enforce national characteristics and preserve the good quality of traditional Hungarian products, while ensuring the smoothness of international trade and the purity of market competition" (Codex Alimentarius Hungaricus, 2018).

The constantly updated list of **food legislation in force in Hungary** is available on the website of the National Food Chain Safety Office: https://portal.nebih.gov.hu/-/elelmiszer-jogszabalyok-jegyzeke

Special regulations for national/local food specialties

Regulations for the production and sale of food by small-scale producers in Hungary:

- Decree 51/2012 (VI. 8.) VM on the food safety conditions of sales on local producer markets
- 55/2009. (III. 13.) Government Decree on Fairs, Markets, and Shopping Centers

- 52/2010. (IV. 30.) Decree of the Ministry of Agriculture and Rural Development on the conditions of production, processing and sale of food by small-scale producers

Food safety management systems used in Hungary

- ISO standard system
- Hungarian standard system
- HACCP
- Codex Alimentarius HU standards

Important national food websites

- Nemzeti Élelmiszerlánc-biztonsági Hivatal: https://portal.nebih.gov.hu/
- Magyar Élelmiszerkönyv (Agrárminisztérium, Élelmiszerlánc Felügyeletért Felelős Államtitkárság): https://elelmiszerlanc.kormany.hu/magyar-elelmiszerkonyv
- Élelmiszerekre vonatkozó jogszabályok jegyzéke: https://portal.nebih.gov.hu/documents/10182/69929/103+kiadas+ELELMISZER+jogszabalygyujtemeny.pdf
- Az Európai Parlament és a Tanács 1169/2011/EU rendelete magyar nyelven: https://eur-lex.europa.eu/legal-content/HU/TXT/HTML/?uri=CELEX:32011R1169&from=EN
- Az Európai Parlament és a Tanács 852/2004/EK rendelete (2004. április 29.) az élelmiszer-higiéniáról: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2004R0852:20090420:HU:PDF
- NAK Szaktanácsadói névjegyzékben szereplő szaktanácsadók élelmiszer előállítás és feldolgozás területén: https://www.nak.hu/a-nak-altal-nyilvantartott-aktiv-szaktanacsadok#result
- NÉBIH: Útmutató a vendéglátás és étkeztetés jó higiéniai gyakorlatához (2018): https://portal.nebih.gov.hu/documents/10182/406632/GHP_press_low.pdf/36f7dfad-0890-4950-b5e6-58bd71418b99
- Jó Higiéniai Gyakorlat útmutatók: https://elelmiszerlanc.kormany.hu/jo-higieniai-gyakorlat-utmutatok
- Útmutató a kistermelői élelmiszerelőállítás és értékesítés jó higiéniai gyakorlatához https://elelmiszerlanc.kormany.hu/download/6/ae/e1000/Kistermeloi%20GHP.pdf

4.2.4. Spain

Key national food regulations, short list of key legislation

EUROPEAN COMMISSION PROVISIONS OF DIRECT APPLICATION

• **Decision 2008/721 / EC** of the Commission, of August 5, 2008, creating a consultative structure of scientific committees and experts in the field of consumer safety, public health and the environment and repeals Decision 2004/210 / EC

• **Regulation (EC) No. 178/2002, of January 28, 2002**, which establishes the principles and general requirements of food legislation, creates the European Food Safety Authority and establishes procedures related to safety food

• **ADDITIVES: Regulation (EC) No. 1331/2008** of the European Parliament and of the Council, of December 16, 2008, which establishes a common authorization procedure for additives, enzymes and food flavorings.

• **Enriched Foods: Regulation (EC) No. 1925/2006** of the European Parliament and of the Council of December 20, 2006 on the addition of vitamins, minerals and certain other substances to food.

• **Ultrafrozen Foods: Commission Regulation No. 37/2005, of January 12, 2005**, regarding the control of temperatures in means of transport and warehousing and storage of deep-frozen foods intended for human consumption.

• **Food Supplements: Regulation (CE) Nº 1170/2009** by which Directive 2002/46 / CE and Regulation 1925/2006 are modified regarding the lists of vitamins and minerals and their forms that can be added to food, including food supplements.

• **Control of products of Animal Origin: Commission Delegated Regulation (EU) 2019/624, of February 8, 2019**, regarding specific rules regarding the performance of official controls on meat production and regarding production areas and relaying of live bivalve molluscs in accordance with Regulation (EU) 2017/625 of the European Parliament and of the Council.

Institutional background in a nutshell

• Spanish Agency for Food Safety and Nutrition (AESAN), belonging to the Ministry of Consumption: Food safety at the internal market level. Consumer protection by the General Directorate of Consumption.

• Ministry of Agriculture, Fisheries and Food (MAPA): Agriculture, Livestock, Fishing and aquaculture, Commercial quality, ecological production and differentiated quality, Plant Health, Imports of live animals, products of animal origin not for human consumption and products intended for animal feeding.

• Ministry of Health (MS): Food imports, by the General Sub-Directorate of Foreign Health.

• Spanish Federation of Food and Beverage Industries (FIAB): its objective is to defend the interests of the sector with the Administration and the different national and international decision-making bodies, as well as anticipating future challenges that affect the development of its activity.

• Spanish Association of Juice Manufacturers (ASOZUMOS): is the business organization that integrates the Spanish juice producers and represents them in all areas, and before public administrations and private entities of all kinds.

Food safety management systems used in Spain

- **IFS**
- **BRC**
- **ISO 22000**

Important national food websites

Spanish Agency for Food Safety and Nutrition AESAN: www.aesan.gob.es

National Plan for Official Control of the Food Chain, PNCOCA
https://www.aesan.gob.es/AECOSAN/docs/documentos/seguridad_alimentaria/pncoca/2021-2025/PNCOCA_2021-2025_en_INGLES.pdf

Spanish Federation of Food and Beverage Industries (FIAB): www.fiab.es

National Food Centre (CNA)
https://www.aesan.gob.es/AECOSAN/web/laboratorios/seccion/CNA.htm

Network of Food Safety Laboratories-RELSA: https://relsa.aesan.gob.es/relsa-web

Special regulations for national / local food specialties

•**General Hygiene of Food Products: Regulation (EC) nº 852/2004** of the European Parliament and of the Council, of May 29, 2003, relative to the hygiene of food products; Regulation (CE) nº 2073/2005 of the Commission, of November 15, 2005, relative to the microbiological criteria applicable to food products.

• **Food Labelling and Information: Royal Decree 126/2015, of February 27**, which approves the general rule regarding food information on foods that are presented unpackaged for sale to the final consumer and to communities.

•**Royal Decree 640/2006, of May 26, 2006**, which regulates certain conditions for the application of community provisions on hygiene, production and marketing of food products. (B.O.E. 27.05.2006)

•**Royal Decree 140/2003, of February 7, 2003,** which establishes the sanitary criteria for the quality of water for human consumption (B.O.E. 02.21.2003)

•**Royal Decree 135/2010, of February 12,** with provisions relating to microbiological criteria of food products

•**Royal Decree 3349/1983, of November 30,** which approves Technical-Sanitary Regulations for the manufacture, commercialization and use of pesticides. (B.O.E. 01/24/1994) Amended by Royal Decree 162/1991, of February 8 (B.O.E. 02/15/1994) Amended by Royal Decree 443/1994, of March 11 (B.O.E. 03.30.1994)

•**Law 17/2011, of July 5**, on Food Safety and Nutrition (BOE 06.07.2011)

•**Royal Decree 1801/2003, of December 26, 2003**, on general product safety (B.O.E. 10.01.2004).

5. Food allergy, intolerance, and main allergens

An adverse food reaction consists of any abnormal reaction after the ingestion of a food. It may be due to a **food intolerance**, which is an adverse physiologic response, or to a **food hypersensitivity (allergy)**, which is an adverse immunologic reaction. Food intolerances may be due to factors inherent in a food, such as toxic contaminants (e.g. histamine in scombroid fish poisoning) or pharmacologic properties of the food (e.g. tyramine in aged cheeses], or it may be due to characteristics of the host, such as metabolic disorders (e.g. lactase deficiency), or idiosyncratic responses. Food aversions may mimic adverse food reactions but are not reproducible when the patient ingests the food in a blinded fashion.

Food hypersensitivities (allergies) are most frequent in young children and may be due to IgE-mediated or non-IgE-mediated immune mechanisms. Although an allergy may be triggered by virtually any food, “major allergens” responsible for most significant reactions include milk, egg, peanut, tree nuts, shellfish, fish, wheat, sesame seed, and soy, while allergy to additives and preservatives is generally uncommon. Food allergic reactions vary in severity from mild symptoms involving hives and lip swelling to severe, life-threatening symptoms, often called anaphylaxis, that may involve fatal respiratory problems and shock. For instance, wheat allergy is a prime example of food hypersensitivity. Dependent on various factors, an individual with wheat allergy could have one of several disorders (e.g., atopic dermatitis, isolated urticaria, anaphylaxis, so-called baker's asthma induced by inhalation of wheat antigens, or coeliac disease caused by gluten). It is the protein component, not the fat or carbohydrate component, of these foods that leads to sensitization and allergy. Nonetheless, it is important to distinguish food allergy from other non-immune-mediated adverse reactions to foods, particularly since more than 20% of adults and children alter their diets due to perceived food allergy.

Many food allergies, particularly allergies to milk, egg, soy, and wheat, are usually outgrown within the first ten years of life. In contrast, allergies to peanut, tree nuts, fish, and shellfish are often lifelong, although 20% of individuals may outgrow peanut allergy. Peanut and tree nuts are responsible for the most serious allergic reactions and food-allergy related fatalities. While promising prevention and therapeutic strategies are being developed, food allergies currently cannot be cured. Early recognition and learning how to manage food allergies, including which foods to avoid, are important measures to prevent serious health consequences. To protect those with food allergies and other food hypersensitivities, regulations require companies to list ingredients on packaged foods and beverages. For certain foods or substances that cause allergies or other hypersensitivity reactions, there are more specific labelling requirements.

MAJOR FOOD ALLERGENS

1. Cereals containing gluten, namely: wheat (such as spelt and khorasan wheat), rye, barley, oats or their hybridised strains, and products thereof, except:

- wheat based glucose syrups including dextrose,
- wheat based maltodextrins,
- glucose syrups based on barley,
- cereals used for making alcoholic distillates including ethyl alcohol of agricultural origin.

2. Crustaceans and products thereof

3. Eggs and products thereof

4. Fish and products thereof, except:

- fish gelatine used as carrier for vitamin or carotenoid preparations,
- fish gelatine or Isinglass used as a fining agent in beer and wine.

5. Peanuts and products thereof

6. Soybeans and products thereof, except:

- fully refined soybean oil and fat,
- natural mixed tocopherols (E306), natural D-alpha tocopherol, natural D-alpha tocopherol acetate, and natural D-alpha tocopherol succinate from soybean sources,
- vegetable oils derived phytosterols and phytosterol esters from soybean sources,
- plant stanol ester produced from vegetable oil sterols from soybean sources.

7. Milk and products thereof (including lactose), except:

- whey used for making alcoholic distillates including ethyl alcohol of agricultural origin,
- lactitol.

8. Nuts, namely: almonds (*Amygdalus communis* L.), hazelnuts (*Corylus avellana*), walnuts (*Juglans regia*), cashews (*Anacardium occidentale*), pecan nuts (*Carya illinoinensis* (Wangenh.) K. Koch), Brazil nuts (*Bertholletia excelsa*), pistachio nuts (*Pistacia vera*), macadamia or Queensland nuts (*Macadamia ternifolia*), and products thereof, except:

- nuts used for making alcoholic distillates including ethyl alcohol of agricultural origin.

9. Celery and products thereof

10. Mustard and products thereof

11. Sesame seeds and products thereof

12. Sulphur dioxide and sulphites at concentrations of more than 10 mg/kg or 10 mg/liter in terms of the total SO2 which are to be calculated for products as proposed ready for consumption or as reconstituted according to the instructions of the manufacturers

13. Lupin and products thereof

14. Molluscs and products thereof

5.1. Food Labels and Allergens

People with food allergies should read labels and avoid the foods they are allergic to. The law requires that food labels identify the food source of all major food allergens used to make the food. This requirement is met if the common or usual name of an ingredient already identifies that allergen's food source name (for example, buttermilk). Otherwise, the allergen's food source must be declared at least once on the food label in one of two ways.

The name of the food source of a major food allergen must appear:

In parentheses following the name of the ingredient.

Example: “Lecithin (soy),” “flour (wheat),” and “whey (milk)”

— OR —

Immediately after or next to the list of ingredients in a “contains” statement.

Example: “Contains wheat, milk and soy”

Consumers may also see advisory statements such as “may contain [allergen] or “produced in a facility that also uses [allergen].” These are used to address “cross-contact,” which can occur when multiple foods with different allergen profiles are produced in the same facility using shared equipment or on the same production line, as the result of ineffective cleaning, or from the generation of dust or aerosols containing an allergen.

Other Allergens or allergenic substances

More than 160 foods have been identified to cause food allergies in sensitive individuals. There are also several food ingredients that cause non allergic hypersensitivity reactions in sensitive individuals that require specific labeling. For example, in addition to the eight major food allergens identified by law, the FDA monitors the food supply to determine if other allergens, food ingredients, or food additives pose a significant health risk and acts accordingly. Gluten, certain additives (e.g., yellow 5, carmine, sulfites), and other food allergens for which new science has emerged, are examples of other substances the FDA monitors and, in some cases, requires specific labeling for.

What to do if symptoms of an allergic reaction occur?

Symptoms of food allergies typically appear from within a few minutes to a few hours after a person has eaten the food to which he or she is allergic. A severe, life-threatening allergic reaction is called anaphylaxis.

Symptoms of allergic reactions can include:

- Hives
- Flushed skin or rash

- Tingling or itchy sensation in the mouth
- Face, tongue, or lip swelling
- Vomiting and/or diarrhea
- Abdominal cramps
- Coughing or wheezing
- Dizziness and/or lightheadedness
- Swelling of the throat and vocal cords
- Difficulty breathing
- Loss of consciousness

People with a known food allergy who begin experiencing any of these symptoms should **stop eating the food immediately, evaluate the need to use emergency medication** (such as epinephrine) and **seek medical attention**. Some of these symptoms are not always due to a food allergen. So, it is important to seek proper care and diagnosis from a healthcare provider to determine if the symptoms or reaction experienced was due to a food allergen.

6. Basics of labelling

A food label, the information presented on a food product, is one of the most important and direct means of communicating information to the consumer. The internationally accepted definition of a food label is any tag, brand, mark, pictorial or other descriptive matter, written, printed, stenciled, marked, embossed or impressed on, or attached to, a container of food or food product. This information, which includes items such as ingredients, quality and nutritional value, can accompany the food or be displayed near the food to promote its sale.

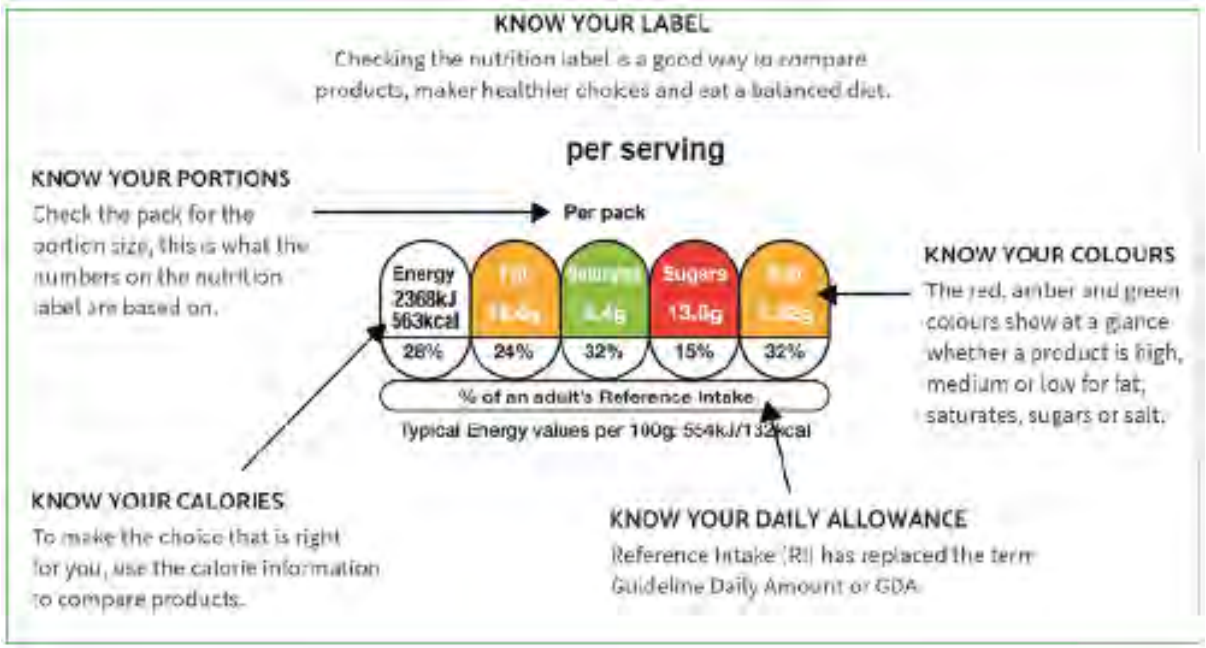
Your pre-packaged food must include the following on its labels:

- The name of the food. This must be a true representation of your product and must not be false or misleading.
- A list of ingredients. You must use ‘Ingredients’ as the heading and list the ingredients used to make the product in descending order of weight.
- The percentage of certain ingredients. If you emphasize a certain ingredient on the packaging of your product, such as ‘Chicken Burgers’ you must state the quantity of this ingredient as a percentage in the ingredient list. For example: chicken (75%). This is also a requirement if you highlight the ingredient with a picture or graphic, such as a cartoon strawberry on the packaging of a yogurt, or if it is necessary to distinguish the product.

- Any instructions for use, such as cooking instructions if they are needed. This includes the cooking equipment, temperature, cooking time and any other specific instructions needed to prepare the food.
- ‘Use by’ or ‘best before’ dates. By putting these dates on your products, you will help customers store and use your food safely, as well as reduce food waste.
- Storage instructions. These instructions help your consumers safely store products before and after opening the packaging, which will ensure they remain safe to consume. For example: ‘Store in a cool, dry place. Once opened, refrigerate and consume within 3 days.’
- Contact details. Include the country of your business, the name of your business and a contact address.
- Country of origin or provenance. You must not imply your product originates from where it was manufactured if you sourced it from somewhere else. For example, if the tuna used in your product was fished in Canada, shipped to the UK and produced into a pre-packaged meal, you cannot say it is British tuna.

Nutrition labelling

To help you make a quick decision, this label clearly shows the nutrients that are important to keep an eye on for health. One of the main drivers for nutrition labelling is the increased prevalence of diet-related non-communicable diseases. These labels can be effective instruments in helping consumers to make healthful food choices. To maximize the potential of nutrition labels and health claims to improve public health, awareness campaigns and education programmes should be provided on an ongoing basis to help consumers to understand and use labels appropriately.



This label will contain the amount of energy in calories (kcal) or kilojoules (KJ), per serving and per 100g. It can also display the amount of fat, saturates (saturated fat), sugars and salt in a serving. The numbers on the label show you how many calories and how much fat, saturates, sugars and salt a serving of the food or drink contains, both in number of grams (g) and as a share (%) of your daily allowance (RI).

The average woman needs 2,000 calories (kcal) per day, the average man 2,500 and children fewer than 2,000 depending on their age. The RI on a front of pack label is based on the RI for an average woman.

Food labelling to reduce food waste

Food manufacturers use date marking to advise subsequent food chain operators on the appropriate shelf-life of a food. The Codex Alimentarius provides guidance on two key date marks "Best before date" or "Best quality before date" and "Use-by-Date" or "Expiration date". Date marking on labels is also linked to food waste. A study carried out by the European Commission estimated that approximately 10% of food waste in the EU is linked to date marking. Food waste can be the result of misinterpretation by the consumer, or it can be due to the way date marks are utilized by food business operators and regulatory authorities.

Food fraud

One of the main aims of a labelling policy is to prevent food sellers from deliberately misleading consumers through false representations on a package. FAO is following this situation carefully and is engaged in a number of activities to contribute to the preparedness of countries to prevent food fraud or to mitigate its impacts. FAO is particularly concerned with the provision of information and analyses that inform policies and programmes across sectors and in raising awareness in developing countries on the issue and its relevance to them. Recently, FAO commissioned a review of fraud in the fisheries sector, which is one of the most vulnerable sectors to food fraud, providing recommendations for future actions.

7. Food contamination risks

Food contamination refers to the presence of harmful chemicals and microorganisms in food, which can cause consumer illness.

Types of food contamination

Biological contamination

Biological contamination occurs when food becomes contaminated by living organisms or the substances they produce. This includes biological matter produced by humans, rodents, insects and microorganisms. Biological contamination is the leading cause of food-borne illness and food poisoning, and a common cause of food spoilage and food waste. There are six types of microorganisms that can cause food-borne illness: bacteria, viruses, parasites, protozoa, fungi and prions.

Physical contamination

Physical contamination occurs when a physical object enters food at some stage of the production or preparation process. Physical objects in food can be a choking hazard and often introduce biological contaminants as well. Even if the object is not likely to injure your customer, finding an object in their food can be very distressing for a customer (who knows that harmful microorganisms on the object could make them ill).

Common examples of physical contaminants in food businesses include:

- hair
- fingernails
- bandages
- jewellery
- broken glass, staples
- plastic wrap/packaging
- dirt from unwashed fruit and vegetables
- pests/pest droppings/rodent hair

Chemical contamination

Chemical contamination occurs when food comes into contact with or produces toxic chemicals, which can lead to chemical food poisoning. Chemical contaminants fall into one of two categories: natural and artificial.

Common chemical contaminants include:

- cleaning products (e.g. detergent, sanitizer)
- pesticides/herbicides
- toxic chemicals in metals and plastic
- preservatives

- naturally occurring toxins

Naturally occurring toxins are toxic compounds that are produced by living organisms, some of which are staples of the human diet (e.g. shellfish, potatoes, fish). These toxins are not harmful to the organisms themselves but can be harmful to us if we eat them.

Cross-contamination

Cross-contamination is the accidental transfer of contaminants from one surface or substance to another, usually as a result of improper handling procedures. In a food setting, the term refers to the transfer of contaminants from a surface, object or person to food. Cross-contamination usually refers to biological contamination but can also be physical or chemical.

Cross-contamination in a food business often occurs as a result of:

- food handlers (e.g. microorganisms from sweat, sneezing/coughing, hands, hair, clothing)
- improper food handling techniques (e.g. reusing cutting boards or utensils for raw and cooked food or for different types of food)
- improper cleaning and sanitizing (e.g. not properly rinsing cleaning chemicals from preparation surfaces, dishware, glassware or equipment)
- improper food storage (e.g. storing raw meat on shelves above ready-to-eat food)
- improper waste disposal (e.g. allowing garbage containers to overflow)
- pests

Cross-contamination can also pose a risk to customers with food allergies, as trace amounts of an allergen can be transferred in the same way that microorganisms can. Even trace amounts of an allergen can cause a serious allergic reaction-in some cases, a lethal reaction. As a food business owner, manager or employee, it is your responsibility to serve customers a safe meal, including customers with food allergies.

8. Food handling

Preparation of food ingredients

Knowing how to properly wash your fresh produce is more important than you might think. Increasing outbreaks of food-borne illness are caused by germs, molds, and bacteria on ordinary fruits and vegetables. Most often poor hygiene leads to contamination with *Escherichia coli* bacteria leading to food poisoning or salmonella. It has been estimated that each year 1.8 million people die as a result of diarrheal diseases and most of these cases can be attributed to contaminated food or water. Proper food preparation can prevent most foodborne diseases. Cleanliness and safe produce go hand in hand.

How to wash food ingredients?

Fruits and vegetables

Before preparing fruits and vegetables, always wash your hands well with soap and water. Clean counter tops, cutting boards, and utensils with hot soapy water before peeling or cutting produce. Bacteria from the outside of raw produce can be transferred to the inside when it is being cut or peeled.

No washing method completely removes or kills all microbes which may be present on produce but studies have shown that thoroughly rinsing fresh produce under running water is an effective way to reduce the number of microorganisms. Washing fruits and vegetables not only helps remove dirt, bacteria, and stubborn garden pests, but it also helps remove residual pesticides. Under running water, rub fruits and vegetables briskly with your hands to remove dirt and surface microorganisms. If immersing in water, a clean bowl is a better choice than the sink because the drain area often harbors microorganisms. Produce with a hard rind or firm skin may be scrubbed with a vegetable brush. Wash water should be no more than 10 degrees colder than produce to prevent the entrance of microorganisms into the stem or blossom end of the produce. Do not wash fruits and vegetables with detergent or bleach solutions. Many types of fresh produce are porous and could absorb these chemicals, changing their safety and taste. Chemical rinses and other treatments for washing raw produce, usually called fruit and vegetable washes, are often advertised as the best way to keep fresh fruits and vegetables safe in the home. But are these washes effective? The FDA advises against using commercial product washes because the safety of their residues has not been evaluated and their effectiveness has not been tested or standardized.

Leafy green vegetables - Separate and individually rinse the leaves of lettuce and other greens, discarding the outer leaves if torn and bruised. Leaves can be difficult to clean so immersing the leaves in a bowl of cold water for a few minutes helps loosen sand and dirt. Adding vinegar to the water (1/2 cup distilled white vinegar per 1 cup water), followed by a clean water rinse, has been shown to reduce bacterial contamination but may affect texture and taste. After washing, blot dry with paper towels or use a salad spinner to remove excess moisture.

Apples, cucumbers and other firm produce - Wash well or peel to remove waxy preservative.

Root vegetables - When it comes to vegetables that are pulled directly from the ground and are usually covered in soil—such as potatoes, carrots, and any other kind of root veggie—a rinse and gentle rub often is not enough to completely remove dirt. You can use a dish rag or a sponge to scrub them clean, but no tool does the job better than a vegetable brush with firm bristles (like the one you can use to clean any produce with hard exteriors or peels). Using the brush, scrub while holding the item under running water, making sure to scrub off any visible dirt.

Melons - The rough, netted surfaces of some types of melon provide an excellent environment for microorganisms that can be transferred to the interior surfaces during cutting. To minimize the risk of cross-contamination, use a vegetable brush and wash melons thoroughly under running water before peeling or slicing.

Hot peppers - When washing hot peppers, wear gloves and keep hands away from eyes and face.

Peaches, plums, and other soft fruits - Wash under running water and dry with a paper towel.

Grapes, cherries, and berries- Store refrigerated until ready to use, but discard spoiled or moldy fruit before storing to prevent the spread of spoilage organisms. Rinse gently under cool running water right before use.

Mushrooms - Clean with a soft brush or wipe with a wet paper towel to remove dirt.

Herbs - Rinse by dipping and swishing in a bowl of cool water and dry with paper towels.

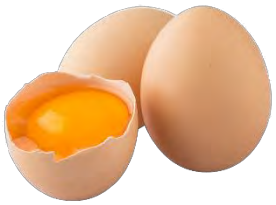
Guide to washing raw meats

Washing raw poultry, beef, pork, lamb, or veal before cooking is not recommended. Washing meat or poultry can mean different things to different people: some consumers rinse it under running water or with a strainer, others soak it in containers full of water and some even use salt water, vinegar, or lemon juice to try to "clean" their meat. Bacteria in raw meat and poultry juices can be spread to other foods, utensils, and surfaces. We call this cross-contamination.

While washing meat and poultry to remove dirt, slime, fat or blood may have been appropriate decades ago when many slaughtered and prepared their food, the modern food safety system does not require it. Meat and poultry are cleaned during processing, so further washing is not necessary. Never use soaps or detergents on your meat or poultry products. They can contaminate your food with chemicals and make it unsafe to eat.

Guide to washing eggs

Do not wash eggs before storing or using them. Washing is a routine part of commercial egg processing and the eggs do not need to be washed again. "Bloom," the natural coating on just-laid eggs that helps prevent bacteria from permeating the shell, is removed by the commercial washing process. It is replaced by a light coating of edible mineral oil, which restores protection for long-term home storage of eggs. Extra handling of the eggs in your home, such as washing them, could increase the risk of cross-contamination, especially if the shell becomes cracked.



Cooking – What should we pay attention to from a hygienic point of view?

The way we cook our food is as important as the way we prepare and store it. Inadequate cooking is a common cause of food poisoning. Cross-contamination from raw to cooked foods, such as from hands, chopping boards, or utensils, can also cause food poisoning. Most foods, especially meat, poultry, fish, and eggs, should be cooked thoroughly to kill most types of food poisoning bacteria. In general, food should be cooked to a temperature of at least 75 °C or hotter. When food is cooked, it should be eaten promptly, kept hotter than 60 °C, or cooled, covered, and stored in the fridge or freezer.

To prevent cross-contamination when preparing food, you should do the following:

- **Avoid cross-contamination** - chopping boards should be color coded so that raw meat is never cut on the same board as fruit and vegetables. Utensils should be washed after being in contact with raw meat to avoid cross-contamination.
- **Wash fruit and vegetables** - all fruit and vegetables (especially root vegetables that may have excess soil) should be thoroughly washed to prevent the risk of spreading harmful bacteria such as *Escherichia coli*.
- **Take care when defrosting foods** - ideally, plan ahead and leave enough time to defrost food. Safe thawing should be done in small amounts in the fridge. Ensure meat and poultry are defrosted on the bottom shelf. If meat is thawed in the microwave, cook it immediately. Foods should be thoroughly defrosted before being cooked.
- **Keep work surfaces clean** - it is important for food safety that all worktops are kept clean and free of bacteria. Use a clean cloth and anti-bacterial sprays. Ensure any surfaces are wiped clear of cleaning residue before preparing food.

Cooking food at the right temperature and for the correct length of time will ensure that any harmful bacteria are killed. Raw foods such as meat, fish, and eggs, may harbor food poisoning bacteria, which if consumed are likely to cause illness. The optimum temperature for the multiplication of most food poisoning bacteria is between 5-63°C, whilst, at temperatures over 70°C most bacteria are killed, and below 5°C most food poisoning bacteria can only multiply slowly or not at all. Most cooking methods, if performed properly, will heat foods to over 70°C, so applying such a temperature for a carefully calculated time period (along with correct food preparation and storage procedures) will prevent many foodborne illnesses that would otherwise manifest if the raw food was eaten.

Meat - When cooking certain meats, they should be cooked thoroughly all the way through. To check that meat is cooked properly it is a good idea to use a food thermometer. Alternatively, the meat should also be steaming hot when you cut into it, the juices run clear and there should be no pink meat. If you are cooking a whole chicken or other bird, pierce the thickest part of the leg (between the drumstick and the thigh) with a clean knife or skewer until the juices run out. The juices should not have any pink or red in them and reach a core temperature of 75°C when using a food thermometer. Kidneys, liver, and other types of offal should be cooked thoroughly until they are steaming hot all the way through. Frozen meat, fish, and poultry must be thoroughly thawed before cooking.

Fish, sea foods - Cook seafood to ~ 63 °C or until the fish becomes opaque and flakes easily with a fork. Shellfish such as clams, mussels, and oysters should open their shells as they cook. Discard any shells that do not open during cooking. To prevent foodborne illness, pregnant women, older adults, young children, and people with weakened immune systems should not eat raw seafood, such as raw fish (sushi or sashimi), raw shellfish (oysters, clams, scallops, mussels, or ceviche) and seafood ordered undercooked or "rare" such as tuna carpaccio. Refrigerated smoked seafood, such as salmon, cod, trout, tuna, or mackerel, which are usually labeled as "novo-style," "lox," "kippered," "smoked" or "jerky" should also be avoided. Uncooked spoiled seafood can have sour, rancid, fishy, or ammonia odors. These odors become stronger after cooking. If you smell sour, rancid, or fishy odors in raw or cooked seafood, do not eat it. If you smell either a fleeting or persistent ammonia odor in cooked seafood, do not eat it.

Eggs-Hard-cooked eggs should be safe for everyone to eat. The American Egg Board recommends frying, scrambling, steaming, or poaching eggs until both the yolk and the white are firm. Type of cooked eggs:

- Fried eggs-cook 2 to 3 minutes on each side, 4 minutes in a covered pan.
- Scrambled eggs - cook until firm throughout.
- Steamed hard-cooked eggs with shells-place eggs in a steamer basket of boiling water, steam for 12-17 minutes. Cool under running water. Crack and peel.
- Poached eggs-5 minutes over boiling water.
- Soft-cooked eggs-7 minutes in the shell in boiling water.
- Egg mixtures such as egg bakes, quiches, and casseroles are safe if they reach an internal temperature of 71°C.

Food storage

It is critical for manufacturers of packaged food and packaging material to comply with the legal requirements for food packaging. Manufacturers need to safeguard the functional safety of the packaging attributes to ensure that food quality is not compromised by breakage or leakage.

Food packaging

Packaging is a socio-scientific discipline that ensures the delivery of goods to the ultimate consumer of those goods in the best condition appropriate for their use. In today's society, packaging is both pervasive and essential as it protects the foods, we buy from the moment they are processed and manufactured through storage and retailing to the final consumer. The importance of packaging hardly needs stressing because in developed countries it is almost impossible to find more than a handful of foods that are sold in an unpackaged state.

A **primary package** is in direct contact with the contained product. It provides the initial and usually the major protective barrier. Examples of primary packages include metal cans, paperboard cartons, glass bottles, and plastic pouches. Frequently it is only the primary package that the consumer purchases at retail outlets. A **secondary package** contains several primary packages, e.g. a corrugated case or box. It is the physical distribution carrier and is increasingly being designed so that it can be placed directly onto retail shelves for the display of primary packages (so-called shelf-ready packaging). A **tertiary package** is made up of many secondary packages, the most common example being a stretch-wrapped pallet of corrugated cases.

The package must protect its contents from outside environmental effects (e.g., water, water vapor, gases, odors, microorganisms, dust, shocks, vibrations, compressive forces, etc.) and protect the environment from the product. For many food products, the protection afforded by the package is an essential part of the preservation process. The protection offered by a package is determined by the nature of the packaging material and the format or type of package construction. A wide variety of materials is used in packaging and primary packaging materials consist of one or more of the following materials: metals; glass; paper; and plastic polymers.

Metals - There are various forms of metal food packaging, such as cans, tubes, containers, films, caps, and closures. Cans are generally made of aluminum or steel, and they are the most commonly used metal packages of food and beverages. They are highly recyclable and are usually coated with a layer of organic material to prevent any interaction between the food and the metal. ***Aluminum*** is generally used for beverage cans, foils, tubes, trays, pouches, and coffee capsules. It has good resistance to temperature fluctuations and acts as an excellent gas barrier, which extends the food's shelf-life. It has outstanding malleability and formability and can be easily embossed. It is relatively harmless, lightweight, and can be recycled indefinitely. Alloying elements, such as magnesium and manganese, are sometimes added to aluminum to enhance its strength. Aluminum can be used in rigid, flexible, and semi-flexible packaging. It helps maintain the freshness and aroma of the foods and is good for protection from radiation, oxygen, moisture, oils, and microorganisms. Soft drinks, seafood, and pet food are commonly enclosed by aluminum packages. ***Steel*** is used for cans, containers, caps, and closures. Organic coatings are also required to resist corrosion. Steel cans are fabricated from tinplate, which is tin-coated steel, or from electrolytic chromium-coated steel, also known as tin-free steel. Steel, being a permanent material, can be recycled open-endedly while retaining its quality. Common applications of tinplate include drink cans, processed foods, and powdered foods.

Paper and paperboard-These materials are mostly used for packaging dry foods. Upon coating or waxing, their applications extend to the packaging and serving of wet and fatty foods. They are commonly used in corrugated boxes, milk cartons, folding cartons, paper plates and cups, bags and sacks, and wrapping paper. Depending on its method of production and packaging purpose, paper can be found as Kraft paper, sulfite paper, greaseproof paper, Glassine, or parchment paper. Kraft paper is the strongest form of paper and is used in packaging flour, sugar, and dried fruits. Sulfite paper is relatively weaker and lighter and is used to wrap biscuits and sweets. Greaseproof paper and Glassine contain densely packed cellulose fibers – Glassine being further hydrated – that improve the paper's oil resistance, thus making it suitable to package snacks, biscuits, fast foods, and greasy foods. Parchment paper is acid-treated paper, which renders it impermeable to fluids but not to air and vapor. It is used in packaging butter and lard. Paperboard is a relatively thicker and heavier material than paper. It

is widely used as secondary packaging that is not in direct contact with the food. Boxes, trays, and cartons used for shipping are the common usages of paperboard.

Glass - Glass is well-known for being among the most reliable and least toxic materials for packaging foods and drinks. Its advantages include imperviousness, inertness, strength, hygiene, resistance to tampering, or transparency. Glass bottles are commonly used for alcoholic drinks, soft drinks, and potable water. Foods packed in glass containers range from coffee to dairy products, spices, spreads, syrups, processed vegetables and fruits, and meat and fish products.

Plastics - Some of their widespread uses are bottles, trays, bags, foils, cups, pots, pouches, and bowls. The volume of plastic allocated to food packaging amounts to around 40% of plastics. The convenience and widespread use of plastic in food packaging is owed to its low cost, ease of process ability, formability, chemical resistance, lightweight, and a variety of physical properties. However, plastic suffers from permeability to gas, vapor, and light. Thermosets are polymers that irrevocably solidify upon heat and are non-reformable, which makes them unsuitable for food packaging. Thermoplastics, on the other hand, soften when heated and can retain their initial conditions at room temperature. This renders them perfect for food packaging. Milk, juice, and water bottles, grocery, retail, and garbage bags, and bread and frozen food bags are some of the uses of polyethylene. Polypropylene is used when heat resistance is needed. Yogurt containers and margarine tubs are applications of polypropylene. The most commonly used polyester in food packaging is polyethylene terephthalate, more commonly known as PETE.

Storage

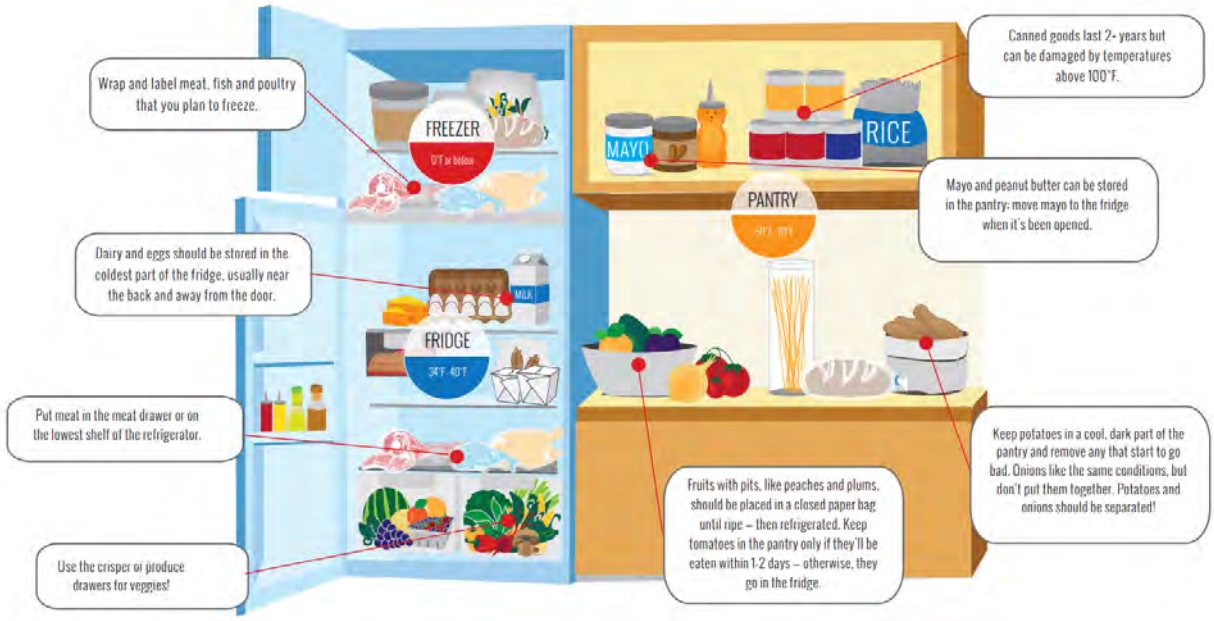
The shelf-life of food will depend upon the food itself, packaging, temperature, and humidity. If the food is not sterilized, it will ultimately spoil due to the growth of microorganisms. Foods, such as dairy products, meats, poultry, eggs, and fresh fruits and vegetables, will spoil rapidly if not stored at proper temperatures. For optimal quality and safety, dairy products should be stored at refrigerated temperatures between 1 and 3°C, meats between 0.5 and 2°C, and eggs 0.5 to 3°C. Fresh vegetables and ripe fresh fruits should be stored between 1.5 and 4°C. Always store refrigerated foods at temperatures less than 4°C. Place a thermometer in the refrigerator and monitor the temperature often. This is especially important during the hot summer months.

Frozen foods should be stored below -18°C in moisture-proof, gas-impermeable plastic or freezer wrap. Make sure to label and date frozen foods. Frozen foods may be safe to eat if stored beyond the recommended storage time but the quality may diminish. Sometimes consumers

will overload a freezer and block the circulation of coolant throughout the freezer compartment. This will lower the efficiency of the freezer in keeping the food below -18°C.

Food that is temperature abused will spoil rapidly as evidenced by off-odors, off-flavors, off-color, and/or soft texture. For instance, spoiled milk exhibits a fruity off-odor, acid taste, and may curdle, whereas spoilage of fresh fruits and vegetables may exhibit an off-color and soft texture. Slime on the surface of the meat, poultry, and fish indicates spoilage. As microorganisms grow, they utilize food as a nutrient source and may produce acids. There is an increased risk of foodborne illness from the consumption of spoiled food. Food may be spoiled without a detectable off-odor. Discard all foods that may have been at room temperature for more than 2 hours. Therefore, when in doubt, throw it out!

To ensure food stored in the refrigerator, freezer, or pantry is consumed within the expiration dates, practice FIFO (First-In-First-Out). When stocking food storage areas, place recently purchased items behind the existing food items. This will help ensure that you are consuming food before the expiration date/spoilage and will save you money by reducing the amount of food to discard. Portion leftovers in clean, sanitized, shallow containers, and cover, label, and date. Generally, leftovers should be discarded after 48 hours in the refrigerator. Dry food staples such as flour, crackers, cake mixes, seasonings, and canned goods should be stored in their original packages or tightly closed airtight containers below 29°C (optimum 10 to 21°C). Humidity levels greater than 60% may cause dry foods to draw moisture, resulting in caked and staled products. Canned goods stored in high humidity areas may ultimately rust, resulting in leaky cans. Discard canned goods that are swollen, badly dented, rusted, and/or leaking.



Recommended storage for various foods

Bread, cereals, flour, and rice - Bread should be stored in the original package at room temperature and used within 5 to 7 days. However, bread stored in the refrigerator will have a

longer shelf-life due to delayed mold growth and may be firmer. Expect a 2- to 3-month shelf-life of bread stored in the freezer. Refrigerate cream-style bakery goods containing eggs, cream cheese, whipped cream, and/or custards no longer than 3 days. Cereals may be stored at room temperature in tightly closed containers to keep out moisture and insects. Whole wheat flour may be stored in the refrigerator or freezer to retard the rancidity of the natural oils. Store raw white rice in tightly closed containers at room temperature and use it within one year. Brown and wild rice stored at room temperature will have a shorter shelf-life (6 months) due to the oil becoming rancid. The shelf-life of raw white and brown rice may be extended by refrigeration. Cooked rice may be stored in the refrigerator for 6 to 7 days or in the freezer for 6 months

Fresh vegetables-Removing air (oxygen) from the package, storing the vegetables at 4°C refrigerated temperatures, and maintaining optimum humidity (95 to 100%) may extend the shelf-life of fresh vegetables. Most fresh vegetables may be stored for up to 5 days in the refrigerator. Always wrap or cover fresh leafy vegetables in moisture-proof bags to retain product moisture and prevent wilting. Root vegetables (potatoes, sweet potatoes, onions, etc.) and squashes, eggplant, and rutabagas should be stored in a cool, well-ventilated place between 10 and 16 °C. Tomatoes continue to ripen after harvesting and should be stored at room temperature. Removing the tops of carrots, radishes, and beets before refrigerator storage will reduce loss of moisture and extend shelf-life. The palatability of corn diminishes during cold storage due to elevated starch content. Corn and peas should be stored in a ventilated container. Lettuce should be rinsed under cold running water, drained, packaged in plastic bags, and refrigerated. Proper storage of fresh vegetables will maintain quality and nutritive value.

Fresh fruit - In general, store fresh fruit in the refrigerator or in a cold area to extend shelf-life. Reduce loss of moisture from fresh fruit by using covered containers. Always store fresh fruit in a separate storage area in the refrigerator, since fresh fruits may contaminate or absorb odors from other foods. Before consumption, rinse fresh fruits and vegetables under cold running water to remove possible pesticide residues, soil, and/or bacteria. Peeling, followed by washing fresh fruits and vegetables, is also very efficient in removing residues.

Dairy products - The shelf-life of fluid milk stored in the refrigerator (< 4°C) will range from 8 to 20 days depending upon the date of manufacture and storage conditions. Milk is a very nutritious and highly perishable food. Milk should never be left at room temperature and always capped or closed during refrigerator storage. Freezing milk is not recommended, since the thawed milk easily separates and is susceptible to the development of off-flavors. Dry milk may be stored at cool temperatures (10 to 16°C) in airtight containers for one year. Handle

reconstituted milk-like fluid milk and store at refrigeration temperatures if not immediately used. Canned evaporated milk and sweetened condensed milk may be stored at room temperature for 12 to 23 months. Refrigerate opened canned milk and consume within 8 to 20 days. Natural and processed cheese should be kept tightly packaged in moisture-resistant wrappers and stored below 4°C. Surface mold growth on hard natural cheese may be removed with a clean knife and discarded. Rewrap cheese to prevent moisture loss. The presence of mold growth in processed cheese, semi-soft cheese, and cottage cheese is an indicator of spoilage and thus these foods should be discarded.

Store commercial ice cream at temperatures below -18°C. The expected shelf-life of commercial ice cream is approximately 2 months before quality diminishes. Immediately return opened ice cream to the freezer to prevent loss of moisture and development of ice crystals.

Meats, Poultry, Fish, and Eggs - Meat, poultry, fish, and eggs are highly perishable and potentially hazardous due to their high moisture and high protein content. Generally, fresh cuts of meat contain spoilage bacteria on the surface that will grow, produce slime, and cause spoilage after 3 days of refrigerator storage in oxygen-permeable packaging film.

Ground meat products are more susceptible to spoilage due to the manufacturing process and increased surface area of the product. Bacteria in ground meats are distributed throughout, providing rapid growth in the presence of air. Ground meats should be stored on the lower shelf of the refrigerator and used within 24 hours of purchase. Refrigerator storage slows bacterial growth; however, the product will eventually spoil. The optimum storage temperature of refrigerated meats, including ground beef, is 1 to 2°C. Freezing inhibits the growth of bacteria. Whole cuts of meat may be stored in the freezer ranging from 4 to 12 months, whereas ground meat may be stored for 3 to 4 months. For maximum storage, wrap meats in moisture-proof, gas-impermeable packaging to prevent freezer burn.

Cured meats, such as bacon, should be stored in their original packaging in the refrigerator. Cured meats tend to become rancid when exposed to air. Therefore, rewrap cured meats after opening the package. Expect approximately a 1-week shelf-life for cured meats.

Vacuum-packaging (absence of air) and modified atmospheric packaging (partial removal of air) extends the shelf-life of meats and meat products (i.e. luncheon meats). The shelf-life of vacuum-packaged meats and gas-flushed meats is 14 days and 7 to 12 days, respectively.

Poultry should be prepared within 24 hours of purchase or stored in the freezer. Poultry may be stored in the freezer (-18°C) for 12 months. Thaw poultry in the refrigerator, under cold running water, or in the microwave. Cook poultry parts (i.e. breast and roast) and whole poultry to an

internal temperature of 77, and 82 °C, respectively. Leftovers stored in the refrigerator should be consumed within 3 days and reheated to 74 °C before consumption. Poultry broth and gravy should not be stored for more than 2 days in the refrigerator and reheated to a full boil (100°C) before consumption.

Fresh fish, shrimp, and crab stored in the refrigerator (slightly above 0°C) should be consumed within 1 to 2 days. Never store fresh fish in water due to the leaching of nutrients, flavor, and pigments. Frozen fresh lean fish and seafood (except shrimp) may be stored for 3 to 6 months at -18 °C. Shrimp may be stored for 12 months at 180°C.

Eggs should be purchased refrigerated and stored in the refrigerator (1 to 3°C) in their original carton. Storage of eggs in the original carton reduces the absorption of odors and flavors from other foods stored in the refrigerator. Use eggs within 3 to 5 weeks of the "pack date" listed on the carton (1 to 365 representing pack date day within the year). Leftover egg yolks and egg whites may be stored in the refrigerator covered for 2 and 4 days, respectively. Cover egg yolks with water. Hard-boiled eggs may be stored in the refrigerator for 1 week, whereas pasteurized liquid eggs may be stored in the refrigerator for 10 days. Egg whites and pasteurized eggs may be stored at freezer temperatures for one year. Shell eggs should never be stored in the freezer. Dried eggs may be stored in tightly closed containers in the refrigerator for one year.

Preventing cross-contamination

Cross-contamination is the transfer of bacteria or viruses from hands to food, food to food, or equipment or food contact surfaces to food. One of the most common causes of foodborne illness is cross-contamination. Cross-contamination may occur when a sick employee handles food, raw food contaminates a ready-to-eat food, food contact surfaces that are not cleaned and sanitized properly come in contact with ready-to-eat food, or equipment is used for multiple foods without cleaning and sanitizing between preparing foods. Proper food storage also is important in preventing contamination:

- **Store food in designated storage areas** - To prevent possible contamination, keep food away from dishwashing areas, garbage rooms, restrooms, and furnace rooms. Never store food near chemicals or cleaning supplies, and keep it out from under stairways and pipes.
- **Store food in a proper container** - If food is removed from its original package, put it in a clean, sanitized container and cover it. The new container must be labeled with the name of the food and the original use-by or expiration date.
- **Store raw meat, poultry, and fish separately from prepared and ready-to-eat food** - If these items cannot be stored separately, store them below prepared or ready-to-eat food. Raw meat, poultry, and fish should be stored in the following top-to-bottom order

in the refrigerator: whole fish, whole cuts of beef and pork, ground meats and fish, and whole and ground poultry.

- **Wrap food properly before storing it** - Leaving food uncovered can lead to cross-contamination. Cover food with tight-fitting plastic wrap or aluminum foil.

Canned foods

Canning is a way to store food for long periods. It is a method of preserving where food is placed in airtight, vacuum-sealed containers and heat-processed at 250 °F. This destroys microorganisms and inactivates enzymes. As the food cools, a vacuum seal is formed that prevents any new bacteria from getting in. Since the food in the container is commercially sterile, it does not spoil. Once the container is opened, however, bacteria can enter and begin growing in the food. Any unused portions must then be refrigerated in clean containers. Unless a canned food label says it is perishable and must be refrigerated, canned foods can generally be stored for long periods. If a can has a "use by" date, be sure to use it before the date it expires or throw it out. General guidelines for how long you can safely store canned foods include:

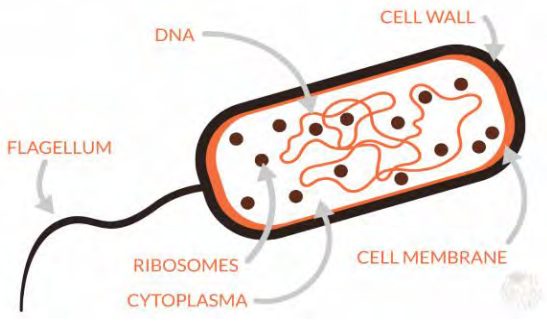
- Shelf-stable canned ham - 2 to 5 years
- Low-acid canned foods (poultry, meats, soups, stews, pasta products, corn, potatoes, peas, and other canned veggies except for tomato products) - 2 to 5 years
- High-acid canned foods (tomatoes, juices, fruits, pickles, sauerkraut, and foods with vinegar-based sauces) - 12 to 18 months
- Home-canned foods - 12 months

1. 9. Food hygiene

What is a microorganism?

Microorganisms are very small living organisms that can only be seen with a microscope. Only when very large numbers of microbes are present will you be able to see them (think of molds growing on stale bread). Food can contain many types of microorganisms, including bacteria, yeasts, molds, and viruses from different genus.

Bacteria



Bacteria consist of one simple cell and have very simple shapes (rod, spherical, spiral, comma, or corkscrew). They can exist as single cells, in pairs, chains, or clusters. Bacteria can be found in every habitat on Earth and there are approximately 10 times as many bacterial cells as human cells in the human body. There are a lot of different bacteria that can be grouped in different ways. One

method is to group them based on their oxygen needs. Bacteria that grow without any oxygen are called anaerobic. Those that need oxygen are aerobic. Some bacteria are microaerophilic: they need a little oxygen, but cannot stand large quantities. Some bacteria do not need oxygen but can handle it.

Fungi

Molds belong to the group of fungi that are made up of very fine threads (hyphae). They have far more complex shapes than bacteria: molds are not simple rods, instead, they may have hairy structures or shapes like a plant. They can form these structures since they are single-celled or complex multicellular organisms. Of course, molds are small, generally about 5-10 microns only. Whereas most bacteria are very sensitive to their environments, such as pH or water activity, molds are a lot less sensitive to these variables. Therefore, they can withstand pretty harsh situations.

Yeasts are very similar to molds, but they consist of just one cell instead of several. This means their structure is less complex (circular, elongated, or apiculate shape). Just like molds, they need oxygen to grow, but many of them can grow under anaerobic conditions. Yeasts can handle a wide range of pH values. Specific strains can also tolerate very high sugar concentrations, which is often a challenging environmental factor due to the lack of available water. One of the most famous yeasts is *Saccharomyces cerevisiae*, which plays an important role in bread making and brewing.

Virus

A **virus** is an obligate intracellular parasite that cannot reproduce itself. Outside the living cell, viruses are inert particles, but inside the cell, they utilize the host cell processes to produce their proteins and nucleic acid for the next generation of virus. Because virus infections rely on many processes and pathways of the host cell, there are only a few unique virus-specific steps in the infection that provide vulnerable points of attack for antiviral treatments and drugs. Nonetheless, viruses with RNA genomes differ significantly from the host cell with regard to genome replication. Therefore, antiviral agents have been designed to target this unique step.

Parasites

Parasites are organisms that derive nourishment and protection from other living organisms known as hosts. They may be transmitted from animals to humans, from humans to humans, or from humans to animals. Several parasites have emerged as significant causes of foodborne and waterborne illness. These organisms live and reproduce within the tissues and organs of infected human and animal hosts, and are often excreted in feces.

Foodborne pathogens

Foodborne illness or food poisoning is often caused by consuming food contaminated by bacteria and/or their toxins, parasites, or viruses. The World Health Organisation estimated that in 2010, these microbes were responsible for more than 600 million illness cases and 418,608 deaths worldwide. Among these pathogens, five of them account for over 90% of estimated food-related deaths: *Salmonella* (31%), *Listeria* (28%), Toxoplasma (21%), Norwalk-like viruses (7%), *Campylobacter* (5%), and *Escherichia coli* O157:H7 (3%). Although many of these diseases result in a self-limiting diarrheal illness in humans, severe invasive disease or prolonged illness in immunocompromised individuals can occur.

Salmonella can often be found in chicken meats and can grow both with and without oxygen, but do not grow at temperatures above 7°C. Fortunately, they cannot withstand heat well: heating them to 70°C for about a minute will kill the bacteria. *Salmonella* can cause both a direct disease, within only a few hours or days, or a longer-term infection, which takes more than a week to show. The first type generally lasts a few days and will cause nausea, fever, and diarrhea. The second is more severe though and may often have to be treated.

Listeria can be found in the soil, water, dust, animal feces, processed foods, and all sorts of raw products, such as dairy or meats. *Listeria monocytogenes* is a quite strong and hardy bacterium that can still grow in your refrigerator and withstand high salt content. Only when the pH is as low as 4.5 does it stop growing. Just like *Salmonella*, *Listeria* can be killed by heat treatment of around 70°C. Once *Listeria* has entered the body it can cause quite an intense infection, especially for those with a weakened immune system. Also, listeriosis is a well-known threat for pregnant women, because the infection of the fetus may cause miscarriage or stillbirth.

Escherichia coli normally live in the intestines of people and animals, where it has several beneficial functions. However, some strains can cause illness. Perhaps the most infamous one is O157:H7, which was responsible for the Jack in the Box hamburger outbreak in 1993. Rather than existing harmlessly in our gut, disease-causing species-like O157:H7-disrupt body functions, resulting in diarrhea. The most dangerous strains can also affect the kidneys and nervous systems of victims, causing permanent damage and sometimes even resulting in death. Although pasteurization and domestic cooking are common interventions for reducing the numbers of these pathogens in food products, strains of *Escherichia coli* belong to the most heat-resistant vegetative foodborne pathogens.

Staphylococcus aureus is also a ubiquitous bacterium that is very common in and on the human body. It is a commensal and opportunistic pathogen that can cause a wide spectrum of infections (e.g., superficial skin infections, foodborne illness, fatal, invasive diseases, etc.). Staphylococcal foodborne diseases acquired from eating enterotoxin-contaminated products are the second most commonly reported foodborne illnesses. Contamination of food products (e.g., meat, poultry, dairy, and egg products, milk, salads, bakery products) with this bacterium can often occur simply from the person handling the food. The amount of toxin needed to cause disease is less than 1 μg. The typical foodborne illness caused by *Staphylococcus aureus* has a rapid onset (3-5 hours) following ingestion of contaminated food. Typical symptoms include

nausea, vomiting, hypersalivation, and abdominal cramping with or without diarrhea. Although *Staphylococcus aureus* can be killed by heat treatment, staphylococcal enterotoxins are still capable of causing foodborne disease due to their heat tolerance capacity. They can often resist 100°C for up to an hour.

Clostridium botulinum is an anaerobic, endospore-forming bacteria that produces botulinum toxin. Even a very small dose of this neurotoxin is sufficient to initiate a serious paralytic condition that can lead to death. Moreover, the formed endospores can be highly heat resistant and can withstand harsh environmental conditions, such as low pH values and high salt/sugar concentrations. Foodborne botulism results from the ingestion of preformed botulinum toxin in food. The neurotoxin can be found in products that have not been properly cooked, handled, processed, or canned. Primary growth limiting factors for Clostridium botulinum include environmental temperature above 121°C or below 4°C, acidity, low water activity, low redox potential, competing microorganisms, and food preservatives (e.g., nitrite, sorbic acid, ascorbates, phenolic antioxidants, etc.).

Foodborne viruses are those transmitted through the consumption of food and beverages. They are typically highly resistant to environmental factors, such as low pH (acidity) and heat. This makes them highly persistent so that they can remain infectious for over a month in food and water. As they originate within the intestines of humans and animals, these viruses are predominantly spread through feces and other body fluids. The contamination of food stuff with pathogenic viruses is often caused by poor hygienic practices in the production line or contact of the food with animal waste or sewage.

Foods most commonly associated with foodborne viruses include shellfish, which are harvested near human sewage outlets, undercooked meats as well as fruit and vegetables which are grown on animal waste fertilized grounds. Even if sewage systems are treated, the virus removal and the removal efficiency depend on how much viral load is present.

Gastroenteritis and hepatitis are the most commonly reported syndromes of foodborne viruses. Although many different types of gastrointestinal viruses can be found in humans, gastroenteritis caused by the human norovirus and hepatitis A virus (HAV) are predominantly reported with foodborne viruses. Other viruses including enterovirus, sapovirus, rotavirus, astrovirus, adenovirus and Hepatitis E virus have also been associated with the transmissions through food and water.

Giardia duodenalis, cause of giardiasis (GEE-are-DYE-uh-sis), is a one-celled, microscopic **parasite** that can live in the intestines of animals and people.

People get giardiasis the following ways: giardiasis is frequently associated with contaminated drinking water, but some people might get infected by consuming uncooked meat contaminated with *Giardia duodenalis* cysts.

Toxoplasma gondii, the cause of the disease toxoplasmosis, is a single-celled, microscopic parasite. We can meet with *Toxoplasma gondii* by consuming foods (such as raw or undercooked meats, especially pork, lamb, or wild game) or drinking untreated water (from

rivers or ponds) that may contain the parasite. Toxoplasmosis can cause severe illness in infants infected before birth (when their mothers are newly infected just before or during pregnancy), or in persons with a weakened immune system.

Trichinella spiralis, cause of trichinellosis (also known as trichinosis) is an intestinal roundworm whose larvae may migrate from the digestive tract and form cysts in various muscles of the body. Infections occur worldwide, but are most prevalent in regions where pork or wild game is consumed raw or undercooked. The first symptoms are nausea, diarrhea, vomiting, fever, fatigue, and abdominal pain, followed by headaches, eye swelling, aching joints and muscles, weakness, and itchy skin. In severe infections, persons may experience difficulty with coordination and have heart and breathing problems. Death may occur in severe cases.

Spoilage causing microorganisms

Food spoilage causes not only economic loss, but also loss of edible foods. Theoretically, any microorganisms (i.e., pathogens, or microorganisms used for fermentation) that can multiply in food to reach a high level (spoilage detection level) are capable of causing food spoilage. In reality, however, only certain bacterial species, yeasts, and molds are associated with food spoilage, including *Lactobacillus* spp., *Clostridium* spp, Zygosaccharomyces spp., *Saccharomyces cerevisiae*, *Alternaria* spp., *Botrytis* spp., and *Rhizopus* spp. The main defects caused by these microbes are surface growth, off-odors and off-flavors, cloudiness, gas production, discoloration, slime, film, and sediment production, texture changes, and decreased pH.

Beneficial microorganisms

Currently, more than 3500 traditionally fermented foods exist in the world. They are of animal or vegetable origin and are part of our daily life. Fermentation—either indigenous or after the addition of starter cultures—brings many benefits, including (1) enhanced food stability and storage, decreased food losses; (2) enhanced food safety by inhibition of pathogens; (3) improved sensory properties; and (4) improved nutritional value. In general, lactic acid bacteria from several genera, including *Lactobacillus*, *Streptococcus*, and *Leuconostoc* are predominant in fermented foods, but other bacteria, as well as yeast and fungi, also contribute to food fermentations. Commercially-produced fermented foods also frequently serve as carriers for probiotic bacteria. However, that particular food or beverage is produced by fermentation does not necessarily indicate that it contains live microorganisms. Bread, beer, wine, and distilled alcoholic beverages require

yeasts for fermentation, but the production organisms are either inactivated by heat (in the case of bread and some beers) or are physically removed by filtration or other means (in the case of wine and beer). Moreover, many fermented foods are heat-treated after fermentation to enhance food safety or to extend shelf-life. Thus, fermented sausages are often cooked after fermentation, and soy sauce and sauerkraut, and other fermented vegetables are made shelf-stable by thermal processing. Some products, such as many of the commercial pickles and olives, are not fermented at all, but rather are placed into brines containing salt and organic acids. Even non-thermally processed fermented foods may yet contain low levels of live or viable organisms simply due to inhospitable environmental conditions that reduce microbial populations over time.

The importance of using fresh ingredients; how to recognize if the food is not fresh/spoiled?

It is often quite apparent when certain foods have expired, but it can be a bit trickier to discern with other foods, such as frozen foods. Generally speaking, any food that has a foul smell or has changed texture is spoiled and should not be consumed. With some general rules and guidelines, you can know when food has expired, including the trickier types, such as frozen or pantry food. Look for soggy edges.

Leafy vegetables will become soggy and/or slimy when they are spoiled. If left for too long, they will begin to turn brown and develop a slimy coating. Discard any leafy vegetables that look like this, as they are inevitably spoiled.

- You will also notice obvious signs of spoilage in carrots if they are softer and a paler orange color than before.
- Grapes will “deflate” and become mushy and soft.
- Mold will appear on citrus fruits when they are spoiled, or they may become soft and have a deflated look.
- Tomatoes will become wrinkled and will dry out.

Examine **cruciferous vegetables** for discoloration. It can be apparent when your head of lettuce has gone bad, but not as easy to tell with cruciferous vegetables, such as cauliflower. Examine the surface of the florets (a flowering stem that makes up the head of broccoli or cauliflower). If there are dark brown or gray speckles on it, it is in the beginning stages of spoiling. The speckled sections can be trimmed off and the rest used since the vegetable does not spoil all at once.

- If you see dark spots all over the florets, snap off a few.
- Cut the floret in half lengthwise.

- If there is discoloration throughout the floret, throw it out. Any florets without discoloration are usable.
- Throw out the entire vegetable if it has become soft and mushy, or if it has mold or insect damage.

Throw the item out if you see mold. Mold is a definitive indicator that your vegetables or fruits have spoiled. Mold often looks like a fuzzy white, green, or dark-colored spot. Mold can contain bacteria that will make you sick or can be poisonous. **Do not risk it.**

Look for limp stems. Limp stems are indicative of the overall wilting of the plant, which is due to the loss of turgor pressure in the plant's cell walls. The cell walls collapse inward as they lose moisture, causing the leaves and stems to wilt. If left for too long in this state, they can begin to become soft, slimy, and mushy, thereby making them unsafe to eat. But if caught early, they can be revived.

- Place the greens or vegetables in a sink or large container of ice water for 15-30 minutes.
- Drain the sink or container and pat the vegetables or greens dry.
- Store in the refrigerator in a plastic bag with dry paper towels to absorb excess moisture. This will prevent the vegetables from spoiling too quickly.
- Check for staleness. Though they are still technically safe to eat, stale foods indicate that it is past its prime. Stale foods will not be as crunchy or as soft as they once were, depending on what the food is. Though the quality of flavor has been compromised, it is still safe to eat.

Examine food for a change of texture. Most shelf-stable foods are safe indefinitely, but if you notice a change in texture, the quality may be compromised. For example, if you notice that any liquids, such as vinegar or oils, have separated, that product may no longer be fresh and/or usable.

- If you are still unsure as to whether or not the food is unspoiled, take a whiff. If you notice an odd or foul smell, you may want to toss that food.
- Inspect **cans** for rust, dents, or swelling. A can that is bulging or has a broken seal should be immediately tossed. Swelling indicates that the food inside has spoiled.
- Check the can for any corrosion, which can indicate a problem with the food inside.
- If the food inside looks moldy, or cloudy when it should be clear, toss it. If you notice an unpleasant odor or gassiness inside the can or jar, dispose of it.
- Canned food that is spoiled may contain bacteria that can cause botulism, which could be fatal. Exercise extreme caution if you notice anything unusual with your canned food.
- Toss if you see freezer burn. Freezer burn is the occurrence of ice crystals or frost inside of food that is a result of the frozen food losing its moisture. Food with freezer burn is technically still safe to eat but the texture and flavor are likely to have changed

drastically and may not taste as good as if it were fresh. **Freezer burn** often occurs as a result of poor packaging, which would allow water molecules to migrate out of the food. Prevent freezer burn by packaging food well before freezing it.

Food preservation in a nutshell

Food preservation, any of several methods by which food is kept from spoilage after harvest or slaughter. Such practices date to prehistoric times. Among the oldest methods of preservation are drying, refrigeration, and fermentation. Modern methods include canning, pasteurization, freezing, irradiation, and the addition of chemicals.

Low-temperature preservation

Storage at low temperatures prolongs the shelf life of many foods. In general, low temperatures reduce the growth rates of microorganisms and slow many of the physical and chemical reactions that occur in foods.

Refrigeration

The life of many foods may be increased by storage at temperatures below 4°C (40°F). Commonly refrigerated foods include fresh fruits and vegetables, eggs, dairy products, and meats. Some foods, such as tropical fruits (e.g., bananas), are damaged if exposed to low temperatures. Also, refrigeration cannot improve the quality of decayed food; it can only retard deterioration.

Freezing

Freezing and frozen storage provide an excellent means of preserving the nutritional quality of foods. At subfreezing temperatures, the nutrient loss is extremely slow for the typical storage period used in commercial trade. The freezing of food involves lowering the temperature below 0°C, resulting in the gradual conversion of water, present in the food, into ice. Freezing is a crystallization process that begins with a nucleus or a seed derived from either a nonaqueous particle or a cluster of water molecules (formed when the temperature is reduced below 0°C). This seed must be of a certain size to provide an adequate site for the crystal to begin to grow. If physical conditions are conducive to the presence of numerous seeds for crystallization, then a large number of small ice crystals will form. However, if only a few seeds are initially available, then a few ice crystals will form and each will grow to a large size. The size and the number of ice crystals influence the final quality of many frozen foods; for example, the smooth texture of ice cream indicates the presence of a large number of small ice crystals.

The freezing of foods exhibits many important differences from the freezing of pure water. Foods do not freeze at 0°C. Instead, owing to the presence of different soluble particulates (solutes) in the water present in foods, most foods begin to freeze at a temperature between 0 and -5°C (32 and 23°F). In addition, the removal of latent heat in foods during freezing does not occur at a fixed temperature. As the water present in the food freezes into ice, the remaining water becomes more concentrated with solutes. As a result, the freezing point is further depressed. Therefore, foods have a zone of maximum ice crystal formation that typically extends from −1 to −4°C (30 to 25°F). Damage to food quality during freezing can be minimized if the temperature of the product is brought below this temperature range as quickly as possible.

Thermal processing

Thermal processing is defined as the combination of temperature and time required to eliminate the desired number of microorganisms from a food product.

Canning

Nicolas Appert, a Parisian confectioner by trade, is credited with establishing the heat processing of foods as an industry. In 1810 he received official recognition for his process of enclosing food in bottles, corking the bottles, and placing the bottles in boiling water for various time periods.

Selected crop varieties are grown especially for canning purposes. The harvesting schedules of the crops are carefully selected to conform to the cannery operations. A typical canning operation involves cleaning, filling, exhausting, can sealing, heat processing, cooking, labeling, casing, and storage. Most of these operations are performed using high-speed, automatic machines.

Automatic filling machines are used to place the cleaned food into cans or other containers, such as glass jars or plastic pouches. The lids are placed on the cans and the cans are sealed. An airtight seal is achieved between the lid and the rim of the can using a thin layer of gasket or compound. The time and temperature required for the sterilization of foods are influenced by several factors, including the type of microorganisms found on the food, the size of the container, the acidity or pH of the food, and the method of heating.

The thermal processes of canning are generally designed to destroy the spores of the bacterium Clostridium botulinum. This microorganism can easily grow under anaerobic conditions, producing the deadly toxin that causes botulism. Sterilization requires heating to

temperatures greater than 100°C (212°F). However, *C. botulinum* is not viable in acidic foods that have a pH of less than 4.6.

At the end of the heating cycle, the cans are cooled under water sprays or in water baths to approximately 38°C (100°F) and dried to prevent any surface rust. The cans are then labeled, placed in fiberboard cases either by hand or machine and stored in cool, dry warehouses.

The sterilization process is designed to provide the required heat treatment to the slowest heating location inside the can, called the cold spot. The areas of food farthest from the cold spot get a more severe heat treatment that may result in overprocessing and impairment of the overall quality of the product. Flat, laminated pouches can reduce the heat damage caused by overprocessing.

Pasteurization

Pasteurization is the application of heat to a food product to destroy pathogenic (disease-producing) microorganisms, inactivate spoilage-causing enzymes, and reduce or destroy spoilage microorganisms. The relatively mild heat treatment used in the pasteurization process causes minimal changes in the sensory and nutritional characteristics of foods compared to the severe heat treatments used in the sterilization process.

The temperature and time requirements of the pasteurization process are influenced by the pH of the food. When the pH is below 4.5, spoilage microorganisms and enzymes are the main targets of pasteurization. The typical processing conditions for the pasteurization of fruit juices include heating to 77°C and holding for 1 minute, followed by rapid cooling to 7°C. In addition to inactivating enzymes, these conditions destroy any yeasts or molds that may lead to spoilage. Equivalent conditions capable of reducing spoilage microorganisms involve heating to 65°C and holding for 30 minutes or heating to 88°C and holding for 15 seconds.

The typical heat treatment used for pasteurizing milk is 72°C for 15 seconds. Since the heat treatment of pasteurization is not severe enough to render a product sterile, additional methods such as refrigeration, fermentation, or the addition of chemicals are often used to control microbial growth and to extend the shelf life of a product.

Blanching

Blanching is a thermal process used mostly for vegetable tissues before freezing, drying, or canning, reducing the microbial load, removing any entrapped gases, and wilting the tissues of leafy vegetables so that they can be easily put into the containers. Blanching also inactivates enzymes that cause the deterioration of foods during frozen storage.

Blanching is carried out at temperatures close to 100°C (212°F) for two to five minutes in either a water bath or a steam chamber. Because steam blanchers use a minimal amount of water, extra care must be taken to ensure that the product is uniformly exposed to the steam.

Dehydration

Dehydration or drying of foods has long been practiced commercially in the production of spaghetti and other starch products, the technique has been applied to a growing list of food products, including fruits, vegetables, skim milk, potatoes, soup mixes, and meats.

Pathogenic (toxin-producing) bacteria occasionally withstand the unfavorable environment of dried foods, causing food poisoning when the product is rehydrated and eaten. Control of bacterial contaminants in dried foods requires high-quality raw materials having low contamination, adequate sanitation in the processing plant, pasteurization before drying, and storage conditions that protect from infection by dust, insects, and rodents, or other animals.

Loss of moisture content produced by drying results in an increased concentration of nutrients in the remaining food mass. The proteins, fats, and carbohydrates in dried foods are present in larger amounts per unit weight than in their fresh counterparts, and the nutrient value of most reconstituted or rehydrated foods is comparable to that of fresh items.

Fermentation and pickling

Although microorganisms are usually thought of as causing spoilage, they are capable under certain conditions of producing desirable effects, including oxidative and alcoholic fermentation. The microorganisms that grow in a food product, and the changes they produce, are determined by acidity, available carbohydrates, oxygen, and temperature. An important food preservation method combines salting to control microorganisms selectively and fermentation to stabilize the treated tissues.

Pickled fruits and vegetables

Fresh fruits and vegetables soften after 24 hours in a watery solution and begin a slow, mixed fermentation-putrefaction. The addition of salt suppresses undesirable microbial activity, creating a favorable environment for the desired fermentation. Most green vegetables and fruit may be preserved by pickling.

When the pickling process is applied to a cucumber, its fermentable carbohydrate reserve is turned into acid, its color changes from bright green to olive or yellow-green, and its tissue becomes translucent. The salt concentration is maintained at 8 to 10 percent during the first week and is increased 1 percent a week thereafter until the solution reaches 16 percent. Under properly controlled conditions the salted, fermented cucumber, called salt stock, may be held for several years.

Pickled meat

Meat may be preserved by dry curing or with a pickling solution. The ingredients used in curing and pickling are sodium nitrate, sodium nitrite, sodium chloride, sugar, and citric acid or vinegar. Various methods are used: the meat may be mixed with dry ingredients; it may be soaked in pickling solution; pickling solution may be pumped or injected into the flesh, or a combination of these methods may be used.

Curing may be combined with smoking. Smoke acts as a dehydrating agent and coats the meat surfaces with various chemicals, including small amounts of formaldehyde.

Chemical preservation

Chemical food preservatives are substances that, under certain conditions, either delay the growth of microorganisms without necessarily destroying them or prevent deterioration of quality during manufacture and distribution. Sugar is used partly for this purpose in making jams, jellies, and marmalades, and in candying fruit. The use of vinegar and salt in pickling and of alcohol in brandying also falls in this category. Some chemicals foreign to foods are added to prevent the growth of microorganisms.

Organic chemical preservatives

Sodium benzoate and other benzoates are among the principal chemical preservatives. The use of benzoates in certain products in prescribed quantities (usually not exceeding 0.1 percent) is permitted in most countries, some of which require a declaration of its use on the label of the food container. Since free benzoic acid is the active agent, benzoates must be used in an acid medium to be effective. The ability of cranberries to resist rapid deterioration is attributed to their high benzoic acid content. Benzoic acid is more effective against yeasts than against molds and bacteria.

Inorganic chemical preservatives

Sulfur dioxide and sulfites are perhaps the most important inorganic chemical preservatives. Sulfites are more effective against molds than against yeasts and are widely used in the preservation of fruits and vegetables. Sulfur compounds are extensively used in wine making

and, as in most other instances when this preservative is used, much care has to be exercised to keep the concentrations low to avoid undesirable effects on flavor.

2. 10. Personal hygiene

In the kitchen environment, cross-contamination by potentially pathogenic microorganisms may play a key role in sporadic or epidemic foodborne illnesses. By personal hygiene, we mean all the personal and material conditions and activities that can be used to prevent pathogens or contaminants from coming into contact with food. During food preparation, bacteria can also be transferred from raw materials to the hands of people involved in the preparation and cooking of food and subsequently to other surfaces. At home, person-to-person transmission of gastrointestinal infections can occur by direct hand-to-mouth transfer via food. Thus, personal hygiene has a dual purpose: to protect food and to protect a person's health. Good personal hygiene is an effective way to protect ourselves and others from food-borne illnesses. This means that regular showering and bathing are required. Moreover, bacteria and viruses can get into the air and on the surface of foods from the mouth or nose during speaking, coughing, or sneezing. Therefore, good oral hygiene practices (keep the mouth clean, rinse with mouthwash) have an important role in controlling the spread of diseases. Spread can also occur by touching the mouth or nose with droplet-contaminated hands.

Handwashing

If not handled properly, soiled vegetables, raw meat, or ready-to-eat food products (e.g., bread, salami, cake, etc.) have an extremely high contamination risk. In the kitchen area, we also reach for the refrigerator door, kitchen utensils, and water tap with our hands. Thus, all manually performed kitchen operations must be completed with clean hands to avoid unwanted contamination. Decontamination of hands can be carried out either by handwashing with soap or by use of waterless hand sanitizers. Proper handwashing has been recognized as an effective measure to control the spread of pathogenic microbes. Always wash your hands:

- before, during, and after cooking,
- before meals - keep any pathogens in the kitchen,
- before and after cutting or wound treatment,
- after he went to the bathroom,
- after changing a diaper or cleaning a child using the toilet,
- after blowing your nose, coughing, or sneezing,
- after touching dirty surfaces or objects,
- after handling pets or animal-related objects, food.

Although handwashing is good for the prevention of food poisoning, people may find these guidelines hard to follow every day and the practice of improper hand washing may be an important factor in the spreading of foodborne diseases by cross-contamination. Therefore, simple and effective hand-washing techniques are needed (Figure 1).

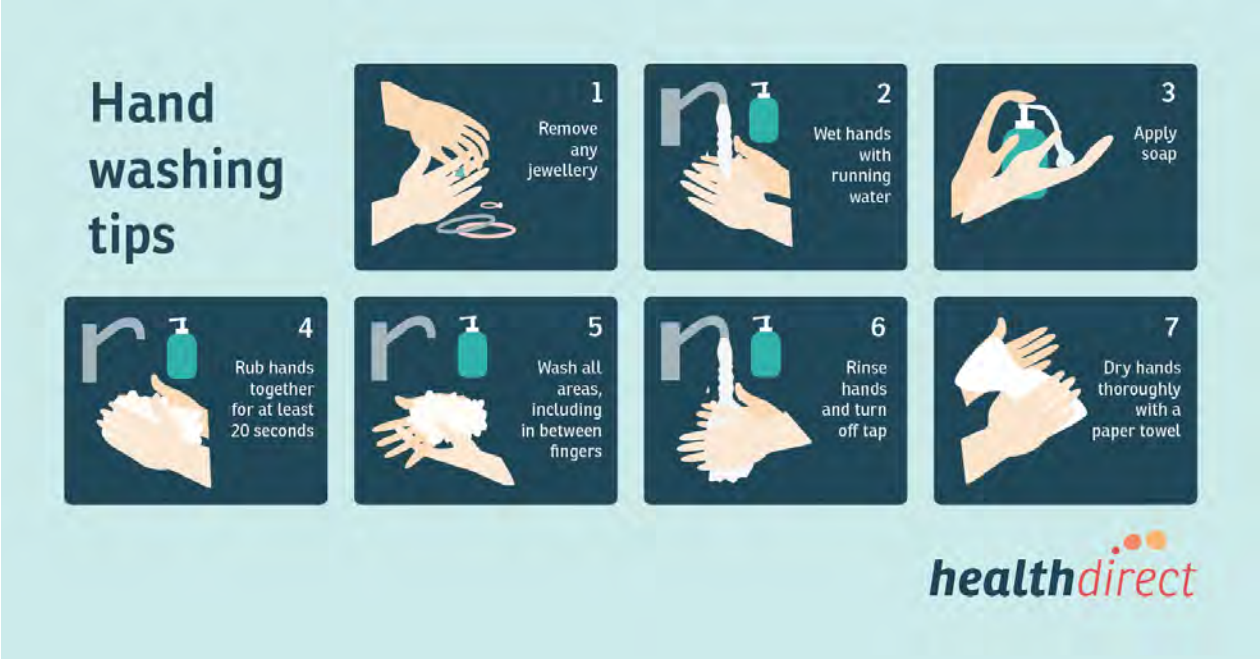


Figure 1. Seven steps of handwashing

Before hand-washing, remove all your hand jewelry. Wet your hands with clean, running water and apply soap. Lather your hands by rubbing them together with the soap. Wash all areas thoroughly for at least 20 seconds (wrists, back of your hands, between fingers, under your nails). If necessary, use a nail brush. Rinse your hands under clear, running water and dry them using a clean towel or air dry them.

Regular hand washing is one of the best ways to avoid the spread of infectious diseases. During food handling and preparation, keeping the hand clean is important, because hands come in direct contact with the food, and may help transmit microorganisms. Pathogens settle under the nail, on the skin, in the folds of the skin. Proper hand washing should be done with running warm water, nail brush, soap, and disposable paper towel.

If soap and water are not available, you can use alcohol-based hand sanitizer (> 60% of alcohol). However, sanitizers cannot get rid of all types of microbes or harmful chemicals and may not be as effective when hands are visibly greasy or dirty (Figure 2).

Figure 2. How to use hand sanitizer?

Clothing

People need to be more careful with their shoes and clothes before entering homes because clothing can contaminate food if it is not clean. A clean apron does little good if it is over dirty clothes, as the clothing could contaminate it. If possible, do not wear jewelry - rings, watches, bracelets, earrings, false eyelashes, contact lenses during kitchen operations. If you have jewelry, be careful not to get it in the food. Glasses can be used, but make sure they are clean, intact, and properly secured. Wear clean protective clothing, such as an apron, keep out your street dress and if possible, do not touch your mobile phones while cooking. Furthermore, hair represents a source of both foreign matter contamination and bacterial contamination. Thus, wear a proper hair restraint when working with or around food to prevent it from getting in the food.

Protective clothing

Aggressive products (e.g. salt, fish, or cartons) – The hands may need protection against irritants such as brine or abrasion from constant handling of boxes. In these conditions, PVC or rubber gloves are best.

Hot and cold products-Special fabric oven gloves are available for taking hot trays from the oven. Some are intended to be disposed of when soiled and before becoming frayed, others are intended to be laundered a few times, often on the premises. Their

construction should be such that there are no raw fabric edges exposed to fray. Insulated gloves are available for working with frozen foods.

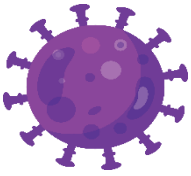
Personal safety – The suppliers of cleaning chemicals which are caustic or otherwise corrosive or irritant will advise on the type of gloves to be worn. Wear protective clothing (apron, non-slip kitchen shoes, etc.) to avoid food contamination and injuries (e.g. burns from grilling or cooking, etc.)

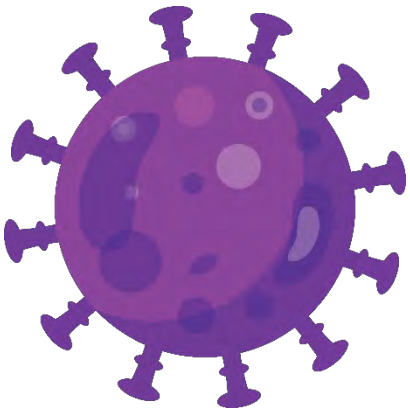
Kitchen clothes

Clothes can be one of the top causes of cross-contamination, thus, it is critical to use them safely to prevent microbes from spreading.

- Use disposable cloths wherever possible. This will make sure that any microbes picked up by the cloth will not be spread.
- Always use a new or freshly cleaned and disinfected cloth to wipe work surfaces, utensils, or equipment.
- Make sure that the re-usable clothes are thoroughly washed, disinfected, and dried properly (not just when they look dirty). Ideally, reusable clothes are washed in a washing machine on a very hot cycle (90 °C). If you wash and disinfect clothes by hand, make sure that all the food and dirt has been removed by washing them in hot soapy water before you disinfect them with boiling water or disinfectant.
- Keep all linen; tea towels, hand towels, and table linen in a clean and dry location.
- Ensure that there is a ready supply of hand towels around the kitchen.

FOOD SAFETY AND COVID-19





Coronaviruses are usually spread from person to person through respiratory droplets and there is no evidence that COVID-19 can be transmitted by food or food packaging. Nonetheless, infected people, whether or not they show symptoms, can be contagious and the virus can spread from them to others. Moreover, people may become infected by touching surfaces and objects that have been contaminated by COVID-19 and then their nose, mouth, or eyes. However, this is not thought to be the main way the virus spreads.

Although cooking for at least 30 minutes at 60°C kills SARS, it is important to follow a good hygiene practice at all times when handling food, taking the following precautions to prevent the spread of infection.

Shop food ingredients safely

- Make a list of what you need for the next few weeks. Buying food in bulk may help limit the number of trips you need to make to the store. In the grocery store, limit what you touch and only touch items that you intend on purchasing.

- Food shopping is not a group activity – It may be tempting to tackle the grocery shopping together, consider leaving your family members at home, if possible.
- Stay home if you are sick or have symptoms of COVID-19.
- Wash your hands often.
- Wear a mask that covers your mouth and nose.
- Disinfect cart handles.
- Use hand sanitizers at the entrance of the store, if they are available.
- Avoid touching your eyes, nose, and mouth.
- Keep your distance-Try to keep 2 arms lengths (2 meters) away from other customers and employees.
- Use a clean grocery bag – If you have a reusable bag clean and disinfect it properly.
- Use hand sanitizer when exiting the store, if it is available.

Safe home food delivery and online food shopping

- Use grocery home- delivery service, if it is available in your area
- Use contactless payment whenever possible (e.g., mobile payments, tap and go, pay online, key fob, etc.).
- Ask for contactless delivery if available. Have your food dropped off at the doorstep
- Keep your distance from the delivery person (at least 2 arms lengths).
- Wash your hands after handling the delivery.

Unpack your groceries safely

- Put away your groceries, especially items requiring refrigeration.
- Wash your hands after handling food and food packaging.
- Use household cleaner or diluted bleach solution to disinfect your kitchen surfaces including counters and door handles of cabinets, pantry, and refrigerator.

Prepare food safely

- Before and after handling food and food packaging, even low-risk food, wash hands thoroughly with soap and water, for at least 20 seconds and dry them thoroughly, ideally using single-use paper towels. Frequent and effective hand washing is usually better than using gloves.
- Wash hands thoroughly throughout the day, especially after coughing/sneezing, after going to the bathroom, before eating and drinking.

- If soap and water are not available, use hand sanitizer gels-they only work on clean hands and they should never be used as a substitute to hand washing. Hand sanitizer needs to have an alcohol content of at least 60%.
- Cover your mouth and nose with a tissue or your sleeve (not your hands) if you cough or sneeze.
- Put used tissues in the bin immediately, and wash your hands straight away afterward.
- Try to minimize direct hand contact with food by gloves, utensils, or tongs.
- Clean and disinfect the frequently used objects and surfaces (e.g., door handles, tables, etc.) - Use common cleaning and disinfection methods to kill coronaviruses.
- Cook your food to recommended safe internal temperatures. Coronaviruses are killed by normal cooking temperatures.
- Avoid cross-contamination of raw and ready-to-eat or cooked foods.
- Ensure that cutlery is cleaned and dried before being stored for reuse.
- **Do not prepare food for other people if you have symptoms of coronavirus** (e.g., sore throat, persistent cough, shortness of breath, fever, etc.)

Cooking while sick

As a general rule, you should not cook if you are sick!

When you work with food, you hold the health of the people who eat that food in your hands. Pathogens can be introduced into food from infected humans who handle the food. Whilst this can produce some unpleasant general consequences in the healthy human body, for children or the elderly it could result in serious illness. Thus, avoid preparing food for others if you are sick. If this is not possible, take steps to reduce the risk of making other people sick.

Food safety tips when you are sick:

- Have emergency food supplies at home.
- Wash and dry your hands thoroughly before you touch food or raw ingredients. Wash and dry them after sneezing, blowing your nose, coughing, or touching your face.
- Do not cough or sneeze over food. Turn away and cough inside of your elbow or into a tissue paper.
- Wear a mask over your nose and mouth.
- Cook food and serve it piping hot.
- Ask someone who is not sick to serve the prepared food. This is safer than everyone in the family touching serving spoons.

- If you are a single parent, a caregiver, or you live alone, you may need to ask someone else to help you until you are feeling better.
- Skin infection – Affected areas (e.g., boils, wounds, scaling skin, etc.) should be covered in a way to reduce the chance of infection.
- Stomach illness – if you have had any sort of stomach illness, do not prepare food of any kind for others. In particular, symptoms such as diarrhea and vomiting should be your ticket out of the kitchen until 48 hours have passed since your recovery.

11. Cleaning and sanitizing

Cleaning and disinfection rules, tools, and eco-conscious cleaning products; Disinfection of cleaning tools

We spend nearly 90% of our lives indoors, and the built spaces, especially the kitchen environment, are very conducive to the establishment and spread of microbes, including pathogens. The composition of these micro-colonies can vary in the different parts of the apartment. Bathrooms and kitchens can be real incubators for microbes because the higher moisture level creates ideal conditions for the growth of these germs. Surprisingly, the majority of food-borne outbreaks (81%) occur in private households and not at snack stands or restaurants. Therefore, strict hygiene rules at home play an important role in controlling food-borne infections.

The difference between cleaning, sanitizing, and disinfecting

Not all **cleaning jobs** are created equal. While some methods might seem interchangeable, there are some major distinctions between cleaning, sanitizing, and disinfecting your home. Cleaning refers to organizing and wiping down surfaces, like countertops so that they appear neat and spotless. All-purpose cleaners are built to lift and remove visible smudges, spots, stains, and debris from surfaces. Cleaning products can potentially *remove* germs from surfaces (along with dirt and other organic material) and wash them away, but the goal of cleaning is about the look and feel. While *cleaners* will help make your surfaces look nice and shiny, there are some places at home (like your kitchen counters, faucet handles, and doorknobs) where you want to

follow up your cleaning with a sanitizer or a disinfectant. Cleaning by itself will not kill germs like bacteria, viruses or fungi.

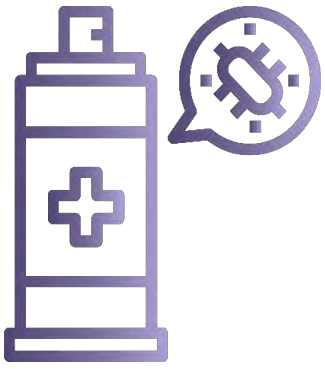
Sanitizing vs. Disinfecting

The difference between sanitizing and disinfecting comes down to semantics. Both sanitizing and disinfecting aim to reduce the number of pathogens and other microbes present on a surface by killing germs, but disinfection - by definition - kills more germs than sanitization. Product manufacturers and agencies use the word "sanitizing" to refer to a solution or device that reduces the number of germs on a surface by 99.9% or more - a level that is considered safe by public health standards. They use the word "disinfecting" for chemical products that are designed to "**kill virtually everything**" on a surface.

When to sanitize?

Sanitizing is necessary for surfaces that come in contact with food. Created with pathogens that reduce germs and fungi, sanitizing sprays will make your surfaces safe to touch again. Sanitizing can also be done without chemicals, by an appliance like a **dishwasher** or **laundry machine** (on the "sanitize" cycle), or **a steam cleaner**, which brings contaminated surfaces into contact with extreme heat (at least 70 °C) to kill bacteria and other germs. Steam cleaning is especially useful for removing germs from porous surfaces - like fabric, carpets, and upholstery - which cannot be effectively disinfected with chemical products designated for hard surfaces. If the washer you are using does not have a sanitize cycle, a product like liquid **laundry sanitizer** can work alongside your normal detergent to help remove and kill germs from your clothing.

When to disinfect?



Disinfection is a step up from sanitization, as it is designed to fully destroy all microorganisms and pathogens. There are varying levels of strength and effectiveness of disinfectants, which will be used for different settings depending on the level of risk. For example, a much higher-grade disinfectant will be used in hospitals compared to an office or restaurant.

If you need to remove every last bit of contamination in a space, you will need a good disinfectant to get the job done. A quality disinfectant should remove 100% of the microscopic organisms on your surfaces. While it may not be that helpful in the stain-removing department, it will effectively stop the spread of diseases and viruses - like colds and flu - wherever you use it.

You may consider reaching for a disinfectant to treat high-touch areas like doorknobs, light switches, and bathroom faucets, especially when a member of the household has been sick. To be effective, disinfecting solutions need to remain in contact with the surface for a specified length of time. For instance, **the instructions on a container** direct you to wipe the surface using enough wipes for the treated surface to remain visibly wet for four minutes.

You do not want to skip the step of cleaning before you disinfect, though. Dirt and organic material **can make some disinfectants less effective**, so cleaning is necessary before disinfecting in most cases. Using "all-in-one" antibacterial cleaners is not enough to disinfect unless you remove visible contamination from the surfaces first (basically, you would have to clean everything twice).

The kitchen and restrooms should be provided with separate cleaning tools because this is the only way to ensure proper hygienic conditions in both rooms.

If you use color codes, you can be sure that you will not accidentally clean the tables with a cloth used in the bathroom. (For example, kitchen with yellow cloths, bathroom with blue ones, and other rooms with red ones).

Eco-friendly cleaning tips

You can also choose from many brands of cleaning products that offer a biodegradable, environmentally friendly alternative. However, even using just a few raw materials can essentially cover the cleaning of an entire household. The advantage of these chemicals is that they are versatile, so we can use them in several places, and they are also cheap due to their simplicity.

Loofah sponge

Scrubbing sponge, made from loofah gourd, is an excellent alternative for cleaning, washing dishes, and washing clothes. Furthermore, you can grow it in your home garden. Eventually, you can toss loofah scrubbers right in your backyard composter, if you are using eco-friendly cleaners.

Vinegar/citric acid

Although these two substances have a similar field of application, some people do not use vinegar due to the strong smell (although it soon evaporates. Vinegar is efficient:

- limescale remover, mold remover;
- disinfectant, so you can safely use it to clean any surface (kitchen, bathroom), mop;
- also perfect for cleaning glass and window surfaces, as it dries drip-free;
- can be used instead of rinse aid.
- How to use it? Diluted with water and filled into a bottle, we can spray directly on the surface with a reused detergent bottle. During descaling, leave the appliance to soak in the vinegar for a longer time. Moreover, it can be added directly to the washing water. In the case of citric acid, wait until it dissolves in the water.

Baking soda

While vinegar and citric acid are acidic (as the name suggests), baking soda is alkaline. It can be used during cleaning as an excellent alternative for washing, bleaching, and stain removing. Furthermore, we can use it as:

- abrasive;
- degreaser;
- deodorizer (e.g. refrigerated in a small bowl or sprinkled on shoes);
- to make dishwashing tablets.

Diluted with a little water, we get a paste from it, which is excellent for removing greasy materials. It can be combined with vinegar easily: when these two substances are mixed, a violent reaction takes place and carbon dioxide is released. Taking advantage of this, we can loosen up stubborn contaminants or smaller drain clogs (first sprinkle baking soda and then pour the vinegar on it).

Essentially, with these two materials (vinegar/citric acid and baking soda), we can clean all the rooms in the house. They can be supplemented with essential oils to improve the disinfecting effect (e.g. tea tree, eucalyptus, peppermint, etc.). Nonetheless, you need to take special **precautions** and dilute the oil properly (in water or a carrier oil) when making cleaning products. Do not use eucalyptus, rosemary, peppermint, and other strong or hot oils around children under 10! If you use volatile oils, stick to one oil or one blend at a time. Essential oils can cause allergic reactions after coming into direct contact with the skin. Make sure everyone is wearing socks when you are cleaning the house.

Cleaning the kitchen

The dirtiest points in the kitchen

Sometimes we wouldn't even think about what surprising places most bacteria are found in the kitchen where we bake and cook.

The **kitchen** is the room in the apartment that needs the most cleaning, even after every cooking. The stove, tiles, and worktop can be cleaned with a multi-purpose vinegar cleaner: fill a spray bottle (0.5 l) with water and vinegar (1:1). It will dissolve limescale perfectly and can also be used to clean the tumble dryer. For those who do not like the smell of vinegar, there is another version of this solution with citric acid: fill the spray bottle with warm water and then dissolve 2-3 tablespoons of citric acid in it. Optionally, the solution can be enriched with natural essential oils. Citric acid is also an excellent limescale remover: we can descale a coffee machine or a kettle with it. Furthermore, its use is safer than cleaning with strong chemicals.

You can get rid of food leftovers burned on the stove or in the pan by sprinkling baking soda on it and then pouring it over with a little water to make a paste. Leave on this mixture for a few minutes, then wipe off with a sponge. Baking soda is an excellent degreasing agent that has an abrasive effect due to its larger grains.

Microwave: Put a little water and half a lemon juice in a deep plate, then turn on the micro. When the steam condenses, stop the microwave and wipe it with a cloth.

- **Refrigerator**: In addition to the microwave, we are reluctant to clean the refrigerator with detergents. However, it is in direct contact with food after all. It is sometimes a good idea to turn off the refrigerator, unpack it and clean the inside of it with vinegar. If we put a tablespoon of alcohol in our solution, it will even disinfect the cleaned areas!
- A **kitchen sponge** is an excellent tool to wipe off dirt or soak up excess water, which makes them great for cleaning all types of surfaces. Nonetheless, it may provide a suitable environment for microbial growth. Therefore, we have to change the used sponges often. Do not leave your sponge in the sink: put it in a basket or drying rack to promote air circulation. The quicker it dries out, the cleaner it will remain. Avoid using your kitchen sponge to sop up every type of spill. Keep your sponge away from meat juices, and use paper towels for those types of messes.
- Let us be honest, we usually use a **kitchen towel** after washing our hands, to wipe off the counter, to dry dishes, or to clean up the liquid from raw meat, soil, and other contaminants. Thus, the moisture content of these cloths favors the growth of bacteria

and other pathogens. As often as possible, at least once a week change the kitchen towels and have a separate towel for your hands.

- **Dishwashing water** is not the cleanest wastewater in the world. After the water is drained out, grease and food residues may stick on the surface of the sink. Moreover, vegetable scraps, raw meat, and grease can splash on the walls around the kitchen sink. After each dishwashing, clean the sink and the tiles with a sponge and detergent.
- In the case of a **cutting board**, the basic rule is to use a separate one for raw meat, poultry, seafood, eggs, vegetables, and ready-to-eat meals to avoid cross-contamination. Use hot, soapy water to thoroughly wash the cutting boards that touched raw meat, poultry, seafood, eggs, or flour. Replace them when they are worn.

What to use for cleaning?

If we want to clean with natural and eco-friendly material we can use vinegar, baking soda, or citric acid. There are several disinfectants and cleaners available in the store that are also perfect for chemical free cleaning routines.

- **Alcohol**: Alcohol is an excellent disinfectant. However, direct contact with isopropyl alcohol (also known as rubbing alcohol) can irritate and burn the skin and eyes. Prolonged or repeated contact can cause a skin rash, itching, dryness, and redness. Repeated high exposure can cause headache, dizziness, confusion, loss of coordination, unconsciousness, and even death! Sources of ignition, such as smoking and open flames, are prohibited where isopropyl alcohol is used.
- **Hydrogen peroxide**: As a common disinfectant for wounds, hydrogen peroxide can be used for disinfecting the kitchen or bathroom. Its mild bleaching effect makes hydrogen peroxide an excellent stain remover for fabrics and grout. It may cause skin or respiratory irritation, so handle it with care!
- **Sanitize your sponge or brush regularly:** You have probably heard that **sponges** are hotbeds of potentially dangerous bacteria, and when they are not sanitized properly, they can be dirtier than a toilet. To avoid wiping nasty germs all over the dishes you are trying to clean, make sure to sanitize your sponge or your **brush** daily. One effective way to clean a sponge is to use vinegar or bleach (but never together!). You can either fill a cup with vinegar and soak the sponge for about five minutes, or you can fill a cup with diluted bleach - ½ cup of bleach for every gallon of water - and soak the sponge for five minutes. Even if you are sanitizing your tools regularly, you should replace your sponge or brush regularly, anywhere from monthly to weekly, depending on how often you hand wash.

Kitchen hygiene

Cleaning surfaces and kitchen tools, keeping food storage areas clean, and hygienic kitchen waste treatment

Washing dishes

The unwritten rules of washing dishes have long been known, only the tools have evolved. In our home, even if we have a dishwasher, we often need to wash dishes by hand.

For example, to prevent unwashed dishes from accumulating in the sink, you may try to wash your dishes and cook your meal simultaneously. If this is not possible, you can make dishwashing faster by rinsing the plates and pots with running water and letting them soak.

Tips for proper dishwashing-Always wash the cleaner items first!

- You can save time and energy by not waiting for the leftover food to dry on the pan.
- Dishes should be washed in hot, dishwashing water and then clean, rinse thoroughly with warm running water.
- A plastic or silicone brush is a better choice than a sponge because they dry faster after use, without providing an ideal, moist home for bacteria for a long time and not having as many deep-seated hiding places for pathogens as sponges do.
- Start the washing process with items that are less dirty like glasses and cups, then proceed to dirtier items like bowls and serving dishes, and finish with the dirtiest items like pots and pans. To make things easier, you can keep the dirtier dishes in the soaking solution while you clean the other ones.
- It is worth changing the dishwashing water often!
- If the water is discolored, there is a build-up of dirt on the edge of the pool, replace it immediately. Always wash the degreasing wash with a warm running water rinse.
- For drying, use a drip instead of a cloth. It is more hygienic and the glasses dry better. If this is not possible, wipe the dishes with a paper towel or a clean, ironed kitchen towel to dry.
- Dispose of chipped, scratched dishes and utensils, as they are much harder to keep clean and their use can cause injuries.
- After each use, wash food residues and dirt from the sponge, unscrew it well, and always keep it in a dry place.
- Dishwashing detergents need to be changed frequently, as they can be a great medium for pathogenic microorganisms and fungi.
- The dishwashing sponge is only used for washing dishes!

- Wash surfaces frequently with a dishwashing or disinfectant cloth, wipe them off, and do not forget to clean the sink and disinfect the drip tray after the job is done.
- Even with the best dishwasher, the result will not be perfect if it is not used as intended.
- Insert the dishes properly. Glasses, mugs, deeper dishes should be placed in the upper basket, similar to plastic dishes that are dishwasher safe. Place the plates, larger serving utensils, and other larger kitchen utensils in the lower basket, always making sure that no large container blocks the path of the water spray - these are placed on the edges of the lower basket.
- Wash dishes and wooden utensils with non-stick coating by hand!
- The cutlery is placed upside down in the basket designed for this purpose, but in the case of more modern models, we can fit them one by one into the appropriate part of the upper tray.
- When using a modern dishwasher, it is not necessary to pre-soak the dishes, it is enough to remove food leftovers from the plates, pots, etc.

How to wash your dishcloths?

Damp cloths, sponges, and tea towels provide an appropriate environment for bacteria to grow. If they are not kept clean, they will spread these bacteria everywhere in your kitchen.

- Wash dishcloths every two days.
- You can run a hot wash cycle with the washing machine, or boil them in water for 15 minutes.
- If you have used a cloth to wipe up after the preparation of raw meat or vegetables, replace it straight away with a clean one.
- If your dishcloth smells, then it is time to change it.

Start and finish with a clean worktop

To prevent bacteria from growing and spreading in your kitchen, it is important to clean any chopping boards and other surfaces that come into contact with food. Proper cleaning requires hot soapy water and a good scrub.

- Always wash the kitchen worktop before you start preparing food.
- Wipe up any spills as you go.
- Clean up straight away after handling raw meat, raw eggs, or soil from raw vegetables.
- You are likely to touch the fridge and door handles, the oven, the microwave, the kitchen tap, and the sink area when you are preparing food. Remember to clean these well too.

How to wash a chopping board?

Cracks and grooves on chopping boards can harbor bacteria, so it is very important to clean them thoroughly.

- Wash your chopping board with hot soapy water after each use and be sure to scrub off any food or bits of dirt.
- This is very important if you have used the board to cut meat, poultry, seafood, or raw vegetables.
- A hot wash in the dishwasher is a very good way to clean plastic chopping boards, but a good scrub in the sink with hot soapy water will also work.
- Never put ready-to-eat food, salad, bread, or fruit on a worktop or chopping board that has been in contact with raw meat, unless you have washed it thoroughly first.
- Ideally, have separate chopping boards for raw meat and ready-to-eat foods.

How to clean cooking utensils?

- Clean everything carefully that you have used during the preparation of raw meat.
- Clean your utensils in hot soapy water or the dishwasher.

How to clean the fridge?

- Clean your fridge regularly, especially its handle, shelves, and storage compartments.
- Wash all surfaces thoroughly with warm, soapy water, then rinse it clean.
- Avoid using cleaning products that may affect the taste of food products, or damage your fridge.
- Wipe up spills immediately.
- Dry it thoroughly with a clean towel or paper towel.
- Once a week throw out the expired foods.

Home appliances and food safety

For many devices, we do not even think about food safety. Even small household appliances need to pay attention to, mainly because of their cleanliness.

Concerning the workplace **kettle**, limescale can be one of the biggest problems. It is not only an aesthetic issue but it can promote the growth of microorganisms in a humid and warm environment. Therefore, it is not recommended to drink water that has been cooling in the kettle for a long time. Always replace it with fresh water and boil it for tea or coffee.

Clean your kettle with vinegar: Measure out equal parts white vinegar and tap water. Fill your kettle around three-quarters full with the mixture. Bring it to the boil and leave it to stand until it's completely cooled. Drain the water and rinse several times, using a long-handled scrubbing brush to remove any rogue flakes if necessary. Fill your kettle with clean water, boil it and empty it a few times to remove any traces of vinegar.

There are several different **coffee makers**, from the Moka pot to the filter coffee machines through the capsule ones. No matter which kind of coffee maker you have, you have to clean them from stale water, mineral buildup, or sludge because germs you cannot see may infect the water and make you sick. Clean the coffee machine regularly according to the instructions of the manufacturer.

- In the case of a filter coffee machine, remove the filter full of coffee slurry after brewing, and wash the funnel-shaped part of the appliance.
- Do not wipe the parts with a kitchen towel, but with a paper towel or wash them in the sink, allowing the cleaned parts to dry on the dish drainer.
- Depending on the hardness of the water, descaling our appliance with a diluted vinegar solution or cleaning tablets is necessary every 1-2 months (As soon as you notice limescale buildup in the machine).
- If you have an automatic coffee maker, follow the "instructions" on the machine's display and clean the machine.

With proper care and cleaning, **nonstick/teflon** cookware will last for years. However, nonstick pans require special care to prevent their surface from scratching, peeling, or warping. Do not overheat your Teflon-coated pan because it can release potentially dangerous fumes. When cleaning nonstick pans, you should never use abrasive tools such as steel wool, scouring pads, or stiff scrubbing brushes, which can damage the surface. Usually, a quick scrub with mild dish soap and a soft cloth or sponge is enough to clean nonstick pans. For stubborn residue, you might need to soak the pan for a few hours in warm, soapy water before gently scrubbing it clean. According to the manufacturer's instructions, wash the inside and outside surfaces of nonstick appliances (e.g. waffle maker, electric wok, etc.) with lukewarm water (of course, always unplug the machine!). If the surface of the pan/appliance is already damaged, scratches have occurred or larger pieces of the coating are missing, it can be used no longer.

Always keep your **microwave oven** clean, try to avoid splatter from food because food residues may burn. Moreover, pathogens can grow on food residues. If the appliance is not used for a long time, it may become moldy or rusty. The following parts require cleaning:

- Internal and external surfaces
- Door and door seals

- Glass turntable and roller ring

During the cleaning process, take care not to damage the covers and seals! Always unplug the device before you start cleaning it!

Plastic tools often become discolored and, unlike metal tools, they are more easily scratched. Pathogenic microbes can easily settle in scratches, cuts, cracks on plastic. Moreover, the plastic may weaken, break, and small particles may chip off due to external influences. Eventually, these fragments, fibers, and debris can get into the food. Thus food safety they are a source of danger. Use these kitchen tools only as long as their surface is smooth, even, and clean.

Garbage 1x1

We do not realize it, but we touch the trash can at least ten times a day.

Much of the **food waste** in our kitchens comes from **inadequate planning** or simply buying too much food. In the world, approximately 1.3 billion tons of food are being discarded each year. This amount of waste takes up 1/3 the amount of trash produced each year, and it shouldn't be.

Kitchen waste should be collected separately in the kitchen, while other household garbage including diapers, household detergent bottles, and used menstrual products should be disposed of in the bathroom or the nursery. The trash can should always have a lid that you keep closed. Therefore, it will not attract insects, emit foul odors, and pollute its environment. You should never put food waste into your general waste bin or down the drain. Moreover, some of the discarded food waste can be composted at home.

Take out the trash every day, especially if you have cooked a meal and a large amount of organic waste has been generated. Otherwise, harmful microorganisms will colonize the food scraps and, eventually, spread infection within your household.

Clean the surface of the trash can at least once a week, if anything spills, wash it off immediately and dry it thoroughly before using it again, otherwise it will become moldy. You can also use a garbage bag that matches the size (capacity) of your bin.

Fortunately, separate waste collection is a popular recycling option, but many households still do not pay enough attention to collect the accumulated waste separately, although we may not even realize how important this procedure is.

- Remember to collect used domestic cooking oil separately. Do not pour it into the trash or flush it into the sewer system. You can now easily deposit used cooking oils at one of the collection points.
- Before recycling your packaging, remove any food or drink residue. Fold food packaging, if possible, to make more space in your bin.
- It is practical to have a trash can in the size you need for everyday life.
- Sort the discards: you can use paper bags and cardboard boxes, or simply put all recyclables in one place and sort them directly into proper bins.

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