Educational materials for attendees of the Health Safety and Personal Hygiene Course

EXTENDEN PROGRAM

Zagreb, 2019

Publisher:

CROATIAN INSTITUTE OF PUBLIC HEALTH

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These educational materials were designed in cooperation with the representatives of sanitary and veterinary inspection, the Croatian Institute of Public Health, the Croatian Veterinary Institute, the network of public health institutes and the Croatian Food Agency.

The materials were published with the approval of the Ministry of Health and the Ministry of Agriculture of the Republic of Croatia and are used as such for the purpose of educating all persons who are required to take a health education course under an extended programme.

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Table of Contents

1. Foreword

These educational materials contain the basic information about food hygiene, personal hygiene, the hygiene of premises, equipment and accessories, food hazards and food poisoning, food labelling and the epidemiology of infectious diseases, and are intended for course participants to acquire the necessary knowledge about food safety, the so called "Minimum Hygiene Requirements", in accordance with the Ordinance on the method and programme of acquiring the necessary knowledge on food safety (Official Gazette No. 116/18). At the same time, the materials are intended for all food business operators as a compendium of the basic rules of conduct for food businesses.

Course attendance under the extended programme is intended for all persons who at their workplaces come into contact with food in the production or distribution of food and water for human consumption who work in meal preparation and serving, and who work with food in more complex meal preparation processes, e.g. in craft and industrial food production, hotels, restaurants, institutional kitchens/canteens, facilities for the production of meat preparations, cake shops etc. This business category includes all business activities, with the exception of those specified in Article 5 of the cited Ordinance.

Pursuant to Article 7, paragraph 3 of the cited Ordinance, said materials are published on the websites of all public health institutes and relevant ministries, to be accessible to everyone.

Persons who work in primary food production (products of the soil, of stock farming, of hunting and fishing) and related activities <u>are not obliged</u> to take a health education course.

The course for persons working in the above business activities is based solely on these approved educational materials.

2. Introduction / Legislative framework / Responsibilities

The "Minimum Hygiene Requirements" course is part of the health education that qualifies all persons who work with food to have basic knowledge about food safety and personal hygiene, as well as the hygiene of premises, equipment and accessories, with a view to adopting and applying this knowledge. The course is organised and conducted by the public health institutes. All who pass the course, in keeping with the Ordinance on the method and programme of acquiring the necessary knowledge on food safety (Official Gazette No. 116/18), shall also be deemed to have acquired the necessary knowledge and fulfilled their responsibilities from Chapter XII, paragraph 1, point 3 of the Regulation No. 852/2004.

The course shall be retaken five years after the initial course, to renew one's knowledge.

2.1. Legislative framework and division of authorities

- Act on the Protection of the Population from Infectious Diseases (OG Nos. 79/07, 113/08, 43/09, 130/17);
- Sanitary Inspection Act (OG Nos. 113/08, 88/10, 115/18);
- Veterinary Act (OG Nos. 82/13, 148/13, 115/18);
- State Inspectorate Act (OG No. 115/18);
- Food Act (OG Nos. 81/13, 14/14, 30/15, 115/18);
- Act on Food Hygiene and Microbiological Criteria for Foodstuffs (OG Nos. 81/13, 115/18), including any amendments thereto;
- Act on Official Controls Carried out in Accordance with Regulations on Food, Animal Feed, Animal Health and Welfare (OG Nos. 81/13, 14/14, 56/15), including any amendments thereto;
- Act on Water for Human Consumption (OG Nos. 56/13, 64/15, 104/17, 115/18);
- Act on the Provision of Food Information to Consumers (OG Nos. 56/13, 14/14, 56/16);

- Ordinance on the rules for establishing systems and procedures based on the principles of the HACCP system (OG No. 68/15);
- Ordinance on the frequency of control and norms of microbiological cleanliness in facilities under sanitary control (OG No. 137/09);
- Ordinance on informing consumers about non-prepacked food (OG No. 144/14);
- Regulation (EC) No. 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety, including any amendments thereto;
- Regulation (EC) No. 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs, including any amendments thereto;
- Regulation (EC) No. 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin, including any amendments thereto;
- Commission Regulation (EC) No. 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs, including any amendments thereto;
- Regulation (EU) No. 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, including any amendments thereto.

National guides for individual business activities dealing with the production and distribution of food, as approved by the Ministry of Health and the Ministry of Agriculture of the Republic of Croatia:

Guides approved by the Ministry of Health:

- https://www.hok.hr/cehovi/haccp_ugostiteljstvo
- https://www.hok.hr/cehovi/haccp_pekarstvo
- https://www.hok.hr/cehovi/haccp_slasticarstvo
- https://www.hok.hr/cehovi/haccp_trgovina
- http://www.mzss.hr/layout/set/print/novosti/novosti_iz_zdravstva/vodic_dobre_higijenske_prakse_i_primjene_haccp_nacela_za_institucionalne_kuhinje

Guide for kindergarten kitchens has been approved and is available on the website of the Ministry of Health:

+ https://zdravlje.gov.hr/o-ministarstvu/djelokrug-1297/sanitarna-inspekcija/hrana-1359/haccp-vodici/3018

Guides approved by the Ministry of Agriculture:

+ https://www.hgk.hr/documents/vodiczadobruhigijenskupraksuuindustrijiproizvodaribarstvav2595785ef38a6ed4.pdf
+ http://www.sircro.hr/wp-content/uploads/2015/12/Vodic-dobre-higijenske-prakse-PRVO-IZDANJE.pdf
+ http://www.lipa-pazin.hr/wp-content/uploads/dobra_pcelarska_praksa.pdf
+ https://www.dekaform.hr/downloads/Vodic_DHP_HCCP_%20industrija_mesa.pdf

Guides for informing consumers on non-prepacked food:

+ http://www.mps.hr/datastore/filestore/115/Vodic_za_informiranje_potrosaca_o_nepretpakiranoj_hrani_2015.pdf
+ http://veterinarstvo.hr/default.aspx?id=4548

With the accession of the Republic of Croatia to the European Union, the EU legislation became part of the Croatian legislation, that is, the EU regulations governing certain areas of food safety have become binding in the Republic of Croatia. EU regulations enter into force in the Republic of Croatia on the same day as in other member states.

Competent bodies that enact and enforce laws are the ministries for agriculture and health, in keeping with the division of authorities, as per the Food Act (Article 4), while, in the area of food safety, inspections are carried out by the sanitary and veterinary inspections, each in their own jurisdiction.

Elementary legal provisions

1. Act on the Protection of the Population from Infectious Diseases

This Act defines infectious diseases, whose prevention and control are in the interest of the state, as are the measures of protecting the population from infectious diseases.

This Act is **related** to other regulations in the field of food safety, as general measures of suppressing infectious diseases include, among other things, the following responsibilities:

1. Ensuring the safety of foodstuffs, including monitoring of zoonoses and their agents, and general use items, as well as sanitary, technical and hygienic requirements for their production and circulation;
2. Ensuring the safety of drinking water and sanitary protection of water sources, water facilities and water-supply works, as per specials regulations;
3. Fulfilment of sanitary, technical and hygienic requirements for drainage of waste and ballast waters, as well as disposal of waste materials;
4. Ensuring the implementation of disinfection and pest control, as a general measure of sanitation of surfaces, spaces, premises or facilities where food is handled.

According to the provisions of this Act, every employee who comes into direct contact with food at their workplace is obliged to undergo an annual health examination, and have a certified sanitary card (health and hygiene certificate) (with the exception of persons who work exclusively with packed food).

Every employee in contact with food shall pass a health course.

Every establishment shall control their microbiological cleanliness at least twice a year by having swabs taken for analysis.

2. Food Act

The Food Act determines the competent authorities and their tasks, the responsibilities of food and feed business operators, official controls, and prescribes administrative measures and penalties.

The Food Act transposes the **Regulation No. 178/2002**, which lays down certain elementary rules that **all food business operators need to be aware of**:

The responsibility for all food-handling procedures and food marketing rests with the food business operator.

Each operator is responsible for complying with food regulations in the part of the food chain where they operate.
It shall be prohibited to market unsafe food or food that is unsuitable for consumption.
Any operator knowing or reasonably suspecting that a food from its production, import or distribution is unsafe shall withdraw it from the market and notify the competent authorities thereof.

3. Act on Food Hygiene and Microbiological Criteria for Foodstuffs

The Act establishes the responsibilities of food business operators, including:

- Set-up and implementation of procedures based on the principles of the HACCP system (see chapter VII);
- Running tests according to certain microbiological criteria;
- Registration of their food business establishments.

Sanitary inspection – surveillances production facilities of foods of non-animal origin, mixed foods, all catering facilities and all retail facilities, except for those under the jurisdiction of the veterinary inspection.

Veterinary inspection – surveillances all production facilities of foods of animal origin and part of retail facilities that are subject to special approval or registration.

The establishments that are under the surveillance of the **sanitary inspection** are the facilities that are **only registered with the Ministry of Health**, namely in the following areas:

- production and processing of foods of non-animal origin and mixed foods;
- commercial establishments;
- catering;
- establishments designated for preparing meals and providing catering services on the premses of social welfare, healthcare, education and similar institutions;
- import and distribution of food (except for food of animal origin);
- production, distribution and marketing of food supplements

Establishments under the surveillance of the **veterinary inspection** are divided into two groups - operators subject to registration and facilities subject to approval:

Establishments subject to registration:

- facilities of primary food production;
- facilities for egg production and egg collectors;
- facilities for the production of raw milk, milk collection points and private premises where cheese and cream are produced;
- primary production of bee products and other primary products, and facilities for their bottling and packaging;
- fish and shellfish farms, and other aquaculture establishments;
- snail farms;
- butcher shops, fish markets, vending machines for milk and other foods of animal origin;
- facilities for slaughtering poultry, lagomorphs and small ungulates at the holding of provenance;
- game collection centres

Establishments subject to seeking approval (undergo inspection before being granted operational authorisation):

- slaughterhouses and cutting plants, including mobile slaughterhouses
- facilities for processing and cutting game;
- facilities for processing and mincing meat, and producing processed meat products;
- facilities for live shellfish and fishery products;
- facilities for the production and processing of milk and eggs;
- facilities for processing frogs, snails, stomachs, bladders, intestines;
- facilities for the production of gelatin and collagen, and export facilities for bee products
- meat wholesale facilities, facilities for the storage and prepacking of food of animal origin

All food business operators shall register and/or authorise all their establishments.
All food business operators shall introduce auto-control systems based on the principles of the HACCP system (see chapter VIII).

4. Act on the Provision of Food Information to Consumers

This Act regulates the manner in which food must be labelled (marked) in the Republic of Croatia. Food must be properly labelled (marked) in the Croatian language and Latin script. Information on a food should be accurate, true and should not mislead the consumer.

A food shall be marked with the name of the food business operator that is its manufacturer or marketer.
It is not allowed to ascribe such food properties that a food does not possess, especially any such property that would prevent or treat human diseases. More information on proper labelling can be found in chapter VI of this educational material.

5. Act on Official Controls Carried out in Accordance with Regulations on Food, Animal Feed, Animal Health and Welfare

This Act, as well as other laws governing inspection procedures (Sanitary Inspection Act, Veterinary Act, State Inspectorate Act), regulates the manner in which responsibilities are divided between individual inspections, but also regulates the authority of the inspection and prescribes the measures that can be taken in case of a violation of regulations. Some provisions thereof should be remembered:

Each inspector is independent in their work and decides independently on the measures to be taken based on the facts established during the inspection.

The measures adopted can range from milder, such as an obligation to eliminate product deficiencies within a limited period; to stricter: operational bans or prohibiting the circulation of a certain food if there is a danger of continued operation under the established circumstances.

In addition to these measures, penalties can also include an on-the-spot fine in a misdemeanour court.

6. Ordinance on the rules for establishing systems and procedures based on the principles of the HACCP system

This Ordinance was adopted on the grounds of the Act on Food Hygiene and Microbiological Criteria for Foodstuffs, and prescribes the ways in which the HACCP system can be set up for all food business operators in the Republic of Croatia (see chapter VII).

7. Ordinance on informing consumers about non-prepacked food

This Ordinance regulates the manner in which non-prepacked foods are labelled in retail sale and the catering industry.

Where can applicable laws be found?

+ **National laws and regulations are published in the Official Gazette ("Narodne novine") and are searchable by number and year at:** https://www.nn.hr/
+ **European legislation is searchable by number and year at: https://eur-lex.europa.eu/homepage.html?locale=hr**

As the above is published in all languages, the Croatian version must be selected.

2.2. Basic glossary of food safety

Food is any substance or product intended for human consumption. The term 'food' includes beverages, chewing gum, water and any other substance that is incorporated into food. **Food is considered *unsafe*** if **harmful for human health and unsuitable for human consumption.**

- **Harmful** food is such food that **does not meet the microbiological criteria** of food safety, that contains pathogenic microorganisms, non-pathogenic microorganisms and parasites for which a risk assessment has established a risk for human health, for which **evidence exists that people have been poisoned by,** that **contains contaminants** that exceed the maximum allowable concentration (MAC) level, or that contains pesticides in an amount that poses a risk to human health, as determined by risk assessment.

- **Unsuitable** food is food with an expired **"use by" date,** as well as food that, **due to its changed properties (taste, smell, rotting and decomposition), is not acceptable for human consumption,** or that **contains allergens** that are not labelled according to a special regulation.

Contamination – the presence or introduction of an undesirable harmful organism or substance (contaminant).

Cross-contamination of food – transfer of microorganisms or other harmful substances from food (usually raw) to another type of food. Bacteria can be transmitted directly, when one type of food comes into contact with another, or indirectly, through hands, equipment, worktops, knives and other utensils. Cross-contamination of food by contact is one of the main causes of food poisoning.

Zoonosis – a disease and/or infection that is naturally transmitted, directly or indirectly, between **Carrier –** a person who shows no symptoms of a disease, but still carries the causative agents of an infectious disease and can spread them to others without being aware of it, precisely because they are not experiencing any health problems.

Incubation – the time that elapses from the ingestion of a microorganism to the onset of symptoms of a disease. It is specific for each causative agent.

Food business operator (FBO) – natural or legal person responsible for ensuring compliance with the requirements of the Food Act within the food business that it supervises. An FBO shall ensure that all phases of food production, processing and distribution comply with the legal regulations. They are obliged to set up a traceability system for targeted and expedite withdrawal of a food from the market, that is, to inform consumers and competent authorities if problems related to food safety should arise.

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Food business establishment (FBE) – a business unit of a food business operator.

Fishery products - all freshwater or marine animals (except live shellfish, live echinoderms, live tunicates and live sea snails, and all mammals, reptiles and frogs), whether wild or farmed, including all edible forms, parts and products of these animals.

2.3. The role of course participants in maintaining health and preventing disease

Every person working with food is the key mediator who, by properly handling food, can and must ensure its proper preservation, preparation and placing on the market.

Every course participant should know that by maintaining proper personal hygiene and handling food correctly, thereby not causing it to become contaminated, they primarily protect themselves and other people from contracting a disease, but also their job and the reputation of the establishment they work for.

3. Personal hygiene and the importance of employees' personal hygiene

Personal hygiene includes general and practical procedures that serve to prevent the *spread* of disease and improving health.

Regular maintenance of **hygiene habits (rules), especially hand washing**, are a necessary **prerequisite for preventing the spread of infectious diseases** and are a reflection of the sociological and cultural habits of an individual and the environment in which they live. Hygiene habits (rules) include procedures that are carried out to maintain personal hygiene, and these should be carried out daily and properly.

3.1. Hygiene rules (habits)

Personal hygiene habits (rules) that should be obeyed at the workplace where food is handled are as follows:

- Wearing jewellery (rings, watches, bracelets) shall be prohibited;
- Nails shall be cut short and not painted;
- Hair shall be tied back, and if there is a risk of food contamination at the workplace, a cap or similar headwear shall be worn;
- During work, it shall be mandatory to wear prescribed work clothes, which must be clean and kept in separate two-compartment cabinets;
- Eating, drinking or smoking while handling food shall not be allowed;
- Hair, beard and moustache shall be neat and tidy;
- No coughing or sneezing around food shall be allowed;
- Minor injuries shall be covered with a patch during work, in which case a disposable glove should be used;
- Any disease shall be duly reported.

3.1.1. Proper hand washing

Dirty hands, i.e. the hands that are contaminated by direct or indirect contact with contaminated material or contaminated objects, spread many infectious diseases, which is why **hand washing is the fundamental procedure and the basis of personal and occupational hygiene**. Dirty hands are the most common route of food contamination and transmission of infectious disease agents, which is why intestinal infectious diseases are popularly known as the 'dirty hands diseases'. Proper washing and disinfection of hands should be carried out over a designated sink, involving accessories for hygienic washing and drying of hands (Image 1).

+ **The hand washing procedure consists of wetting the hands with warm water, applying liquid soap, rubbing to a foam (spend a minimum of 15 seconds on rubbing in the soap on all surfaces of the hands) and, if necessary, using a brush to remove dirt from the pores and under or around the nails.** After soaping, rinse thoroughly the hands under a stream of warm water until all traces of soap are removed. **It is recommended to get an antibacterial soap.** Hand drying is done with disposable towels or a hot air dryer.

+ **The use of gels, creams and liquids for hand disinfection is also recommended when handling unpacked foods.**

Image 1. Hand washing and drying instructions

Hands must be washed in the following situations:

Before putting on work clothes (prior to starting work);

Before entering the food handling area, e.g. after a break or using the toilet;

Before meal preparation;

Before handling any ready-to-eat meals;

After handling raw foods, such as meat/poultry and eggs;

After handling left-overs or emptying the trash can;

After cleaning;

After blowing your nose or sneezing/coughing.

3.1.2. Hair hygiene

All employees who work with food in food production and processing, catering and other facilities, where there is a possibility of hair getting in the food, shall wear head coverings, so that all hair is covered by the headwear (nets, hats, scarves). Head coverings are part of the work clothes of employees who work with food.

3.1.3. Hygiene of work clothes and shoes

Work clothes must at all times be **clean and suitable for the type of work performed by the worker**. It is recommended that work clothes be made of cotton and that they may be washed at 90°C and ironed. Protective aprons of suitable material and protective footwear must be worn when working in crude food processing (fish, meat, vegetables) and when washing dishes. When washing dishes, it is mandatory to wear protective rubber gloves.

Work clothes should be clean and kept in separate cabinets (in two-compartment cabinets, with separate compartments for work and civilian clothes).

Work clothes may not be kept in storage rooms, toilets or inside areas where food is prepared!

Disposable gloves must be changed whenever changing the work process. After use, used disposable gloves are to be disposed of in a dedicated container for waste disposal. No reuse of already used gloves is allowed.

3.2. Disease reporting and the importance of disease reporting

The obligation to report infectious diseases is prescribed by the Act on the Protection of the Population from Infectious Diseases, with a view to preventing and suppressing infectious diseases.

Infectious diseases represent one of the most significant threats to public health, while recognising outbreaks and monitoring infectious disease trends is key in order to prevent and suppress them.

Disease reporting

In case of **symptoms of a disease that may be transmitted through food** or contaminate food, such as:

vomiting;
diarrhoea;
coughing, sneezing;
purulent changes on the skin;

all employees are obliged to report the symptoms to the **responsible person**.

After recovery, but before returning to the workplace, any case of diarrhoea or vomiting in the family should also be reported to the responsible person, as certain microorganisms can be transmitted even after the person has recovered from an infectious disease, i.e. they can still be a carrier.

The responsible person shall not allow employees with above symptoms of disease to work with food!

3.3. The importance of personal hygiene

Personal hygiene of employees is pivotal for preserving the cleanliness of food and for preserving and improving health. It is a known fact that microorganisms in food are most often transmitted by failure to perform personal hygiene procedures, specifically by:

unclean hands;
sneezing;
coughing;
blowing one's nose;
bodily secretions of a sick person;
contaminated objects.

Consequently, every person who works with food must maintain a high level of personal hygiene and keep a neat physical appearance, while adhering to the rules earlier specified in this manual.

4. Hygiene of premises, equipment and accessories

4.1. Preliminary requirements for spaces and premises where food is handled

All premises where food is produced, processed, distributed or circulated shall meet certain preliminary requirements, as prescribed by EU legislation, namely:

+ The location, size and arrangement of premises in a food business shall be suitable for the scope of the activity being carried out;
+ The premises where food is handled shall be clean, maintained and in good condition;
+ Adequate maintenance, cleaning and/or disinfection shall be readily available;
+ Good hygiene practices shall be maintained, including protection against contamination and especially pest control;
+ Certain requirements shall be met for handling food, as well as for food storage at controlled temperatures, which shall be monitored and recorded;
+ An adequate number of toilets with running water connected to an efficient drainage system shall be ensured. Toilets may not open to the inside of the premises where food is handled;
+ An adequate number of sinks for washing hands shall be ensured, placed in suitable places. Hand washing sinks shall offer hot and cold running water, hand washing agents and hygienic drying;
+ Adequate and sufficient natural or artificial ventilation shall be provided;
+ Adequate natural or artificial ventilation shall be ensured in sanitary facilities;
+ Adequate natural and/or artificial lighting shall be ensured in premises where food is handled.

- Wastewater drainage systems shall be efficient, designed and constructed in such a way as to avoid the risk of contamination;
- Adequate wardrobe space for staff shall be ensured;
- Cleaning and disinfecting agents may not be stored in areas where food is handled;
- Floor surfaces shall be in good condition, made of impermeable, non-absorbent, washable and non-toxic material and easy to clean and disinfect;
- Wall surfaces shall be kept in good condition, with smooth surfaces, made of impermeable, non-absorbent, washable and non-toxic material, and easy to clean and disinfect;
- All above-head ceilings and structures shall be designed and constructed in such a way as to prevent the accumulation of dirt and reduce condensation, and to prevent the development of undesirable mould and the scattering of particles;
- Windows and other openings shall be so designed to prevent any accumulation of dirt. If necessary, they must have protective nets that prevent the entry of insects and that can easily be removed for cleaning;
- Doors shall be easy to clean and disinfect. This requires the use of a smooth surface made of non-absorbent material.
- Surfaces (including equipment surfaces) in areas where food is handled, and especially those that come into contact with food, shall be kept in good condition and easy to clean and disinfect. This presupposes the use of smooth, washable and non-toxic, corrosion-resistant materials;
- Adequate conditions for washing food shall be ensured. Every sink or other such equipment intended for washing food shall provide an adequate supply of hot and cold water, and shall be regularly cleaned and, if necessary, disinfected.

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4.2. Washing, cleaning and disinfection as general measures of infectious disease control

All objects, utensils and equipment coming into contact with food shall be effectively cleaned, washed and, if necessary, disinfected. Cleaning and disinfection must be carried out often enough to avoid any risk of contamination.

The objective of cleaning and disinfection is to reduce contamination with microorganisms and remove pathogenic microorganisms. **The cleaning process always starts from the clean part towards the unclean part**, so as to prevent the possibility of contamination of the premises, accessories and equipment (cross-contamination).

Washing and cleaning – removal of major impurities and dirt.

Disinfection – eradication and/or removal of microorganisms.

Order or activities

1. **Cleaning and washing with warm water first – removal of visible impurities;**
2. **Application of detergent solution – removal of residual impurities;**
3. **Rinsing with warm water – removing detergent and impurities;**
4. **Disinfection – eradication of remaining microorganisms;**
5. **Final rinsing – removal of disinfectant residues**
6. **Drying**

During cleaning and washing you should:

+ wear designated clothes;
+ not perform cleaning, washing or disinfection tasks when preparing meals;
+ always **adhere to the dosage** indicated on the packaging of detergents and disinfectants and **follow the instructions (the contact between the disinfectant and the surface should be long enough to have an effect)**;
+ make sure that the washing process is always done in two stages – **washing first, then disinfection**, and finally rinsing and drying;
+ always rinse the surfaces after washing and disinfection;
+ adhere to the deadlines prescribed by the plan;
+ keep detergents and disinfectants away from food.

4.3. Needs for a washing, cleaning and disinfection plan, and keeping a measure implementation record

A washing, cleaning and disinfection plan is a document that usually lists all areas, equipment and accessories that must be cleaned.

Furthermore, it defines the frequency and type of product used for washing (the agents, that is, the preparations used in the washing and disinfection process, as well as the method of their preparation and application), the persons who carry out the washing, and the methods of verification.

This Plan is part of the mandatory documentation, pursuant to the Ordinance on the rules for the establishing systems and procedures based on the HACCP principles (OG No. 68/15).
The persons designated for the washing, cleaning and record-keeping procedures **keep a record** on the implementation of the plan.

Establishment:	PLAN OF HYGIENIC MAINTENANCE OF PREMISES, ACESSORIES AND EQUIPMENT	Date: 25/02/2009
		Version: 01
		Page: 3/9

No.	Device – Equipment	Method of maintenance (Write the intended agent, dosage, method of application, contact time of action, temperature)	Maintained by	Cleaning and washing frequency	Disinfection frequency
AREA FOR WASHING AND CLEANING FOODSTUFFS					
2.	Kitchen utensils		Person responsible for washing surfaces and equipment	Daily: after end of work	Machine wash
3.	Dishware		Person responsible for washing surfaces and equipment	Daily: after end of work	Daily: after end of work
4.	Potato machine		Person responsible for washing surfaces and equipment	Daily: after end of work	Daily: after end of work
5.	Shelves		Person responsible for washing surfaces and equipment	Daily: after end of work	Daily: after end of work
6.	Worktops		Person responsible for washing surfaces and equipment	Daily: after end of work	Daily: after end of work
SURFACES, EQUIPMENT AND UTENSILS THAT COME INTO CONTACT WITH FOOD DURING PREPARATION AND STORAGE					
1.	Kitchen utensils		Person responsible for washing surfaces and equipment	Daily: after end of work	Machine wash

Establishment:	**RECORD OF CLEANING, WASHING AND DISNFECTION OF DEVICES, ACCESSORIES, EQUIPMENT, WORKTOPS, FLOORS AND WALLS**	Date: 25/02/2009
		Version: 01
		Page: 1/1

Date	List of persons resp. for cleaning and disinfection	
	Shift 1	Shift 2
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Date	List of persons resp. for cleaning, washing and	
	Shift 1	Shift 2
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		
29.		
30.		
31.		

List of persons responsible for a weekly record control
Date and signature
Date and signature
Date and signature
Date and signature
Date and signature

Note: Cleaning should be carried out in accordance with the Plan for the hygienic maintenance of premises, accessories and equipment. A handwritten signature guarantees that the cleaning was carried out in accordance with the Hygienic Maintenance Plan.

A record is to be kept of how or when certain areas or equipment were cleaned and the person responsible for carrying out the cleaning process.

The effectiveness of the performed cleaning and disinfection is checked by swab sampling or contact and stamp plates.

Pursuant to the Ordinance on the frequency of control and norms of microbiological cleanliness in facilities under sanitary control (OG No. 137/09), an FBO shall have swab samples taken from surfaces, equipment and employees' hands **at least twice a year**.

4.4. Hygiene of food production devices and plants

In food production plants, it is necessary to regularly wash and disinfect all food production equipment.
All equipment should be maintained in such good condition that the risk of contamination is reduced to a minimum, including provisional food packaging.

The only exceptions are plants where flour and cereals, spices, additives, and similar products are stored and facilities of the milling industry, where cleaning is usually done by dry brushing and blowing procedures, with occasional quarterly/annual complete washing.

There are a number of different products on the market that are used to maintain the hygiene of premises and equipment. All agents used must be suitable for cleaning utensils, devices and surfaces that come into contact with food.

To carry out proper washing and disinfection, washing accessories and equipment, and chemical agents are used.

All accessories and equipment used must be designated for washing (cloths, sponges, brooms, foam sprayers, etc.) and shall be replaced regularly, when they become unsuitable for proper use due to normal wear and tear. It is important to remember:

+ A designated space or a separate closet is needed for storing accessories and cleaning equipment when not in use.

- Cleaning and disinfecting agents shall be stored separately from areas where food is handled.
- M**anufacturer's instructions** on the method of preparation and use must be followed.
- All products shall be properly labelled, and they may not be decanted into non-original packaging.
- Chemical agents are divided into:

  Detergents – chemical agents that are used to remove fats, impurities and food residues, and partially mechanically remove microorganisms as well;

  Disinfectants – chemical agents that destroy microorganisms

- **Before the disinfection procedure, it is necessary to clean all traces of grease, impurities and food residues from objects and surfaces, that is, to carry out the washing procedure first.**

There are also chemical products on the market that contain both components – wash and disinfect at the same time.

Food production plants often have specific procedures in force for washing individual devices using a combination of **several different washing agents** (alkaline agent – acid agent, disinfectant), which should be **predefined by the plan** for each designated area, with a list of pertaining equipment, in keeping with the foreseen frequency. All plan implementation activities shall be documented in prescribed records.

4.5. Disposal of liquid and solid waste, and environmentally friendly waste management

Waste shall mean any part of food, packaging material, even parts of clothing and cleaning accessories which are no longer suitable for use.

Waste disposal

Before carrying out any cleaning and disinfection procedures, waste shall be removed from the premises.

Waste represents a risk of possible physical contamination of food and attracts pests, as well as a risk of cross-contamination of other food with pathogenic microorganisms.

Organic, like other waste, must be removed as soon as possible from the area where food is handled. Furthermore, disposal of waste oil and other waste must be ensured in accordance with special regulations.

Waste receptacles shall be located in all places where waste is generated and shall be equipped with a tight-fitting lid and a pedal.

Areas for waste disposal shall be so built to ensure easy sanitation and prevent pest infestation/entry.

+ Waste from the catering industry and institutional kitchens/canteens **shall not be used** for feeding animals, pursuant to veterinary regulations!
+ Food of animal origin that has expired, or is unsuitable for human consumption for other reasons, must be disposed of as a category 3 by-product by a legal entity authorized for the collection of by-products.
+ Animal by-products not intended for category 3 human consumption are: meat, meat products, milk, dairy products, eggs and egg products, fresh and processed fishery products unfit for human consumption or expired.
+ Bones, offal and other inedible by-products from approved and/or registered facilities shall be disposed of by a legal entity authorised for the collection of by-products.

4.6. Safe water needs

Water intended for human consumption is all water that, in its original state or after processing, is intended for drinking, cooking, meal preparation or other household needs, regardless of its origin, i.e. regardless of whether it comes from the public water supply system, from cisterns or from bottles, i.e. water containers.

Water is quintessential for human, animal and plant life. It is not only used for drinking, but also for other purposes, from meal preparation, personal hygiene, washing clothes and rooms, public baths, fire protection, to various technological processes in industry.

It is, hence, crucial to ensure healthy water for human consumption. **Water is considered to be safe when it**:

+ **contains no microorganisms,** parasites or their developmental forms in numbers that pose a danger to human health;
+ **contains no harmful substances** in concentrations that alone, or with other substances, pose a danger to human health;
+ **does not exceed the values of the microbiological and chemical parameters** of water safety, as **prescribed by a special regulation**.

Public suppliers of water services (public waterworks) are regularly surveillanced by internal or external laboratories, state monitoring or official controls. It can, thus, be said that an FBO needs to pay "less" attention to this segment of safety if their FBE is connected to public water supply. However, there is a whole series of harmful parameters that can be detected in water as a result of a poor "internal" network (lead, copper, *Legionella, Pseudomonas aeruginosa*).

All public suppliers shall publish a complete water analysis on their website and make it available to all FBOs.

FBOs that are connected to individual systems (e.g. wells, cisterns, water tanks, smaller water tanks) and that, as a rule, do not undergo effective surveillance of water quality, **shall be obliged to have their water tested 4 times a year (quarterly) for basic parameters (A analysis)** and take measures to ensure water safety, if water analysis should indicate a deviation of certain parameters.

Measures to be taken in case of non-compliance:

+ If you carry out a water analysis that should prove non-compliance with safety requirements, immediately consult the competent public health institute for remedial measures;
+ If the water is shown to contain *E. coli, Enterococci* or other pathogens that can affect food safety, the water may not be used for meal preparation! Water shall be provided by an alternative method (water tank, etc.).

Food business operators, consequently, have the following obligations in terms of ensuring food safety:

All FBOs that are connected to the public and local water supply systems shall have a control plan for water for human consumption based on risk assessment.

All FBEs that are connected to individual water supply systems (e.g. wells, cisterns, water tanks, smaller water tanks) shall have their water tested for human consumption 4 times a year (quarterly), namely A analysis (basic analysis).

The importance of safe water for ice making

Ice is made in almost all catering establishments, but also elsewhere, in ice (making) machines. When using ice in drinks to be consumed directly, it is very important to emphasize the following:

- Ice should be produced exclusively from water for human consumption;
- The lids and doors of the ice machine should be closed during operation;
- The scoop for removing ice from the ice machine should be regularly washed and disinfected, and should be kept in a suitable place (outside the device);
- Ice machines should be regularly cleaned and disinfected at least once a week, and more often, if necessary;
- In case of ice machine failure or power cut, water must be drained out, and the machine cleaned and disinfected.

Ice shall be safe, pursuant to the criteria for water for human consumption, and the water used therein shall be tested in accordance with the scope, type of business and risk involved.

Another water product used in food production is water vapour. The devices and apparatus for the production of vapour that is introduced into a product shall be washed and cleaned regularly.

Procedures in case of water supply from individual supply systems

Special attention should be paid to the maintenance of own water supply systems in FBEs, and they should be regularly cleaned, washed and disinfected, while the maintenance method and frequency should be adapted to the type of water supply system.

Maintenance of water tanks (cisterns, rainwater cisterns, smaller-capacity plastic tanks)

Water tanks must be maximally protected against the possible entry of insects, rodents and other animals, as well as all other types of contamination. Tanks should be fully emptied from time to time, and sludge and other impurities should be removed from the bottom. The walls should then be cleaned well with a brush and/or sponge, rinsed with clean water and then disinfected using a chlorine solution (e.g. Izosan-G, Dezisan or similar), strictly following the manufacturer's instructions for preparation and use. The water remaining in the tank after washing and disinfection must be removed, after which the tank can be filled with fresh water.

If filters are used for water purification, they also need to be regularly maintained, regardless of whether using sand/gravel filters, activated carbon filters or more modern membrane filters.

Sand/gravel filter chambers must be regularly cleaned from impurities, and the layers of gravel and sand must be changed as necessary.

Also, if rainwater is used as water for human consumption, as is often the case in coastal areas and on islands, ponding surfaces (e.g. roof) and gutters must be cleaned at least twice a year. Water for human consumption from own water supply systems needs to be disinfected, either chemically, i.e. using chemical agents (most often based on chlorine), or by UV radiation.

Maintenance and disinfection of wells

The environment surrounding a water well, and the well itself should be protected from any possible impact of animals, the vegetation should be properly mowed, and channels with wastewater and rainwater directed away from the well, and it is necessary to place a cover on the crown of the well, if possible.
The wells shall be cleaned periodically by first pumping out all the water from the well, then repairing and brushing the walls. The walls of the well shall, then, be disinfected with a chlorine solution (e.g. dissolve 5 g of Izosan-G in 5 l of water). Ultimately, water shall be regularly disinfected, the most effective method being the installation of a solution chlorinator, through which water disinfection is carried out continuously.

Regular chlorination through solution chlorinators, where an aqueous chlorine solution is prepared, will meet safety requirements if the level of residual chlorine is under 0.5 mg/l.

With well water, periodic disinfection is not effective due to the impact of weather conditions and the constant movement of groundwater, depending on the geological composition of the soil. Momentarily, individually or periodically disinfected water flows out of the well, while new, non-disinfected water simultaneously flows into the well. For this reason, well water should be chlorinated continuously and the concentration of free residual chlorine should be checked regularly using a manual comparator (quick tests available).

Important note: When entering tanks or wells for cleaning and/or disinfection, it is necessary to use protective clothing, footwear and equipment (gas masks, goggles and gloves). One must also be alert for possible harmful gases.

In addition to chemical agents (most often chlorine-based) used for disinfection of water for human consumption, water can also be disinfected with UV radiation.

Disinfection by UV radiation

This method of disinfecting water for human consumption uses ultraviolet radiation to destroy viruses, bacteria and other microorganisms that can be found in water, including those that are resistant to chlorine.

Unlike chlorination, no chemicals are used to kill microorganisms, which means safer drinking water for people.

UV lamps are installed on the main supply pipe and do not require any additional installations or special maintenance, and they are especially cost-efficient in combination with built-in water softening and filtering systems, because the clearer the treated water, the greater the disinfection effect of UV-lamps.

UV lamps have a limited lifespan and, after a certain number of working hours, need to be replaced, according to the manufacturer's instructions.

4.7. Pest control

Since pests are vectors of infectious diseases and cause damage to food and premises where food is produced, prepared, stored and distributed, controlling the presence of pests in establishments that produce and distribute food is crucial. The presence of pests can be monitored in different ways.

An FBE shall be so constructed as to prevent the entry of pests, in the following ways:

+ **By installing nets on ventilation and other openings;**
+ **By closing off** drainage channels and other openings, through which pests could enter, with **nets** and **bell siphons**, and keeping floors, walls, roofs, doors and windows that open in good condition, without damage or crevices.

Most common pests	Signs of pest presence
Rats and mice	Small tracks in the dust, droppings, holes in walls and doors, nests, chewed food packages, urine stains on food packages
Flies and flying insects	Insect bodies, live insects, nests, buzzing, larvae
Cockroaches	Eggs, insects (cockroaches), frass
Ants	Small piles of sand or soil, insects, flying ants on hot days
Birds	Bird feathers, droppings, nests, noise, birds
Other insects	Motile insects, especially in dry food, small larvae

In case they find traces of pests, as previously described, employees should report this to their supervisors.

Every FBO should have a pest control plan. The plan is implemented through preventive disinfection/pest control measures, for which purposes the FBO shall conclude a contract with an authorised legal entity.

+ **FBOs may not carry out chemical insect/rodent extermination measures on their own!**
+ **Insect control** (formerly known as 'disinsection') implies a set of different (mechanical/chemical) measures/methods that are undertaken with a view to reducing the population of or completely destroying harmful arthropods. Insect control also includes a method of preventing the entry and retention of harmful arthropods on surfaces, within premises and facilities.
+ **Rodent control** (formerly known as 'deratisation') involves a set of different (mechanical/chemical) measures that are undertaken with a view to reducing the population of or completely destroying harmful rodents. Rodent control includes all measures taken to prevent the entry, retention and reproduction of harmful rodents on surfaces, within premises and facilities.

5. Food hazards and poisoning

5.1. Microbiological hazards

The term food-related "microbiological hazards" primarily refers to pathogenic bacteria that can threaten food safety, and, by extension, human health. In addition to bacteria, microbiological hazards include viruses and parasites.

Microorganisms can be introduced into the human body directly through contaminated food or water, but transmission is also possible through objects used in food preparation, and the source of infection can also be an infected person.

Contamination of food can occur via the following routes:

+ Primary food contamination of the food production system through contaminated raw materials (e.g. meat, milk, eggs, mouldy vegetables);
+ Secondary food contamination originating from slaughterhouses, butcher shops and kitchens, if the meat of a healthy animal comes into contact with the intestinal content of an infected animal or via worktops and utensils;
+ Secondary contamination of fruits and vegetables, if washed in water that is contaminated with animal or human faeces;
+ Secondary contamination of food can also occur through worktops contaminated by fly, mouse and rat excreta;
+ Raw materials, as well as cooked food, can be contaminated by an infected person – carrier;
+ Cooked food can, likewise, be contaminated by a healthy person by unsanitary handling.

5.2. Chemical hazards

Through raw material, certain chemical substances (heavy metals, pesticides) can enter the product, which, due to their toxicity, if consumed in large quantities, can cause health problems. By cooking food or preparing meals,

some such compounds can be removed or inactivated. Chemical hazards in food also include an **accidental retention of detergents or disinfectants that can get into food** and cause chemical poisoning.

This is why no washing or cleaning agent should ever be decanted into food packaging (e.g. mineral water glass bottles) and it is extremely important to store them away from the area where food is handled.

Unlike biological poisoning, these are cases of **non-contagious poisonings and are not transmitted further among people**.

5.3. Physical hazards

Physical hazards include pieces of glass, plastic, rubber, metal (from shot in shot animals to screws and similar pieces of process equipment), wood, stone, rust, etc.

5.4. Allergens

Allergens are substances that cause the so-called hypersensitivity or allergic reactions.

Allergy is not a disease, but rather an **inherited tendency of the immune system to react with hypersensitivity to certain substances**, and in contact with allergens, an allergy may or may not develop. In contact with an allergen, the body's defence system is disturbed and reactions occur, such as the expansion of the walls of blood vessels, the release of fluid into tissues, **itching, sneezing, coughing, watery eyes, runny nose, stomach cramps, vomiting, diarrhoea, redness, hives-like rash, and even life-threatening acute systemic allergic reactions (anaphylaxis).**

The most important food allergens:

1. **Cereals** containing gluten, i.e. wheat, rye, barley, oats, spelt, kamut or their hybrids and cereal products;
2. **Crustaceans** and crustacean products;
3. **Eggs** and egg products;
4. **Fish** and fish products;
5. **Peanuts** and peanut products;
6. **Soy bean** and soya products;

7. **Milk** and milk products (including lactose);
8. **Nuts,** i.e. almonds, hazelnuts, walnuts, cashews, pecans, Brazil nuts, pistachios, macadamia or Queensland nuts and products thereof;
9. **Celery** and celery products;
10. **Mustards seed** and mustard products;
11. **Sesame seed** and sesame products;
12. **Sulphur dioxide and sulphites** at concentrations greater than 10 mg/kg or 10 mg/l, expressed as total SO_2;
13. **Lupine** and lupine products;
14. **Molluscs** and mollusc products

Effective allergen management

What is it that an FBO must do to control the presence of allergens and provide accurate information?

1. **Start** – procurement of raw materials from authorised suppliers
2. **Storage of raw materials and/or products – an important step in allergen control**

   Cross-contamination most often occurs through physical contact;

   Raw materials must be tightly sealed;

   Raw materials that are allergens should be grouped together;

   Prescribed procedures for what to do when such raw material spills.

3. **Production/processing**:

   The person handling food shall be familiar with products or raw materials containing allergens (types of allergens);

Handling – due to the possibility of cross-contamination, either spatial or temporal separation of the process is necessary;

Production planning – allergens – order of production processes to avoid cross-contamination (non-allergenic product is handled first);

Good hygiene practices (GHP) – cleaning the premises, which ensures the removal of any traces of allergens;

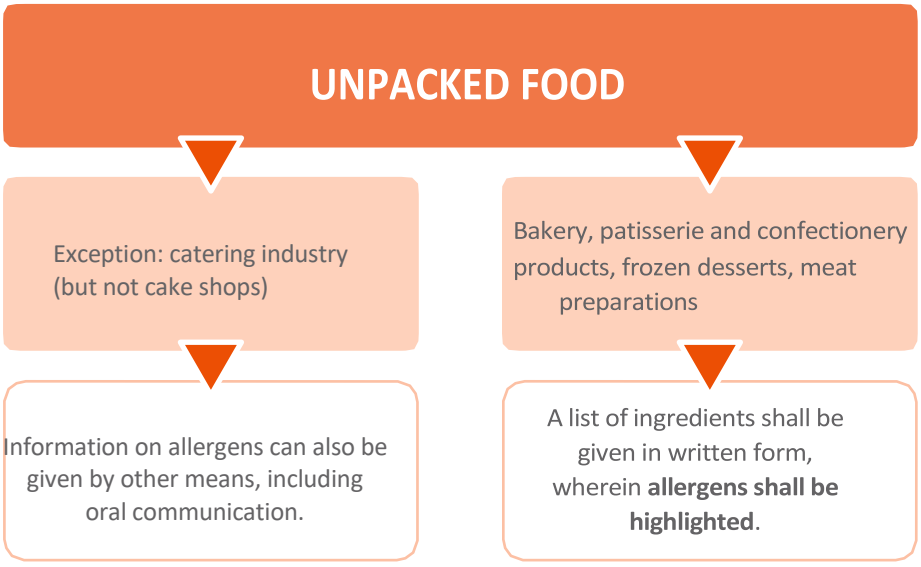
Control plan regarding the possibility of cross-contamination of allergens (laboratory analysis with the purpose of determining the presence of allergens).

4. **Correct labelling of allergens**

Allergen information shall be made available on both **packed and unpacked foods**, as follows:

Labelling of packed food products – allergens shall be listed in the list of ingredients in such a way that they **are highlighted** (e.g. **with different letters, styles or background colours or in bold**). In the case of food for which there is no obligation to provide a list of ingredients (e.g. wine), allergens shall be listed after the word "contains" (e.g. “contains: sulphites”).

Labelling of unpackaged food



In the catering industry, where applicable, information on allergens shall be provided by alternative means, including oral communication, under the following conditions:

- A notice shall be given in a visible place (e.g. in the price list, on the table) pointing to an available source of information about allergens or instructing the consumer to contact staff (the staff shall be given all necessary information). Said notice must be easily visible, clearly legible and, where applicable, indelible.
- Information shall be available in printed or electronic form in the food selling establishment, so that it is easily accessible to the consumer and competent inspections upon request.
- Information shall be made available before the food is offered for sale, without incurring additional costs to the consumer.

Examples:

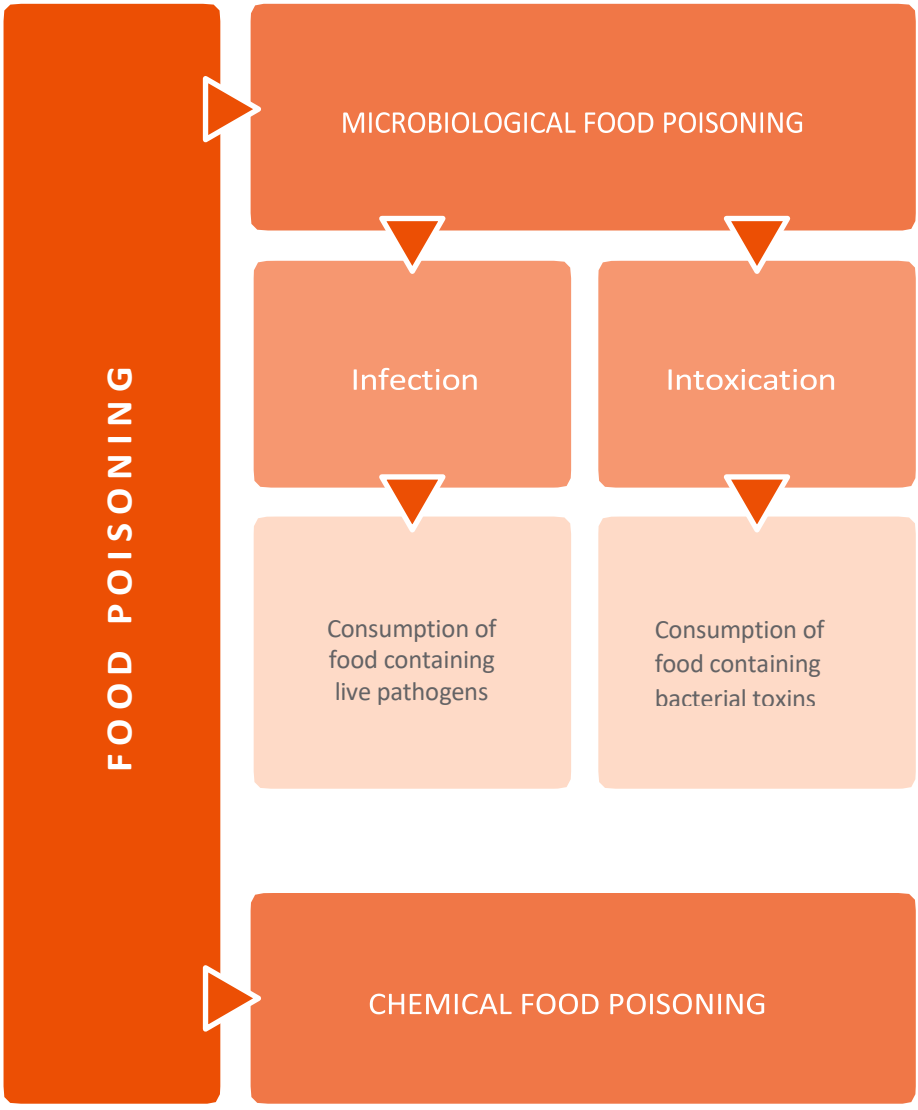
Without a list of ingredients

With a list of ingredients

5. **Employee training – all employees of a food production establishment should be familiar with internal allergen control procedures**

5.5. Food poisoning

Food poisoning can be a dangerous and fatal disease!



If 'food poisoning' was caused by consuming food containing live pathogenic bacteria, it is a case of **infection** (*Salmonella spp.*, *L. monocytogenes*, *Campylobacter spp.*).

In addition to the effect of the microorganism, 'food poisoning' can also be the result of toxins produced by bacteria in food (*Staphylococcus aureus, Bacillus cereus* – emetic toxin) or toxins produced by bacteria in the digestive tract (*Clostridium perfringens, Bacillus cereus* – diarrhoeal toxin), in which case it is a matter of **intoxication**.

In case of food poisoning caused by toxins, the incubation period is significantly shorter and the clinical picture is dominated by symptoms of the digestive tract, excluding temperature and general symptoms. An exception is the extremely severe clinical manifestation caused by the activity of botulinum toxin (*Clostridium botulinum*).

What to do in case of food poisoning?

What are the symptoms?

Depending on the causative agent, incubation period may vary (e.g. 12-72 hours for salmonella), as well as the clinical picture of disease, which is most often **characterized by nausea, vomiting, diarrhoea and general symptoms (temperature, headache)**.

What to do?

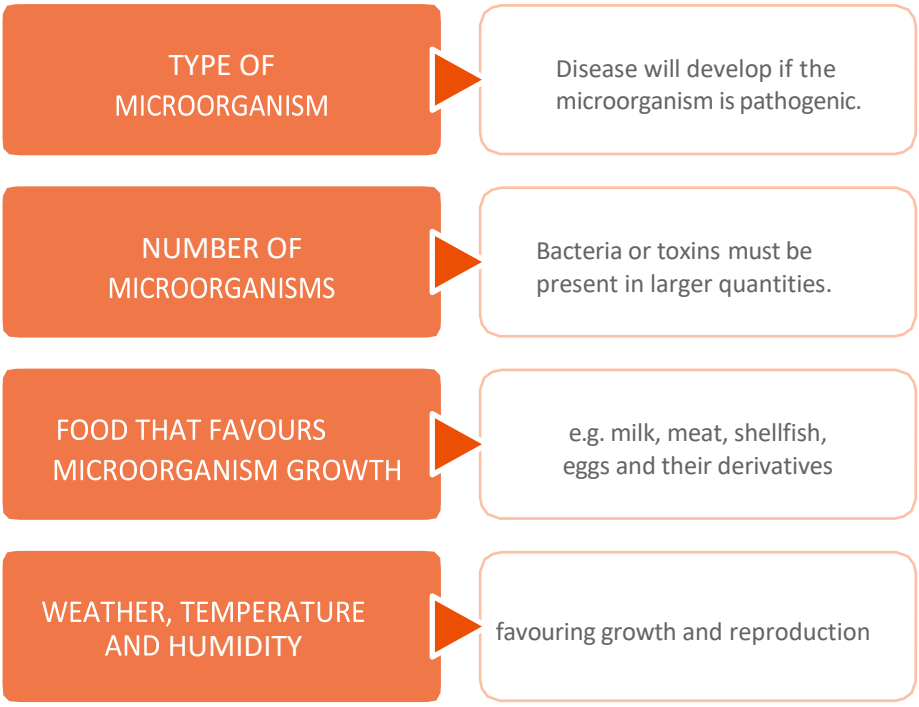
In case of food poisoning, there are two priorities to keep in mind:

+ Rehydration – drink plenty of fluids or unsweetened tea to replenish lost fluids. In mild forms of disease, this will be enough.
+ Medical assistance – in case of severe complications, and if the affected person is a small child, infant, pregnant woman or an immunocompromised person, contact their family doctor or an emergency medical service for instructions on further treatment.

5.6. Microbiological food poisoning and foodborne diseases

Of the 250 different types of food poisoning described, most are **microbiological**, i.e. infectious in nature.

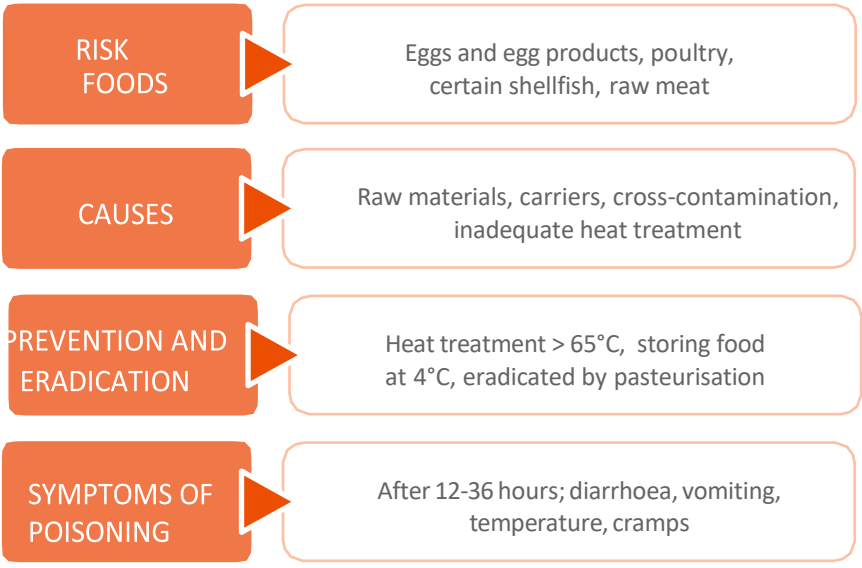
Whether poisoning will ensue after the food has already been contaminated depends on the following factors:



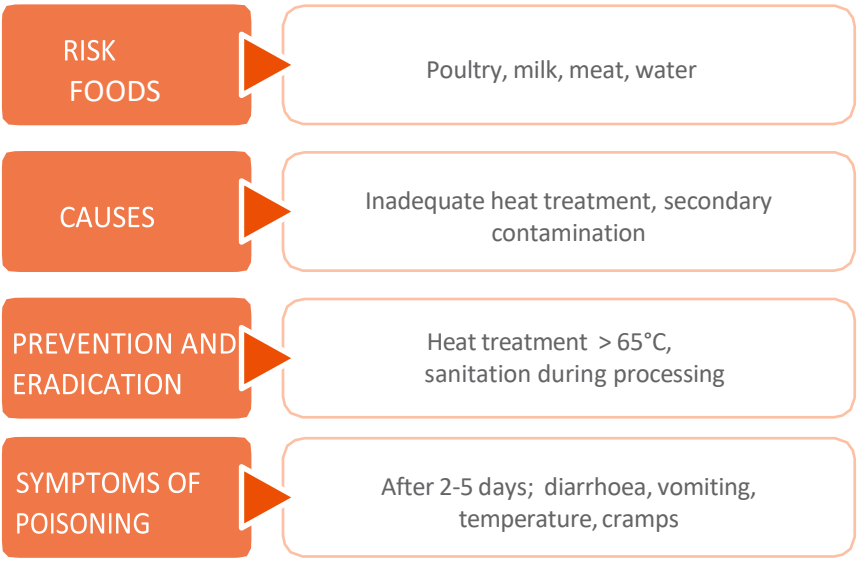
The longer contaminated food is kept under favourable conditions (room temperature), the more the microorganism will multiply and the consumption of such food will cause a greater number of infection cases. The time that elapses from the introduction of the microorganism to the onset of symptoms is called **incubation** and is specific for individual causative agents as well as consumers.

Microorganisms that most often transmit diseases through food are: *Salmonella, Clostridium botulinum, campylobacter, staphylococci, Shigellae, E. coli,* as well as *Rota* and *Noro viruses.*

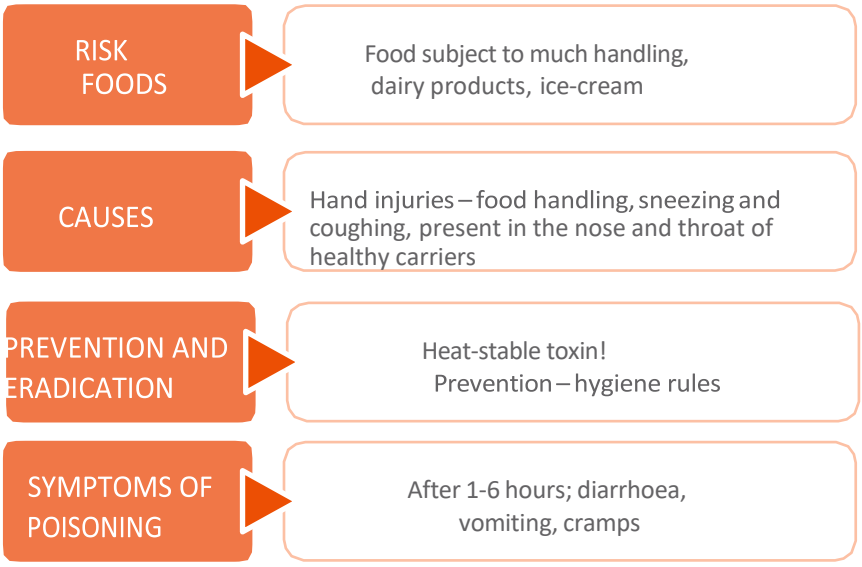
+ **Salmonellosis** - by far the most common cause of food poisoning in the country is ***Salmonella***, most frequently *Salmonella enteritidis*. Here is a quick overview of poisoning causes, symptoms and prevention:



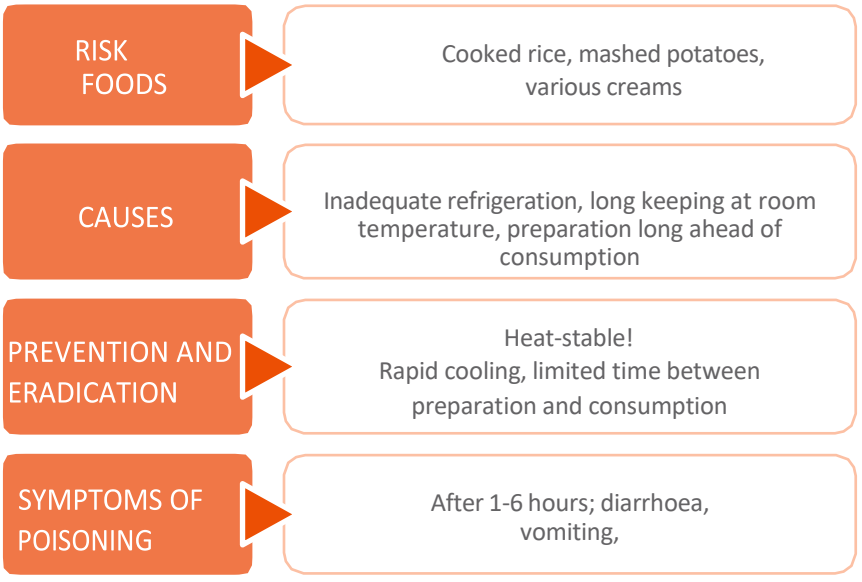
+ **Campylobacteriosis** – the most common cause of food poisoning is *Campylobacter jejuni* bacterium. Here is a quick overview of poisoning causes, symptoms and prevention:



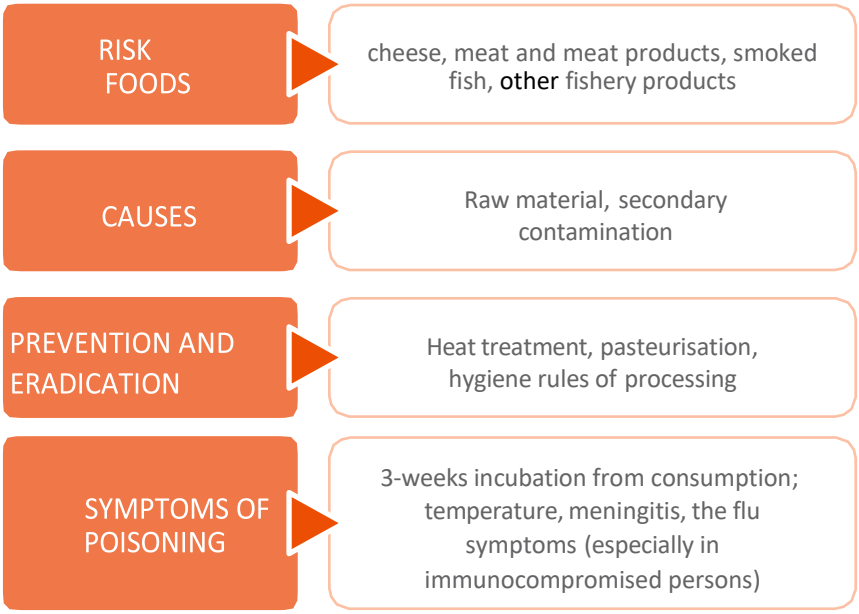
+ **Staphyloenterotoxicosis** – staphylococcal food poisoning. The causative agent is *Staphylococcus aureus*. Here is a quick overview of poisoning causes, symptoms and prevention:



+ ***Bacillus cereus*** – a bacterium that produces two toxins, one of which causes vomiting and the other diarrhoea. Here is a quick overview of poisoning causes, symptoms and prevention:



+ **Listeriosis** – food poisoning. The causative agent is *Listeria monocytogenes*. Here is a quick overview of poisoning causes, symptoms and prevention:



+ **VTEC (verocytotoxigenic *Escherichia coli*)** – *E. coli* is commonly found in the digestive system of humans and warm-blooded animals. While most *E. coli* are non-pathogenic microorganisms, there are numerous subgroups of pathogenic *E. coli* associated with causing various diseases. Among the pathogenic groups, the most important members for humans are verocytotoxigenic *E. coli* (VTEC), named for their ability to produce verotoxins.

+ **Rotaviruses** – frequent causes of digestive disorders, especially in children younger than 12 months. The typical route of infection for rotaviruses is the faecal-oral transmission. The most common route is direct contact with an infected person who spreads the disease with contaminated hands.

+ **Norovirus** – one of the most common causes of enterocolitis because once it enters an environment, it is difficult to get rid of. After the incubation within 12-24 hours, a sudden "projectile" vomiting and/or watery stools appear with elevated temperature and extreme malaise. In terms of frequency, the most common route of transmission is through food, followed by direct contact from person to person, and less often through contaminated water.

5.7. Microbiological food poisoning (examples from practice)

+ **Food poisoning – causative agent: *Salmonella spp.***

1. Cakes were made in the kitchen containing uncooked egg custard. The heat treatment of the custard was not carried out properly. Decoration required a lot of food manipulation. The cakes, after standing for a long time at room temperature, were served at a banquet the next day.

2. The guests consumed the cakes and, over the next couple of days, some of them developed diarrhea and stomach pain.

3. From stool samples of the patients and cake samples, *Salmonella* was isolated, and it was concluded that the resulting symptoms were caused by food poisoning. *Salmonella* was isolated in the stool sample of one of the cooks and in a number of eggs.

- **Botulism** – in the country, alimentary botulism is most often associated with the consumption of home-cured sausages and ham (prosciutto), as well as with canned food. Cans in which the *Clostridium botulinum* toxin has developed (usually canned fruit and vegetable products) do not show any external changes and their contents are not characterised by a distinctive smell. The toxin is mainly caused by inadequate sterilisation temperature.
- In case of consumption of such food, after a short incubation period of 12 to 36 hours, muscle weakness, rapid fatigue, vision disturbances, difficulty swallowing and speaking, as well as dizziness, headache and prominent dryness of the oral mucosa are manifested. Mortality as a result of botulism is still possible today, but in less than 5 to 10% of cases.

1. A person consumed a food in which botulinum toxin had developed.

2. Two days later, the person experienced vision disturbances, difficulty swallowing and dryness of the oral mucosa, and requested medical help.

- **Staphylococcal** food poisoning (staphyloenterotoxicosis) – the main reservoir of staphylococci is man, and is often found in open wounds and festering pimples on the skin and in the respiratory tract mucosa. Thus, coughing and sneezing, and touching food with hands infected with staphylococcus are the most common route of infection. When staphylococcus gets into food, it starts producing a heat-stable toxin, which cannot be destroyed by subsequent heat treatment. Signs of poisoning with staphylococcal toxins break out very quickly, within two to six hours of consuming contaminated food, and are manifested by pain and cramps in the abdomen, accompanied by intense nausea and vomiting, general weakness, often with diarrhoea, but without temperature. The toxin produced by this bacterium is heat-stable, which means that it is resistant to high temperatures.

1. Hands of a restaurant cook.

2. The food from the restaurant was delivered after having been contaminated with staphylococci in the morning. People did not consume it until that evening at the party, by which time it had been standing at room temperature.

3. Four hours after consumption, half of the consumers sought medical help for **nausea and vomiting**.

5.8. Other biological hazards in food

Trichinosis is a disease caused by the parasite *Trichinella spiralis*. It is introduced into the body through the consumption of raw or undercooked meat or meat products containing cocooned trichinella. Incubation varies between 5 and 45 days. Most patients experience diarrhoea and elevated body temperature, which are soon followed by muscle pain, swelling of the face and the upper eyelids. The disease lasts for several weeks, and cardiac and neurological complications can develop.

Therefore, it is particularly important that meat, meat preparations and meat products delivered to client premises come exclusively from approved catering establishments under the surveillance of veterinary inspection, where the meat of every carcass is mandatorily tested for *Trichinella*.



Other food poisonings: histamine poisoning

- ***The most common of the aforementioned poisonings*** is histamine food poisoning that develops after consumption of **oily sea fish** (tuna, sardines, anchovies, etc.) that was not put on ice immediately upon capture, or that was not properly thawed during preparation. In this way, histamine is produced, which is the cause of *allergic reactions. It is a very heat-stable toxin and is not* destroyed by cooking. Symptoms develop very quickly in the form of redness, itching and burning in the face, nausea, sweating, headache, abdominal cramps, palpitations and pressure in the chest.
- Fish should, thus, be procured from a registered supplier of proven traceability, stored at the recommended temperature and defrosted in a refrigerating unit as short as possible!
- Once defrosted, fish must not be refrozen again.

5.9. Chemical food poisoning (examples from practice)

Chemical food poisonings are **non-contagious poisonings** that cannot be transmitted further among infected persons. Many raw materials in the food industry contain chemical substances, which, if consumed in large quantities, can cause health problems due to their toxicity. By cooking food or meal preparation, such compounds can be eradicated or inactivated.

Example: **Pesticide poisoning**

Improper treatment
(excessive pesticide treatment)

Improper handling
(insufficient washing)

If an excessive amount of pesticides is present on vegetables or fruits due to improper treatment or non-compliance with the withholding period for a certain pesticide, these cannot be removed by washing; Still, thorough washing and peeling of fruits and vegetables are definitely recommended methods for reducing pesticide residues on fruits and vegetables.

5.10. Food poisoning prevention measures

In the prevention of food poisoning, all staff who handle food need to be trained in the theory and practice of cooking and preserving food, as well as in personal hygiene habits and routines.

The more a food is handled or the more ingredients a food is made of, the greater the number of bacteria present in that food, which potentially lowers both food safety and product shelf-life.

Routes of contamination/Cross-contamination

If analysing what it is that affects product safety (ready-to-eat meals), a series of previously discussed factors come to mind. Part of these factors have to do with the transfer of bacteria that can also be expected indirectly, when one type of food comes into contact with another type of food, or through hands, equipment, worktops, knives and other accessories – a process known as cross-contamination. Cross-contamination of food by contact is one of the main causes of food poisoning.

How to properly handle food?

1. Wash – keep your hands, worktops, kitchen utensils clean

Wash your hands with soap and warm water before handling food, and often during meal preparation, especially after handling raw meat and unwashed fruits and vegetables:

- Wash and sanitise all surfaces, utensils and dishware used when preparing meals;
- Wash fruits and vegetables thoroughly, especially if eaten raw.

Why? *Although most microorganisms do not cause disease, dangerous microorganisms can often be found in soil, water, animals and humans. These microorganisms are found on the hands, dish-cloths and kitchen utensils, especially so on cutting boards, and can be transferred to food by even the slightest touch, to cause food-borne diseases. Along with microorganisms, pesticide residues are just some of the dangers that can be eliminated, to a large extent, by thorough washing of fruits and vegetables.*

2. Separate – separate raw food from heat-treated (cooked) food, and raw meat from food that will not undergo heat treatment

- Separate raw meat, poultry, fish and seafood from other foods;
- Do not use the same boards and utensils for cutting raw meat and vegetables, or raw and cooked food;
- Keep foods separated in closed containers to avoid contact between raw and cooked foods.

Why? *Raw food, especially poultry, fish and seafood, can contain dangerous microorganisms that can be transferred to other foods during meal preparation and food storage. Though these microorganisms will be destroyed by cooking meat, they will contaminate other food that is not cooked, such as vegetables, via cutting boards and utensils.*

3. Cook – make sure that heat treatment is always carried out thoroughly

Cook food thoroughly, especially poultry, eggs, fish and seafood:

- **The heat treatment temperature must reach at least 73 °C (at least for 30 seconds);**
- **Reheat** leftover soups, stews and similar dishes **until the boiling point** in order to reach a sufficiently high temperature.

Why? *Thorough cooking destroys almost all dangerous microorganisms.* ***Research has shown that cooking food at 70 °C can help make food safe for consumption****. Special attention is needed with certain types of food, such as minced meat, meat loaves and rolled roasts, large pieces of meat and whole poultry.*

4. Refrigerate – keep food at safe temperatures

- Do not leave cooked food at room temperature for longer than 2 hours;
- **After consumption, store all thermally processed and easily perishable food in the refrigerator (at a temperature below 4 °C)**;
- Do not store food for too long, even in the refrigerator, and consume leftovers within 2 days;
- **Do not defrost frozen food at room temperature, but rather in the refrigerator.**

Why? *Microorganisms can multiply rapidly if food is kept at room temperature. Keeping food at a temperature below 4 °C or above 65 °C slows down or stops the growth of microorganisms. Some dangerous microorganisms can develop even at temperatures below 4 °C.*

6. Food hygiene

Food hygiene studies and prescribes the measures that are implemented so that the consumer can consume safe food, whose composition will meet the needs of the body and will not harm the health.

Food types according to origin and risk

According to its *origin*, food is divided into: **food of plant, animal and mineral origin**.

Food of plant origin includes: cereals and derivatives thereof, pasta and related products, biscuits and related products, starch, dextrin, sugars and similar products, candies and cream-filled products, vegetables and derivatives thereof, fruits and derivatives thereof, spices, alcoholic and non-alcoholic beverages.

Food of *animal* origin includes: meat and meat derivatives, fish and fish derivatives, honey, milk and milk derivatives, eggs and egg derivatives, and animal fats.

Food of *mineral* origin includes table salt.

Low-risk group comprises fruits and vegetables.

High-risk **(perishable) food contains proteins and high water content, namely dairy products, eggs, meat and seafood.**

'Ready-to-eat' food implies food that is ready for immediate consumption as is, without the need for cooking or any other type of processing.

Food spoilage

Preconditions for microbiological food spoilage

Microbial food spoilage is caused by microorganisms. Microorganisms, although invisible to the eye, like other living things, feed, grow, multiply and die.

All microorganisms require certain preconditions to live, thrive and reproduce, namely: **food, temperature, duration in favourable conditions, water, oxygen, pH value**, etc.

These factors directly affect the growth and reproduction of microorganisms: for example, at temperatures between 30 and 37 °C they thrive, while, at a temperature of 100 °C, all vegetative forms are destroyed (sterilisation temperature). Likewise, if microorganisms lack water, they cannot grow – to illustrate, there are certain types of food (e.g. marmalade, salted fish, honey) where their growth and reproduction are inhibited by the lack of water.

How fast do bacteria grow?

Bacteria grow and multiply in a warm and moist environment. They multiply quickly and under favourable conditions. A single bacterium can multiply to several million new bacteria in eight hours, or several billion in twelve hours.

This virtually means that if food is contaminated, even with a very small number of bacteria, the number required for the development of a disease can be reached the very next day. In this case, a single morsel can cause disease or poisoning. Storing and keeping food in the refrigerator will significantly slow down bacterial growth.

On the other hand, there is a whole series of so-called 'good' bacteria that are harmless to the consumer and that are used for food production (production of yogurt, wine, beer, etc.), where microbial growth and the accumulation of their metabolic products in food is desirable.

What is bacteria's favourite food?

Bacteria's favourite food, and the most common cause of disease, is **food rich in proteins and water**, i.e. **meat, poultry, eggs and milk**.

What are the signs of food spoilage?

The action of microorganisms on food, but also the action of various enzymes, the accumulation of acids or, in certain cases, the formation of gas, after a certain time will cause visible changes in food, such as a change in smell, colour and taste, rancidness or rotting, putrefaction or decomposition.

Table 1. Comparative display of characteristic sensory properties by food type with corresponding signs of spoilage

RAW MEAT	Characteristic colour for meat type, elastic consistency, characteristic odour.	Mucous sticky surface. Colour change (rainbow). Unpleasant and foul smell. Soggy.
FISH	Eyes clear and wide. Moist gills. Moist skin. Firm flesh. Abdomen undamaged and shiny.	Dull and strained eyes. Gills dry, dark grey. Scales come off easily. Flesh is soft and dark around the bone. Foul smell.
FRUITS AND VEGETABLES	Ripe fruit. Sensory properties characteristic for the species.	Gooey, rotting, moldy, worm-infested
EGGS	Shell clean, undamaged. Egg white clear and transparent. Yolk immobile or barely mobile.	Musty, sulphury smell. Strongly developed embryo. Agitated, bloody content.
SHELLFISH (MUSSELS, OYSTERS)	Shells clean, edges undamaged, close at the touch. Shell contents clear. Specific odour.	Open shells, foul smell.
SEMI-DRY SALAMI AND CHEESE	Even colour, pink red, bacon-like parts are white, characteristic odour. Cheese of characteristic colour and odour.	Soggy salami, grey or greyish green meat parts, yellow colour of bacon-like parts, sour or rancid smell. Bloated or moldy cheese, sour, rancid or bitter taste.
CAKES AND ICE-CREAM	Characteristic colour and smell.	Loss of characteristic features, dissolved content, cracky, hardened, cheesy taste or smell.

6.1. Control of food storage temperature regimes and food heat treatment

As previously explained, the growth of microorganisms is most intense and fastest **at temperatures from 30 to 37 °C;** these temperatures are, hence, the most dangerous, and this is often the temperature in the kitchen area where food is prepared, or in the summer heat. At the **boiling temperature of +100 °C,** if sustained long enough, microorganisms die.

- The temperature of the refrigerator should range between +4 and +8 °C. At this temperature, microorganisms grow much more slowly. The table below shows that this temperature range should be maintained both when preparing meals and when refrigerating (meat, poultry, offal, milk and dairy products, and chilled ready-to-eat foods);
- However, it should be kept in mind that heat-treated (cooked) food must be suitably chilled. Namely, the process of slow cooling causes rapid growth of bacteria and represents a potential hazard;
- Chilling of cooked food should be carried out as follows:

  If a shock freezer (device for rapid chilling/freezing of food) is available, it should be used as it is the safest method of rapid chilling, to bring down the temperature of cooked food to +4 °C or lower in a very short time.

  If a shock freezer is not available, then chilling should be carried out in 3 stages:

  1. Chilling/cooling phase 1: to +60 °C at room temperature (maximum 30 minutes);
  2. Chilling phase 2: fast chilling in a refrigerating unit to +10 °C within 4 hours;
  3. Chilling phase 3: fast chilling in a refrigerating unit to +4 °C for the next 2 hours.

Chilled food must always be marked with the date when it was cooked in order to apply the "First stored – first used" rule.

+ **Freezer temperature should be -18 °C**. At this temperature, food freezes, as do microorganisms. After defrosting, most bacteria are still alive, which means that they can cause disease even after freezing.

It is, hence, vital to correctly carry out the process of defrosting

When defrosting, it is important to follow the following rules:

Food once defrosted must not be refrozen again!

Care must be taken not to cross-contaminate other products or worktops: for example, meat or poultry should be placed in separate containers and on separate refrigerator shelves (preferably, bottom shelves) while defrosting; Make sure that the blood and drained contents do not contaminate worktops, refrigerating units or other food.

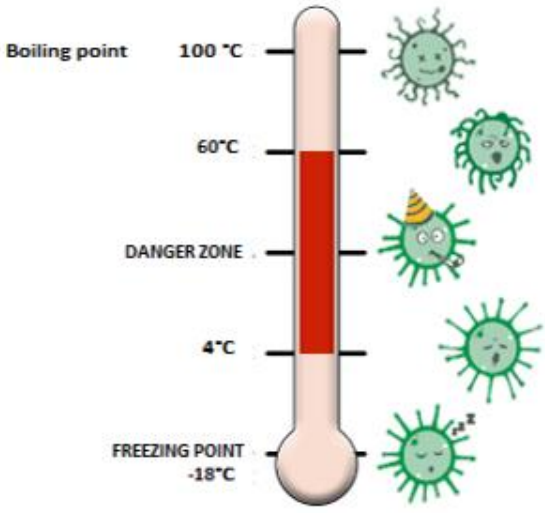
All food should be defrosted prior to cooking (unless otherwise stated), and after freezing, food temperature should be between 0 °C and 5 °C.

Defrosting can be carried out in the following ways:

in a refrigerating unit (refrigeration);

under running cold water;

in a microwave oven (suitable only for defrosting food that will be cooked immediately)



Heat treatment (thermal processing) of food (cooking, baking, pasteurisation, sterilisation)

In most cases, food will be safe for consumption after the heat treatment process, if required temperature is reached at the core of the foodstuff.

Raw, incompletely heat-treated (undercooked) food is a hazard because it allows the survival, growth and reproduction of bacteria that can lead to food poisoning. Some bacteria produce toxins that are resistant to high temperatures (heat-stable), so it is important to handle food with care even before the heat treatment (during the 'raw phase'). **It is crucial that the temperature reached at the centre of the food immediately after heat treatment is at least 73 °C**. Heat treatment includes the process of reheating. During the reheating of the food which has previously been cooked and cooled, it is likewise necessary to reach a core temperature of at least **73 °C for 30 seconds**, just as with the initial heat treatment.

Table 2. Heat resistance of microorganisms

120 °C	Spore destruction
100 °C	Rapid destruction of all vegetative forms, but not spores (it takes a long time to destroy spores)
65-100 °C	Pasteurisation
40-60 °C	Development of bacteria that favour higher temperatures
20-40 °C	Development of most bacteria – mesophilic bacteria
0-20 °C	Development of bacteria that favour low temperatures
–20 °C do –40 °C	Progressive dying of all types of bacteria

Subsequent or secondary contamination

In order to avoid subsequent contamination, thermally processed food must be carefully handled and protected, and special care must be taken to prevent it from coming into contact with raw food that may contain pathogenic microorganisms.

Attention!

If using insulated dishware when preparing a meal, immediately move the remaining food to another container so that it cools down as quickly as possible.

Food with a suspicious colour and smell or that has been in the refrigerator for a long time should be thrown away.

Since numerous refrigerating devices are used today in shops, warehouses, and other facilities, one should keep in mind:

Table 3. Optimal food storage temperatures that should be obeyed and recorded:

Cold products	In keeping with the lowest declared temperature on the foodstuff
Poultry	Max. 4 °C
Fresh meat	Max. 7 °C
Minced meat	Max. 2 °C
Meat preparations	In keeping with the declared temperature on the foodstuff
Edible offal (intestines, etc.)	Max. 3 °C
Meat products	In keeping with the lowest declared temperature on the foodstuff
Deep-frozen products	Below -18 °C (outdoor temperature)
Milk and milk products	In keeping with product label, recommended up to 8 °C
Warm products	Above 65 °C
Fruit and vegetable salads	Max. 8 °C or in keeping with the declared temperature on the foodstuff
Fresh fish	0-3 °C, approximate temperature of ice melting
Frozen fish	Below -18 °C
Deep frozen products	Below -18 °C

Ready-to-eat foods in cold chain (e.g. ready-to-eat spreads, etc.)	Max. 4 °C (max. 24 hrs)

6.2. Method of controlling chemical and physical hazards in food

The surveillance of chemical and physical hazards in food includes determination of all potential chemical and physical hazards. Again, the possibility is two-fold:

+ primary contamination of food with chemical substances (pesticides, heavy metals, antibiotic residues, etc.) or
+ secondary contamination due to, say, improper storage of chemical substances such as pesticides or cleaning and disinfecting agents.

The control of said hazards should, thus, be extended to the control of raw materials and proper storage procedures.

Precautions for physical hazards in food include periodic visual inspections for the presence of physical hazards (metal, glass, stones, hair, wood, paper, etc.), built-in filters and sieves or metal detectors.

In case of chemical hazards in food, control is carried out by periodic controls (tests) and/or supplier surveillance.

6.3. Food storage and preservation

6.3.1. Food storage

When stored, food must retain its sensory and safety properties, while the **food storage area shall, in all respects, comply with the prescribed sanitary, technical and hygienic requirements**. Food storage rooms shall be designated for the purpose of storing food and shall not store other objects. Warehouses/stockrooms shall be clean and sanitary, sufficiently ventilated, and different types of products should be stored separately, depending on the necessary requirements and temperatures, as prescribed by the manufacturer. All raw materials and ingredients shall be stored in suitable conditions to prevent damage from spoilage and to protect them from contamination.

Certain rules should be followed for proper storage procedures:

- Food traceability should also be guaranteed during food storage.
- It is necessary to regularly check food shelf life.
- All stored food (including ready-to-eat meals) should be distributed according to the "First in – first out" principle.
- Visibly damaged and inflated cans shall not be used and must be disposed of safely.
- If mould or insects appear on stored foodstuffs, these shall not be used and must be disposed of safely.
- All foodstuffs shall be protected from contamination during storage.
- Raw materials shall be stored in the conditions specifically prescribed by the manufacturer.
- Warehouses/Stockrooms should be dry, maintained in a sanitary condition, protected from contamination.
- The doors of all storage rooms should be closed (except when loading or unloading, or during washing).
- In warehouses/stockrooms, food should be raised away from the floor, on shelves or pallets.
- All containers in which food is kept must be made of food-friendly material that is easily to clean.
- Upon receipt of foodstuffs, and prior to storage in the warehouse/stockroom or refrigeration device, the outer transport packaging should be removed, in order to avoid the possibility of contaminating the stored foodstuffs, storage area and refrigeration device.
- If food is repacked from its original packaging into dedicated vessels or containers, it is necessary to save the original label or record data on the type of food, ingredients, storage method and expiration date.
- Ready-to-eat meals, cakes and the like may be kept in the same refrigerator with raw materials only if separated at the top and protected from contamination.

When storing foodstuffs, it is necessary to **make sure that all devices for refrigerating and storing deep-frozen food work properly**. It is also necessary to regularly check the temperature of **said devices at least twice a day**. Pursuant to the Ordinance on quick-frozen foodstuffs (OG No. 38/08), all **chambers and refrigerating units shall be equipped with a thermometer to monitor the temperature**.

Pursuant to the Ordinance on the rules for establishing systems and procedures based on the principles of the HACCP system (OG No. 68/15), **documents on food traceability, temperature records, and pest control records should be made available in all storage facilities.**

Along with temperature, foodstuff expiration date shall also be controlled. All stored foodstuffs should be distributed according to the "**First in – First out**" principle. Foodstuffs shall leave the warehouse/stockroom in the same order in which they enter it, in order to avoid food spoilage due to long keeping.

Selection of food suppliers

An FBO shall ensure that all purchased raw materials used in food production are not contaminated with parasites, pathogenic microorganisms, toxic materials or substances that affect product safety (Annex II of the Regulation No. 852/2004).

As a guarantee against such contamination, each FBO shall choose a supplier who is registered or approved for a particular economic activity and whose foods are traceable and properly labelled.

When foodstuffs from suppliers are received by an FBE, they shall be checked at reception and attention shall be paid to:

- **Product appearance (no external smell, colour or taste);**
- **No signs of deterioration;**
- **Preserved packaging;**
- **Cans shall not be damaged or inflated;**
- **Food that is kept cold shall be delivered at the correct temperature (4-8 °C), as specified in the manufacturer's instructions;**
- **Quick-frozen foods shall be delivered at the prescribed temperature (-18 °C – Note: a variation of 3 °C is allowed during transport);**
- **Foodstuff shelf life shall not be expired;**
- **Foodstuffs shall bear an accurate label;**
- **Food of animal origin (meat, fish, eggs) shall be delivered with all needed data proving the traceability of origin in the pertaining commercial documents (see section "Traceability of food of animal origin"), which shall be enclosed with the product;**
- **Foodstuffs that do not meet the above requirements at receipt shall be returned to the supplier.**

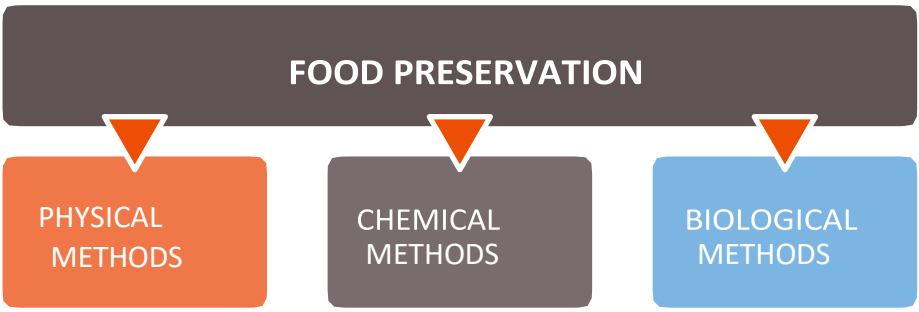
6.3.2. Food preservation

Throughout history, man was forced to design a way of preserving food in order to prolong the needed food supplies, and procedures such as smoking and drying meat, salting fish, etc. have been known for centuries.

Food preservation is a process whose purpose is to preserve the safety and original quality of certain foods to the greatest extent and for the longest possible period, with a view to preventing spoilage or degradation.

Most preserved foods are foods with a low percentage of water (pasta, concentrates, sugar, flour, milk powder, etc.), does not require a special temperature regime and can be safely stored at room temperature in a food warehouse.

Food preservation is carried out by applying 3 types of procedures (methods): physical, chemical and biological preservation methods.



Food preservation is carried out by physical, chemical and biological methods.

Physical methods of food preservation include:

Food drying or dehydration;

Application of low temperatures;

Application of high temperatures;

Food filtering;

Ionizing radiation.

1. **Food drying (*Food preservation by drying*)** is a process which reduces the amount of water in the product by dry heat and, thus, yields a dried product. The loss or removal of water prevents the growth and reproduction of microorganisms. The process of preservation by drying is ancient, is used in many nations around the world and is applied to many products, including meat, fish, fruits, vegetables, eggs, milk, mushrooms and other.

2. **Preservation at low temperatures** is done by applying the chilling and deep freezing processes:

   Chilling is storing at a temperature of 0 to 4 °C in refrigerators, where perishables can keep for several days. At these temperatures, the growth of microorganisms is reduced and slowed down.

   Deep freezing is the process of freezing food in special devices where food is rapidly chilled to temperatures from -35 °C to -50 °C, after which the frozen food is stored at a temperature of -18 °C, and in these conditions food can keep for a longer period. **The rule is that once defrosted food must not be refrozen again.**

3. **Preservation at high temperatures** is done by pasteurisation and sterilisation procedures:

   Pasteurisation is a process of short exposure of food to medium-high temperatures **(from 65 °C to 100 °C),** and this process significantly reduces the number of microorganisms in food. Microorganisms are not completely eradicated by pasteurisation, because resistant forms (spores) survive at temperatures up to 100 °C. The height of the pasteurisation temperature, as well as the duration (exposure), depend on the food type.

   Sterilisation is the process of heating food at temperatures **above 100 °C.** Sterilisation destroys all microorganisms present in food and preserves the product for a longer period of time. This process is a simple, reliable and cheap way of preserving food.

   Various milk, meat, fish, fruit and vegetable products are preserved by pasteurisation and sterilisation. Canned products differ in shelf life. Foods treated by pasteurisation have a shorter shelf life, and products exposed to sterilization have a longer shelf life.

4. **Food filtration** – process applied to (liquid) food to pass it through filters that stop all microorganisms larger than the pores on the filter.

5. **Ionizing radiation** – Pursuant to the Ordinance on food subject to ionizing radiation (OG No. 38/08), only certain categories of food are allowed to be irradiated, namely: dried and aromatic herbs and tea, dried fruits and vegetables, gum arabic and powdered eggs. The process of food irradiation can only be carried out in authorised institutions – In Croatia, only in the Ruđer Bošković Institute. All irradiated foodstuffs must be marked as "subject to ionizing radiation".

Chemical procedures – Food can also be preserved by ***chemical processes***, by adding chemical agents that have the ability to prevent the growth of micro-organisms. Chemical preservatives include: **table salt, brining mixture (table salt, nitrate and nitrite), acetic acid, salts of benzoic and sorbic acids, and sugar**. Adding salt to food is called salting, and is mostly used for meat and fish products. Adding brine is called brining, and is used to treat meat prior to drying and

smoking. Marinated foods are produced by adding acetic acid. Sugar also has a preservative effect as it increases the dry matter, so bacteria cannot develop in an environment that does not provide enough water. Some of said chemical agents belong to food additives (see chapter "Food additives").

Biological preservation is food preservation caused by the process of lactic-acid fermentation and the formation of lactic acid. This method of preservation is well known for its products – pickled cabbage or pickled turnip, with their characteristic aroma and taste.

6.4. Food labelling basics

Food can be marketed in packed (prepacked) or unpacked form (e.g. potatoes sold in bulk at a farmers' market). Uniform European legislation prescribes the requirements for food labelling on the market, so that end consumers are informed when choosing food. Foods placed on the market must bear a formulated text – a label. Labelling in the Republic of Croatia shall be in the Croatian language and Latin script.

The label on a packed food (on the packaging itself) or a declaration adhered thereto shall contain certain "mandatory information". Both must be perceptible in a visible place, clearly legible and, if necessary, indelible. In no case shall this information be hidden, covered or interrupted by other written or pictorial representations, or other material (for example, no 'Sale/Discount' etc. labels are allowed over these markings).

Mandatory data shall be printed in letters with a minimum height of x **1.2 mm** (exceptionally, in the case of packaging or containers whose largest surface is less than 80 cm^2, the height x of the letters shall be equal to or greater than 0.9 mm).

Mandatory information on packed foods is shown in the following example:

Mandatory data	Mandatory data in the example	Notes
Food name	Milk chocolate with hazelnuts, nuts and rum flavour	Trade name such as “Mikado”, ”Dorina”, etc. shall not be considered product name.
List of ingredients and labelling of allergens **Quantity of certain ingredients or ingredient categories**	Ingredients: sugar, **whole milk powder**, cocoa butter, **hazelnuts** (10%), chopped **almonds** (9%), cocoa mass, **soy lecithin** emulsifier, flavouring	**List of ingredients** is given so that after the word "ingredients" all the ingredients of a food are listed in descending order with regard to mass. Certain food categories are exempted from the listing ingredients rule: fresh fruits and vegetables, carbonated water, fermented vinegar, cheese, butter, fermented milk and cream to which no other ingredients have been added, as well as foods consisting of a single ingredient, if the food name is the same as the name of the ingredient (e.g. honey).
Net quantity	225 g	
Date of minimum durability	Best used by: Nov 1, 2019	See explanation below the table.
Special conditions of storage and/or use	Store in a cool and dry place.	Listed only if the information is important for preserving food properties.

Country or place of origin (only for certain food categories)		Country of origin is **mandatory information** only for certain food categories such as olive oil, fruits and vegetables, bananas, honey, fish, wine, eggs, beef and beef products, fresh, chilled and frozen pork, sheep and goat meat, and poultry.

Mandatory data	Mandatory data in the example	Notes
Instructions for use or preparation, when in the absence of such instructions proper food use would not be possible		
For drinks containing more than 1.2% vol. alcohol, the actual alcoholic strength by volume		
Nutrition declaration	Average nutritional value in 100 g: Energy 538 kcal; Fats 33.4 g, of which saturated fatty acids 14.6; Carbohydrates 53 g, of which sugars 46 g; Proteins 9 g; Salt 0.4 g	Certain food categories, such as salt, table sweeteners, herbs, spices or their mixtures, vinegar. Herbal and fruit infusions, tea and coffee are exempt from the **nutrition declaration** requirement (The list of foods which are exempted from the requirement of the mandatory nutrition declaration is given in Annex V of Regulation No. 1169/2011 on the provision of food information to consumers).
For certain food types or categories Annex III establishes additional mandatory data		E.g. drinks with increased caffeine content, food containing sweeteners
LOT	L 1121927	If a food is marked with a minimum durability date, with LOT day, month and year, then this is not mandatory data.

FBO name and address	MAKSI d.d., Zagreb, Ksaver 200a	FBO must have a registered office in the EU.

* Details of allergen labelling on packed and unpacked foods are listed in chapter “Food Hazards: Allergens”

Notes for small packages: in the case of packaging or containers whose largest surface area is less than 10 cm^2, the packaging or the label shall state only:

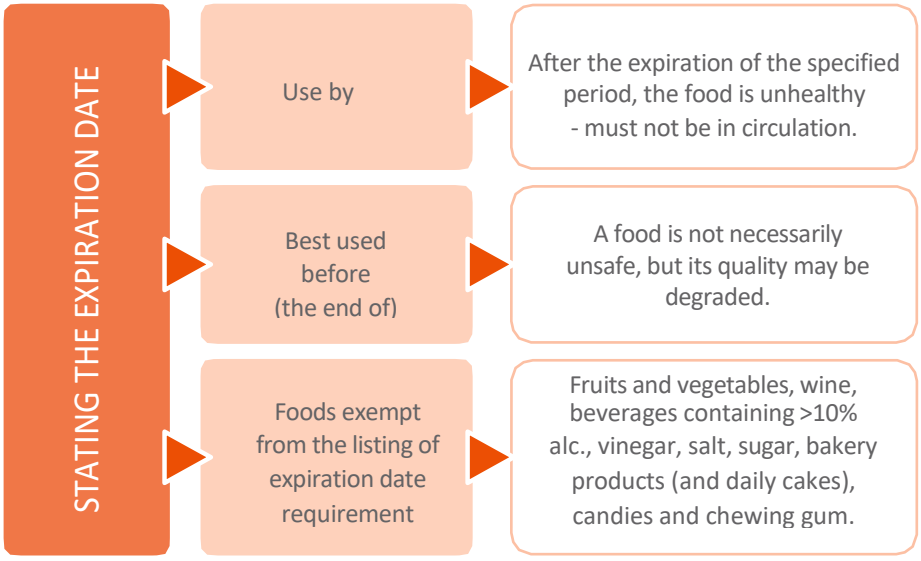
+ name of food, information on allergens, net quantity of food, date of minimum durability or "use by" date (product ingredients are stated elsewhere or made available to the consumer, upon request).

Important notes: A food may not be attributed properties of disease prevention, therapy and treatment or properties that it does not possess.

The prohibitions do not only apply to the labelling text, but also to advertising through leaflets, advertisements, etc.

Stating the expiration date

Stating the expiration date is one of the most important information for the consumer and represents an indicator of proper and safe food consumption. However, in order for the given information to "convey the right message", the producer must label it correctly on the food, and consumers must understand it. Expiration date represents the expected time past which product's safety or quality will change from acceptable to unacceptable.



Food that is rapidly perishable, from a microbiological point of view, and is, therefore, likely to pose a direct hazard to human health after a short period of time is marked with a "use by" date. After the "use by" date, the food is considered unsafe, and must not be in circulation or consumed.

Other foods are marked with a date of minimum durability: "Best before (end)":

"*Best before (end)*" marks the date by which time a food retains its characteristic properties, if stored properly. Past this period, the food is not necessarily unsafe.

Labelling of unpacked (non-prepacked) foods

There are a number of products on the market that are sold to consumers unpacked (e.g. bakery products, sausages sold in bulk from butcher shops, cakes, etc.), the labelling of which is defined by the Ordinance on informing consumers about non-prepacked food (OG No. 144/14). This type of food is subject to different labelling requirements, depending on the type of food in question, but, generally, **all unpacked foods shall provide information on allergens**.

By comparing two examples in the table below, it will be clearly shown how unpacked foods should be labelled in circulation, as regards prescribed mandatory data:

Mandatory data	Example 1 – bakery product	Example 2 – meat preparation	Note
Food name	Donut	Fresh patty	
Additional particulars from Annexes III and VI of Regulation No. 1169/2011			
Name of FBO	-	Manufacturer and approved No. of FBO	Approved No. is listed if product comes from an approved FBO.
			Not necessary to list if the name is displayed on FBO door and invoice.
Country of origin	-		
List of ingredients	Ingredients: **wheat flour**, sugar, **milk**, **eggs**, yeast, salt	Ingredients: minced pork and beef, spices **(contains celery)**	
Use by:	No listing of expiration date is required.	Mandatory listing: e.g. Feb 1, 2019	
			* Note: If unpackaged product is offered in catering establishments (except pastry shops), it is only necessary to provide information on allergens (see chapter "Allergens").
Net quantity	Mandatory data on product net quantity		

For more details on the provision of information for non-prepacked foods visit:

+ Vodič za informiranje potrošača o nepretpakiranoj hrani (*Guide for informing consumers on non-prepacked food*) http://www.mps.hr/datastore/fi estore/115/Vodic_za_informiranje_potrosaca_o_nepretpakiranoj_hrani_2015.pdf

6.5. Food traceability

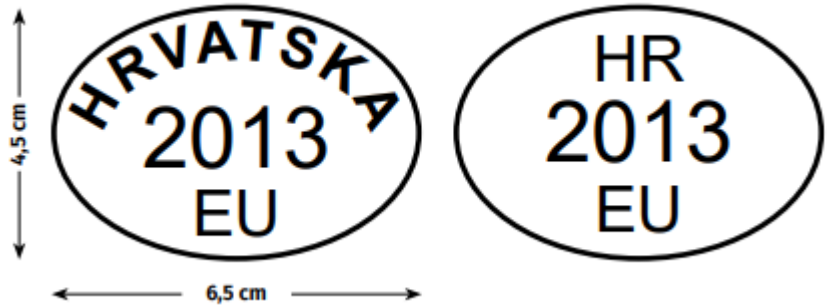
Traceability is the ability to trace a food, feed, raw material or substance intended to or expected to be incorporated into food or feed, through all stages of production, processing and distribution.

Traceability is an important factor for the management of food safety and quality, and it can be monitored by means of a LOT number, which can be used to trace the entire history of food production, should an unwanted situation occur.
"Batch" or "LOT" means a series of sales units of a food that has been produced, processed or packed under virtually identical conditions. The LOT No. does not need to be indicated in case of a food marked with a date of minimum durability or a "use by" date, when that date contains at least the day and month mark in that order.

6.5.3. Traceability of food of animal origin

Food of animal origin shall be procured from registered and/or approved establishments that are under the supervision of veterinary inspection.

All food of animal origin that is placed on the market, in addition to being subject to the labelling rules specified in this chapter, shall also bear special health marks, which help establish which approved FBEs, or FBEs approved under special conditions, the food was marketed by.
Health mark and identification mark for food of animal origin coming from an approved FB:


4,5 cm
HRVATSKA
2013
EU
6,5 cm
HR
2013
EU

Identification mark for a food of animal origin coming from an FBE approved under special conditions implies that said food is allowed to be placed on the market in catering and trade establishment:

Eggs

When eggs are placed on the market, they must be accompanied by a commercial document stating information on the traceability of eggs. Furthermore, all eggs in circulation must be marked with the **number of the farm of their origin**. Eggs for human consumption shall bear the **class "A" mark, egg shells must be of normal shape, clean and undamaged**.

The formulation of the farm No. as a mandatory marking on eggs, for example:

* The exception is eggs sold by small producers (50 eggs), where they are put on the market at the place of production and/or as part of their own tourist offer, which is exempt for the listing of farm No. requirement.

Traceability of milk and milk products

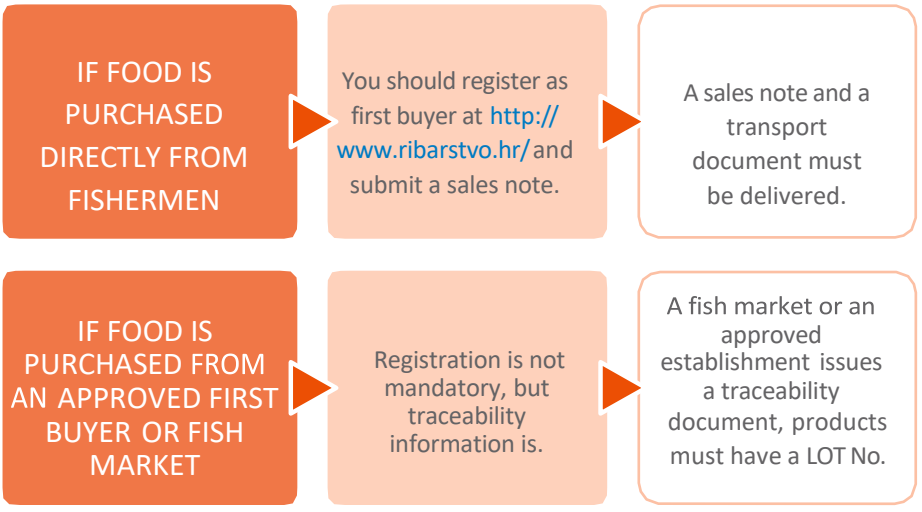
Milk and milk products placed on the market shall come from approved establishments, or establishments approved under special conditions, and be marked with identification marks, as discussed earlier.

Exceptions:

- Creamed cottage cheese originating from registered establishments that need not bear a health mark, and may sell their products at farmers' markets in the area of producing and neighbouring counties;
- Raw milk can be placed on the market through milk vending machines, door-to-door sale and delivery to customers within a 50-km radius;
- Donkey milk (raw and frozen) shall come from registered establishments, and can only be placed on the market by direct sale to end consumers (directly from the farm) and customers within a 50-km radius.

Traceability of fishery products

Monitoring the traceability of fishery products is specific as opposed to previously discussed other foods. There are different requirements concerning documentation that must be issued, depending on whether an FBO, as an entity (e.g. a restaurateur) is the so called first-hand buyer of fishery products or is buying fish products from the first-hand buyer'. In any case, information must be given on the batch - LOT of the fishery product being used.



Manuals for first-hand buyers of fish and the use of transport documents are available at: www.ribarstvo.hr.

6.6. Preconditions for proper food transport

Food safety is also contingent upon the method of transportation. Food can be contaminated during transport due to the harmful effects of physical, chemical and biological factors. Transport vehicles and containers should be **regularly sanitised, made of materials that will not have a harmful effect on food, and should be used exclusively for food transport.**

Means of transport and/or containers used for transporting food that requires a special temperature regime – **cold chain**, such as meat, fish, cakes, ice-cream, etc., must be such that the food transported inside can be kept at the appropriate temperature and monitored. Food distribution shall be carried out by means of transport and in containers that are used exclusively for food transport, and must be regularly cleaned, washed and sanitised. Vessels in vehicles and containers shall not be used to transport anything other than food.

Figure 2. Vehicle for food transport

Figure 3. Containers for food transport

During transport, the food should be under the prescribed temperature regime:

READY-TO-EAT MEALS – keeping food warm	> 65°C
CHILLED FOOD	0 - 4°C
FROZEN FOOD	–18°C (± 3°C deviation)

6.7. The importance of preserving the cold chain, food preservation temperature regimes

Cold chain is a process in which chilled and frozen foods are continuously transported and stored at the proper temperature from production to consumption.

Means of transport and/or containers used to transport food that requires a special temperature regime, i.e. cold chain, must be such that the food transported inside can be kept at an appropriate temperature and monitored.

If an FBE freezes food, the use of a device for quick freezing of food (the so-called "shock freezer") is mandatory.

Thermally processed food that is kept warm shall, without exception, be kept at a temperature higher than 65 °C. At lower food storage temperatures (the so-called "danger zone"), there is a risk of growth and reproduction of bacteria that can cause food poisoning. Food can be kept warm on the stove or in a warm bath, etc.

Food can only be reheated once!

6.8. Health requirements for food packaging materials

Food is sold in bulk or in packaging. Packaging can be sales, grouped and transport packaging. Sales packaging comes into direct contact with food and, as such, shall not affect the sensory, chemical and physical properties of food, or contain substances and microorganisms that can have a harmful effect on the human body. Grouped packaging simplifies the packaging of merchandise into transport packaging and the handling of merchandise in the store (multiple units of sales packaging). Transport packaging is used for packing several units of sales or grouped packaging. The most important role of packaging is to protect foodstuffs and ready-to-eat meals from unfavourable environmental effects during transport, storage and trade in general. Packaging, as well as dishware, utensils, equipment and devices shall be sanitary and shall not be a source of contamination (Act on General Use items, OG No. 39/13; Act on Materials and Articles that Come into Direct Contact with Food, OG No. 25/13).

Packaging materials shall be so stored that they are not exposed to the risk of contamination.

Figure 4. Proper storage of packaging materials

Wrapping and packaging procedures shall be so carried out as to avoid product contamination. When appropriate, and especially in the case of cans and glass jars, the integrity and cleanliness of the container shall be guaranteed.

Reusable food wrapping and packaging material **must be easy to clean and, as needed, to disinfect**.

Figure 5. Easy-to-clean plastic material

If the packaging is intended for direct contact with food, the following pictogram shall be displayed on the packaging:

6.9. Food additives basics

Food additives are substances of known chemical composition that are not consumed as food, nor are they a typical food ingredient, regardless of their nutritional value, **but are added to food for the purpose of improving the technological effect and maintaining sensory properties**.

The use of additives in food production is restricted and there is a whole series of additives that have prescribed MAC (maximum allowable concentration) levels for a particular food category. Additives that are not subject to MAC may be added in production as much as is minimally necessary to achieve a certain technological effect.

Approved additives have their prescribed name and E number (a three-digit number with the prefix E, e.g. E 202 stands for potassium sorbate).

Considering the technological role they can play in foods, food additives are divided into 27 functional categories.

Table 4. Overview of additive categories and E numbers

Category (technological function) of additive	E numbers
Colours	E 100 – E 180
Sweeteners	E 420 – 421, E 950 – E 969
Other additives: Preservatives, antioxidants, carriers, acids, acidity regulators, anti-caking agents, anti-foaming agents, bulking agents, emulsifiers, emulsifying salts, firming agents, flavour enhancers, foaming agents, gelling agents, glazing agents, humectants, modified starches, packaging gases, propellants, raising agents, sequestrants, stabilisers, thickener, flour treatment agents, contrast enhancers	E 170, E 172, E 200, E 202, E 210, E 211, E 212, ..., etc., up to E 1521
A total of 333 food additives have been approved.	

Employees who work with additives should keep in mind the following:

- Additives, and especially those with prescribed MAC levels, should be carefully **weighed** according to the supplier's instructions or internal company procedure!
- FBOs should have a food additive **control plan** set up, with specified final product MAC levels (laboratory analyses).
- *Any food that contains permitted additives within the prescribed MAC level is safe for consumption*.
- Additives should be so marked on the food packaging (label) that the technological **property (category) and specific name or E number of the additive** are stated.

Additives may not be added to unprocessed food, honey, non-emulsified oils and fats of vegetable and animal origin, butter, pasteurized and sterilised milk (including ultra-high temperature (UHT) processing), pasteurised cream, non-flavoured buttermilk (except sterilised), unflavoured fermented milk products and fresh cheese, natural mineral and spring waters, coffee and coffee extract (except flavoured instant products), non-flavoured tea, sugar, dry pasta, except gluten-free pasta and pasta intended for a hypo-protein diet (regulated by special regulations).

7. HACCP

Introduction

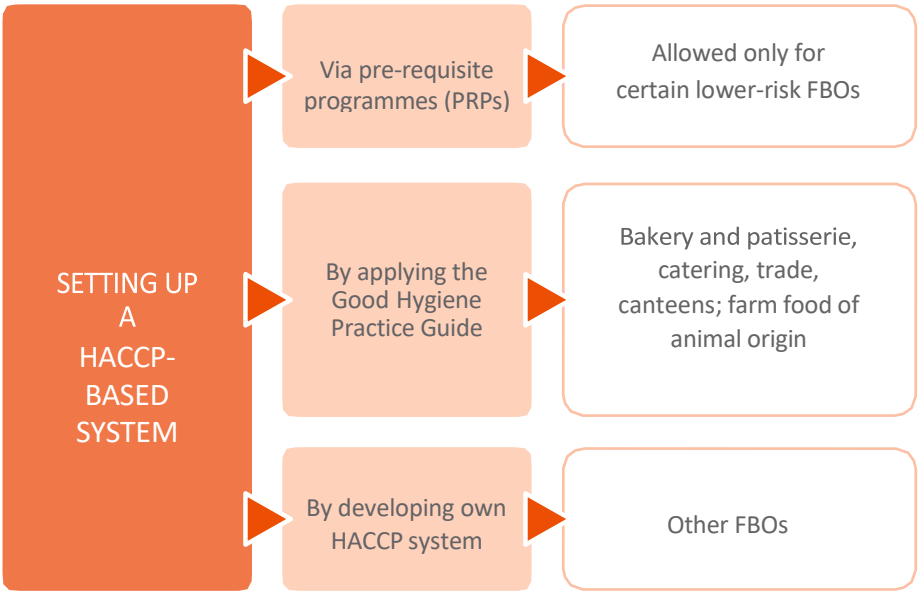
FBOs have a legal obligation to establish and implement a HACCP-based auto-control system.

What does that mean?

HACCP – abbreviation of 5 English words (*Hazard Analyses and Critical Control Points*) implies a system that must be established by every company/trade or entity, in which **all hazards (everything that can go wrong) in food production and/or meal preparation are identified and measures established to prevent, remove or reduce these hazards to an acceptable level**.

This, in fact, implies a legal obligation that requires all entities and all their employees to work according to certain procedures, the application of which ensures food safety.

Said obligation can be implemented in the following ways:



Before a HACCP system can be set up, an FBO shall meet all the **PRP (prerequisite programme) requirements**, which have earlier been discussed, namely:

- **All infrastructural facility and equipment requirements;**
- **All raw materials and materials in contact with food requirements;**
- **Microbiological food criteria;**
- **Safe food handling requirements;**
- **Disposal of animal-origin waste and by-products;**
- **Pest control;**
- **Washing, cleaning and disinfection procedures;**
- **Water control;**
- **Cold chain maintenance and control;**
- **Monitoring of employees' health status, personal hygiene and training;**
- **Monitoring of food traceability and withdrawal/recall procedures.**

7.1. Set-up of HACCP-based systems and procedures

Some FBOs and professional activities from Art. 10 of the Ordinance on the rules for the establishment of systems and procedures based on the principles of the HACCP system (OG No. 68/15), after having met these PRP requirements, and in combination with keeping prescribed records, will be considered to have a HACCP system set up. This group includes, for example, coffee bars, warehouses, packed food outlets, farmers' markets, facilities producing only short crust and leavened pastries and batters, or baking frozen wares, butcher shops (registered establishments), fish markets, etc.

7.2. Good hygiene practice guides

Certain economic activities (sectors) of food production, where food handling procedures are well known, have designed the so-called 'good hygiene practice' guides.

National good hygiene practice guides in the Republic of Croatia are approved by the Ministry of Health and the Ministry of Agriculture. These guides cover all potential significant hazards in food business and clearly define the procedures and methods of controlling these hazards, with the corrective measures to be taken in case of non-compliance. An FBO that has set up a HACCP system in their establishment based on positively evaluated guides is obliged to apply the guide in its entirety. The guide then becomes a mandatory part of the documentation, including all plans and records specified by the guide. The FBO shall regularly update their plans and records.

Employees who work in FBEs that have set up a HACCP system based on any of the nationally acknowledged guides (e.g. bakeries, cake shops, catering establishments), by implementing all procedures and keeping records set by the guide, will be considered to be properly implementing the HACCP system.

The national guides for individual economic activities in food production and trade that have been approved by the Ministry of Health or the Ministry of Agriculture of the Republic of Croatia are as follows:

Guides approved by the Ministry of Health:

+ https://www.hok.hr/cehovi/haccp_ugostiteljstvo
+ https://www.hok.hr/cehovi/haccp_pekarstvo
+ https://www.hok.hr/cehovi/haccp_slasticarstvo
+ https://www.hok.hr/cehovi/haccp_trgovina
+ http://www.mzss.hr/layout/set/print/novosti/novosti_iz_zdravstva/vodic_dobre_higijenske_prakse_i_primjene_haccp_nacela_za_institucionalne_kuhinje

A guide for kindergarden kitchens has been approved by and made available at the Ministry of Health website:

+ https://zdravlje.gov.hr/o-ministarstvu/djelokrug-1297/sanitarna-inspekcija/hrana-1359/haccp-vodici/3018

Guides approved by the Ministry of Agriculture:

+ https://www.hgk.hr/documents/vodiczadobruhigijenskupraksuuindustrijiproizvodaribarstvav2595785ef38a6ed4.pdf
+ http://www.sircro.hr/wp-content/uploads/2015/12/Vodic-dobre-higijenske-prakse-PRVO-IZDANJE.pdf
+ http://www.lipa-pazin.hr/wp-content/uploads/dobra_pcelarska_praksa.pdf
+ https://www.dekaform.hr/downloads/Vodic_DHP_HCCP_%20industrija_mesa.pdf

7.3. More about HACCP

Other food manufacturers for whom there is no approved guide to consult shall set up their own auto-control system based on the HACCP principles.

7.3.1. Hazard identification

If you need to set up your own HACCP system, the first thing you have to do is to identify all potential hazards to the food production process, i.e. the ones that can cause the food to become unsafe for the consumer. For this step, it is usually necessary to form a team of people or one individual who knows the technological process very well. Then, **every step** in the food business with all the activities carried out is checked.

The hazards, as mentioned earlier in chapter V, can be biological, chemical or physical in nature:

+ **Biological hazard** – the presence of microorganisms, e.g. bacteria, viruses, yeasts, moulds, that can be dangerous for the consumer
+ **Chemical hazard** – e.g. detergent residues from washing
+ **Physical danger** – the residues of such substances as pebbles, metal, etc.

When a certain hazard is identified, then the **measure, i.e. method, of control** should be established.

7.3.2. Identification of critical control points

Identification of critical control points is the key and most important phase of the setting up of the HACCP system. If a good control of food hazards is not established at this stage, food safety can be jeopardized.

After having identified the hazards, as previously stated, it is necessary to determine the **main steps** in the production process, where these hazards can be controlled. These steps are called critical control points (CCPs). As a rule, CCPs are the last points where the hazards are controlled before the food is prepared for the consumer.
How do you know if a certain step is included in the CCP process?

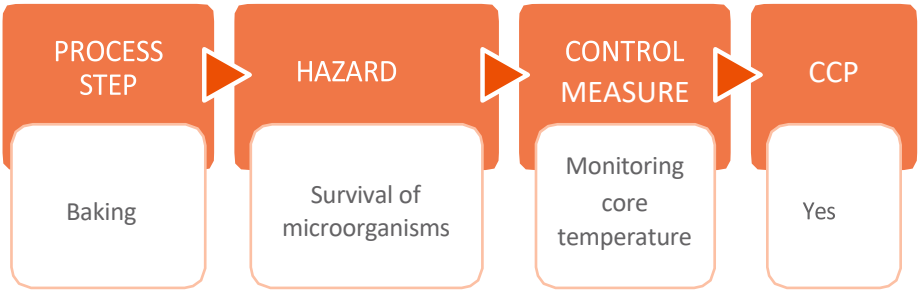
If all of the following four questions are answered with a YES, the step in question is, in fact, a CCP:

Does the established hazard control measure affect food safety?

Can the established control measure reduce or eliminate the hazard?

Is it the last point in the process where this hazard can be controlled?

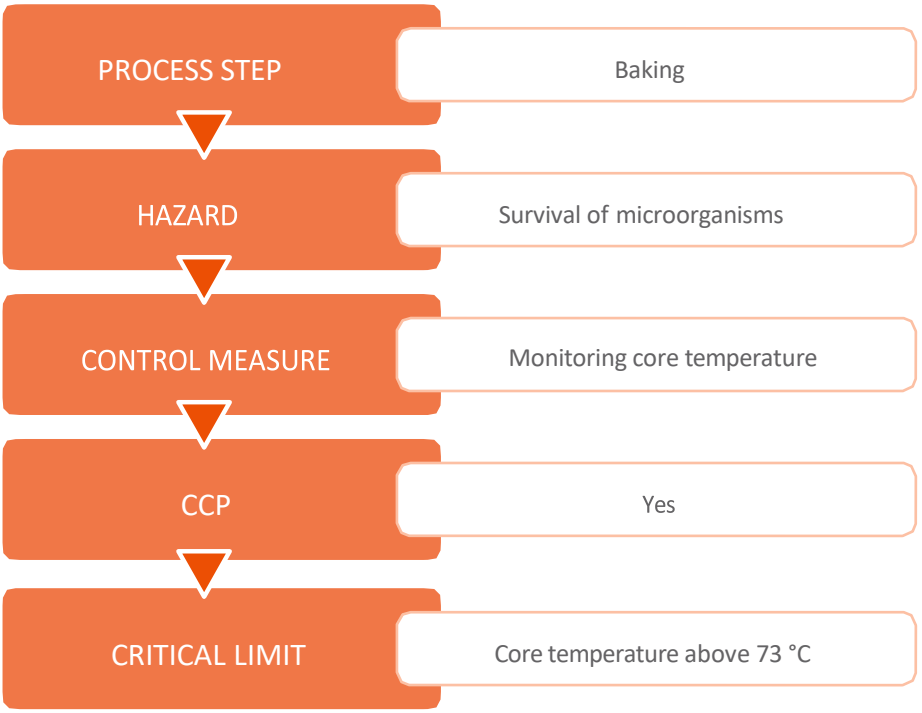
Can you set up a method of monitoring/measuring this control measure?



Set-up of critical limits

Critical limit is the border that separates the acceptable from the unacceptable. For example, a temperature of 73 °C at the core of the product during baking is acceptable as it ensures the eradication of the bacteria present, while lower temperatures for this specific baking process would not be acceptable.

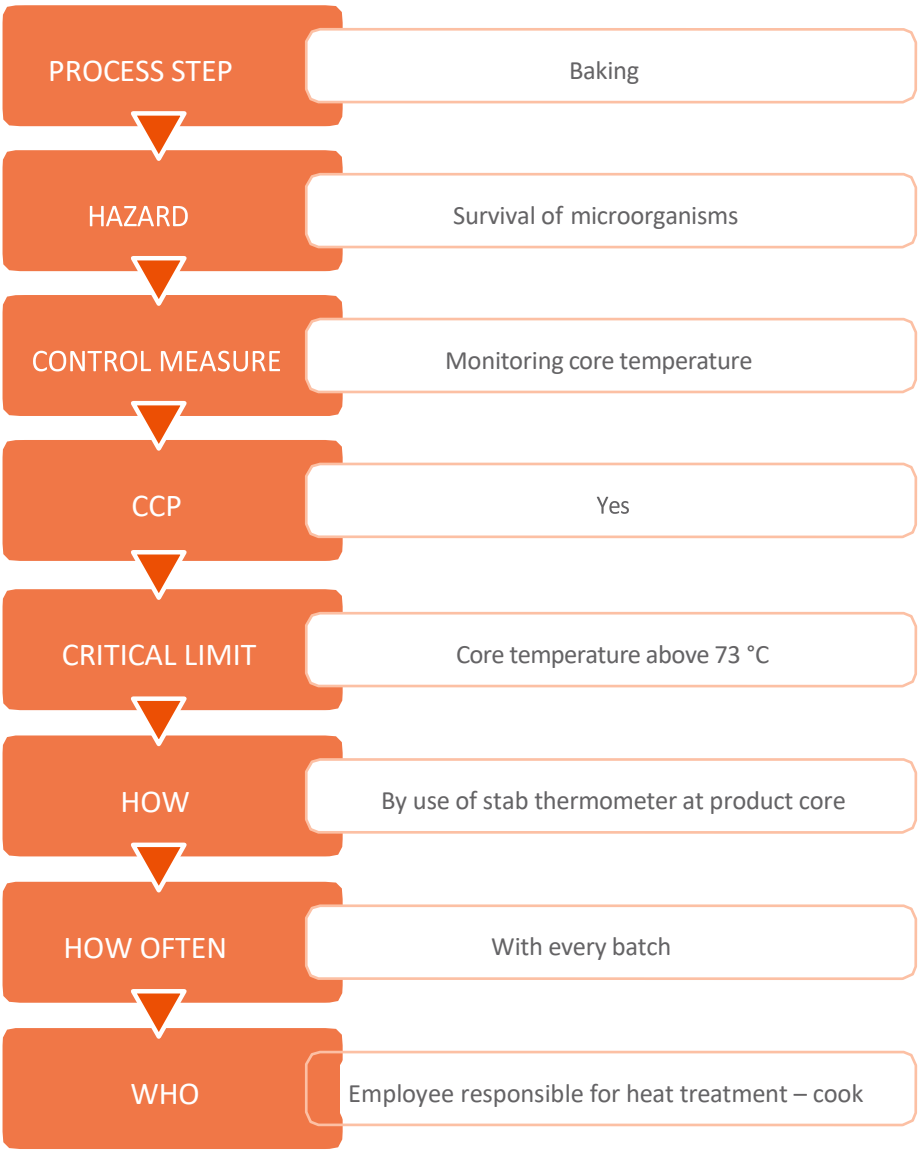
Often, the monitoring of the CCP process can also be carried out visually. For example, when the soup boils, it means that a temperature of 100 °C has been reached, which guarantees an acceptable level of product heat treatment.



7.3.3. Monitoring

Each FBO shall establish three parameters for each CCP:

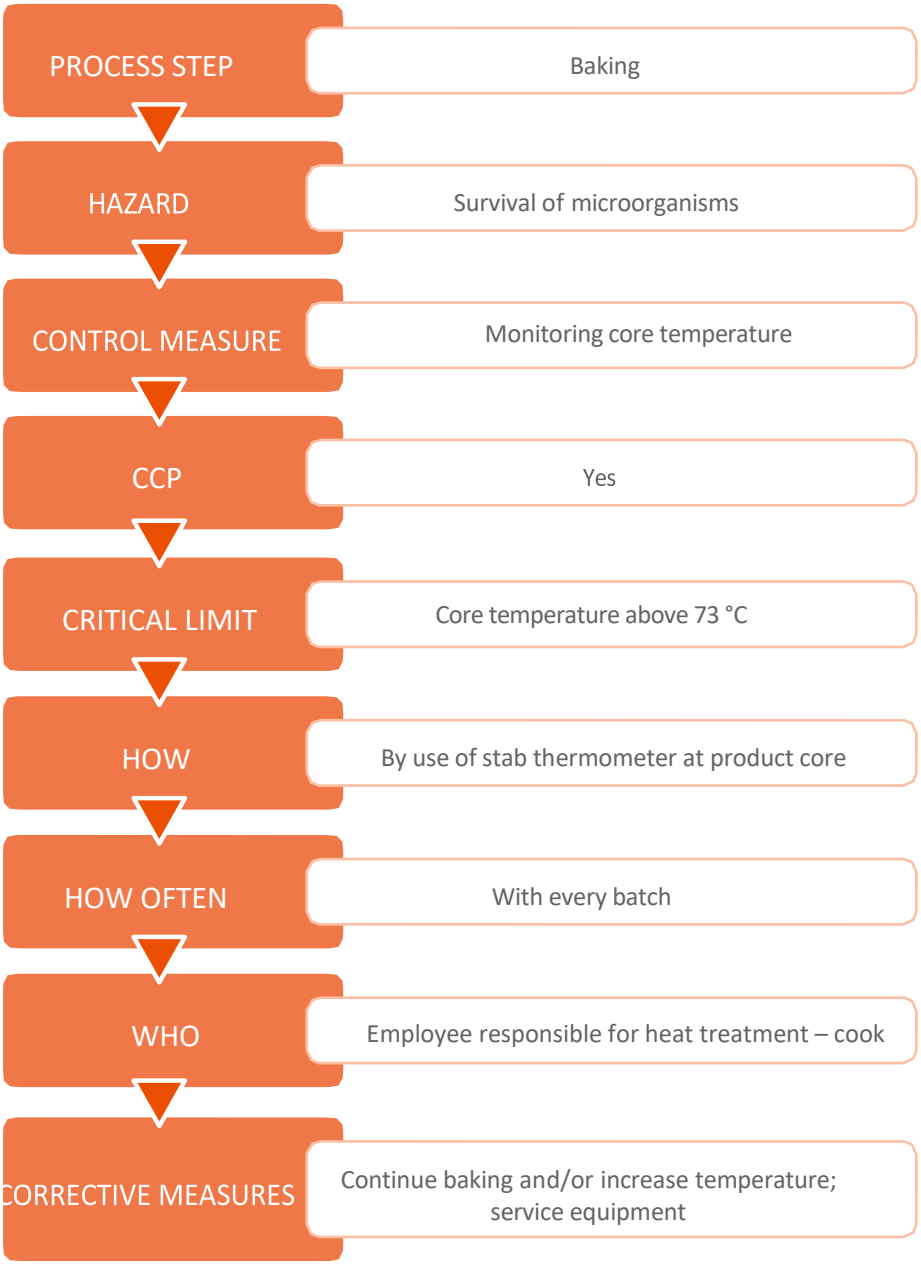
+ Control **method – HOW?**
+ Control **time/frequency – WHEN/HOW OFTEN?**
+ Control **staff – WHO?**



7.3.4. Corrective measures

Corrective measures are the measures that should be implemented if the CCP monitoring establishes that the critical limit has been violated. Corrective measures need to be predefined in advance. They must describe exactly what should be done with a compromised food batch and ensure that a similar undesirable event does not happen again.

If, say, despite the baking process conducted for an expected period of 30 minutes, it was established that the CCP was not reached, then the following measure should be taken: continued heat treatment or temperature increase. But at the same time, an inspection and servicing of the equipment should also be carried out.



7.3.5. Check-up (verification)

The verification of the HACCP system is proof that food hazards may be effectively controlled. This implies that the established system is carried out exactly as planned and that all activities are carried out according to a precisely scheduled frequency.

An FBO sets up their own methods of controlling the effectiveness of the HACCP system, as well as appoints the persons who will carry out the control.

As a rule, persons in charge of the verification are not the same persons in charge of the surveillance (monitoring) of the HACCP system.

When checking the effectiveness of the HACCP system, certain verification measures will be carried out continuously, while others only periodically.

For example, daily verifications (checks) will include whether the critical limits have been exceeded at the CCP and whether records are kept about it, while periodical checks will concern whether individual equipment is calibrated.

These measures are regulated by an FBO via the HACCP plan for each FBE, and this method should establish whether the HACCP plan was implemented in the production exactly as intended (planned).
One of the verification measures is the analysis of the final product, which is carried out in accordance with the annual sampling plan.

7.3.6. Revision of the HACCP system

The HACCP system should be revised every time that:

- an important change occurs within food production, such as a change in or introduction of a new product or a new production line;
- a problem continuously appears even though the prescribed corrective measure is implemented.

7.3.7. Keeping documentation and records

Each FBO that has implemented the HACCP system by applying all the principles as described shall keep records on the implementation of the HACCP plan, which, pursuant to the Ordinance, includes at least the following:

1. procedures for prerequisite programmes (PRPs);
2. hazard analysis;
3. HACCP plan;
4. established CCPs and CPs;
5. established critical limits;
6. changes to systems and procedures based on the principles of the HACCP system.

Necessary records are all records related to the implementation of PRP procedures, including plans, records of CCP and CP monitoring activities; records of deviations and related corrective measures; records of verification activities and records of conducted training (the records must contain at least the following: names of participants, dates, agenda, names of lecturers and duration of training).
Documentation and records shall be made available at the FBE and shall be presented at the request of an inspector.

7.4. Procedures in case of product withdrawal and recall

Even if an FBE should undertake all possible measures to market a correct product without defects, sometimes 'failures' occur, due to which a food on the market may fail to meet the safety requirements. Commonly, this concerns minor non-conformities related to food labelling or an ingredient discovered that does not pose a health risk, but occasionally a marketed food may require both a withdrawal from the shelves and public notification to consumers (public recall), if there is risk to consumer health involved.

Withdrawal means the removal of an unsafe food or feed from the market, including withdrawal from retail outlets. Withdrawal takes place when it is established that a food or feed product is unsafe and when **it is certain that the product has not left the distribution chain or reached end consumers**.

Recall is the removal of an unsafe food or feed product from the market, including food or feed that has been distributed to end consumers and, consequently, requires communication with consumers.

If an FBO knows or reasonably suspects that a food imported, produced, processed, manufactured or distributed on their part does not meet the health and safety requirements, they shall immediately undertake to withdraw the product from the market.

The requirements, roles and responsibilities that an FBO must meet in relation to food withdrawal and recall are as follows:

- **Notifying the competent authority (inspection)**

  FBOs are obliged to notify the authority responsible for the implementation of official control on any withdrawal measures taken and/or reasons thereof.

- **Informing the distribution and supply chain**

  An FBO is obliged to submit data to all retail and wholesale outlets in order to stop any further distribution, sale or serving of a product that is considered to represent or could represent a health hazard.

- **Recall from the consumers**

  An FBO shall effectively and accurately inform consumers about the reason for product recall.

- **Disposal of recalled, unsafe, unsuitable or returned foods**

  Foods that are subject to recall shall be clearly marked and separated from other foods, to prevent any accidental sale, and disposed of in a harmless way.

- **Activities of a retail operator**

  An FBO in the retail trade whose only activity was placing a defective/unsafe food on the market is obliged to withdraw it from the market and act in accordance with the decisions of the manufacturer and/or competent authority.

8. Epidemiology of infectious diseases

The first and most immediate task of epidemiology is the prevention of disease as a mass phenomenon, and the second is the prevention of individual cases, i.e. the complete eradication of a particular disease.

Infectious diseases are a group of diseases caused by microorganisms or their toxins, which are transmitted from one person to another.

8.1. Preconditions for the development and transmission of infectious diseases

As already explained in earlier chapters, in his everyday life, man is surrounded by countless microorganisms that are invisible to the naked eye. They are divided into several groups according to form, activity and reproduction. In terms of transmission, the most important pathogens are:

Bacteria

Viruses

Fungi

Helminths

Protozoa

The basic characteristic of infectious diseases is direct or indirect transmissibility of their causative agent from an infected person, animal or carrier to a healthy person. Skin, venereal and 'dirty hands' diseases are transmitted by direct contact, while insects can transmit infection by mechanical and biological routes. In order for an infectious disease to appear and then spread, certain preconditions must be met:

The causative agent of an infectious disease is any microorganism that can cause disease;

The source of infection can be an infected person, animal and germ carrier;

The route of transmission implies the transfer of pathogenic microorganisms from the source to a new host, most often transmission through contact, air, food and water;

"Entry portal" is the respiratory tract or digestive system – intestinal and other infections, skin and visible mucous membranes;

Virulence (strength) is a set of factors consisting of the capacity of microorganisms to cause disease;

Predisposition, i.e. tendency to become infected (state of immunity, i.e. the body's defence power).

Above preconditions are interconnected, which means that the absence of any of them will prevent the development of an infectious disease, or its transmission.

Example: A worker in a restaurant, after defecating, did not wash his hands and contaminated them with salmonella germs (**causative agent**). Since he has no symptoms, he is not aware that he carries germs in his digestive system and that he can spread them on. In this case, the worker is a germ carrier, that is, the **source of infection**. Subsequently, the worker serves food after having contaminated it with salmonella (**transmission route**, in this case by **contact**). A restaurant guest (**host**), an elderly person with a weakened immune system, eats the contaminated food (**entry portal**, in this case the **digestive system**) and develops symptoms (abdominal cramps and diarrhoea) within 24 hours.

8.2. General methods of infectious disease prevention and suppression

General methods of prevention and suppression of infectious diseases are prescribed by the Act on the Protection of the Population from Infectious Diseases (see chapter II.), and include:

ensuring food safety;
ensuring the safety of water for human consumption;
ensuring the sanitation and hygiene of surfaces, premises or facilities;
ensuring the implementation of disinfection and pest control as general measures for surfaces, spaces, premises or facilities.

The measures implemented daily for the purpose of preventing and suppressing infectious diseases are aimed at eliminating the factors needed for the spread of infectious diseases.

- **Measures aimed at the source of infection:** If the source of infection is an infected person or carrier, antimicrobial drugs or isolation measures can be applied; and if this concerns animals, pest control (insect and rodent extermination) measures are applied.
- **Measures aimed at the causative agent:** Elimination of the causative agent is achieved by means of disinfection (procedures that reduce the number of microorganisms) and sterilisation (processes that eradicate all microorganisms).
- **Measures aimed at the route of transmission:** Disinfection of objects in the environment, personal hygiene, proper meal preparation and food storage, supply of safe water.
- **Measures aimed at the entry portal:** In order to prevent the entry of microorganisms into the body, it is necessary to protect the host's entry portal (protective masks, eyewear and clothes), to ensure sterile wound dressing, and to knowingly avoid such risks as the consumption of contaminated food and water.
- **Measures aimed at the host:** The resistance of the organism can be achieved through healthy lifestyles or by preventive administration of antimicrobial drugs to prevent infection in persons under increased risk.

8.3. Basics on carriage and its role

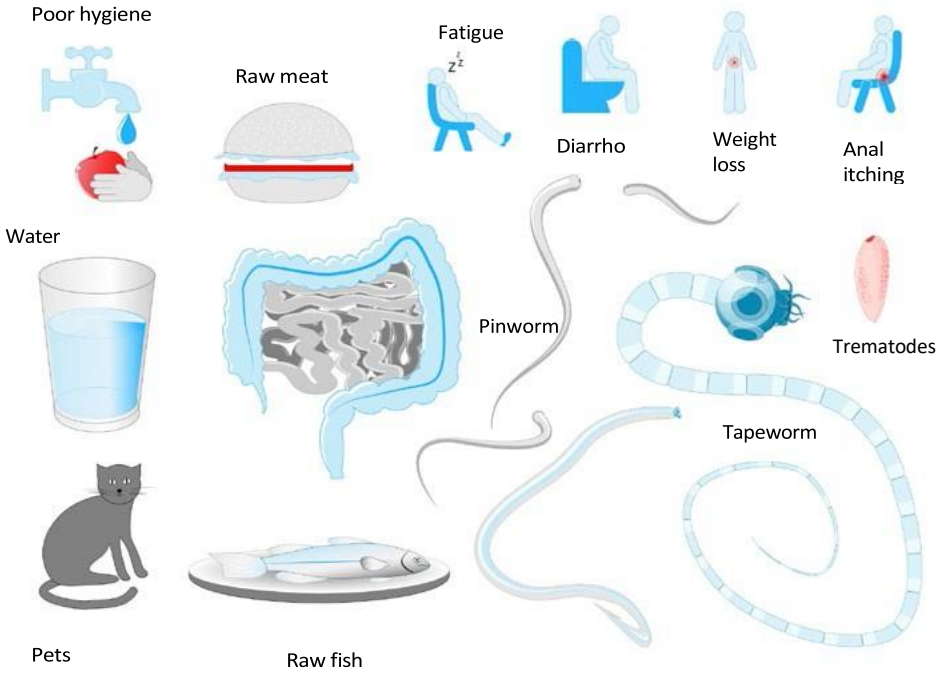
Cases with symptoms of disease hidden or very subtle are the most dangerous as diseases are left untreated, while infected persons are not isolated and move freely around the workplace contacting healthy people. A **carrier** is a healthy person who carries a certain infectious microorganism and can further spread it to susceptible people, without having any symptoms or signs of a disease. Carriage can be acute or chronic. Chronic carriage is possible with typhoid, hepatitis B, hepatitis C and AIDS. The law precisely regulates how health surveillance is exercised over carriers of infectious diseases. As source of infection, a carrier is a particularly dangerous person as they can easily infect a large number of people over a varying period, without even being aware of it.

8.4. Basics on intestinal, droplet and parasitic diseases

As mentioned in the previous chapters, persons who come into direct or indirect contact with food, dishware or utensils may cause food contamination through their actions, that is, development of disease in people who consume said food. Unsafe food and contaminated water transmit infections, primarily infectious intestinal diseases. Food that particularly favours the development of microorganisms is meat and meat products, milk and milk products, eggs, etc.

Dirty hands are the most common route of food contamination and transmission of pathogens, which is why infectious intestinal diseases are also known as '**dirty hands' diseases**.

Parasitic diseases – parasites are organisms that inhabit another organism and live at the expense of the host organism. The most famous parasites are Trichinella and tapeworm. The main route of transmission is the faeco-oral route, but parasites can also be ingested with food or water.



Droplet diseases – the flu, the cold, tuberculosis. When speaking, coughing or sneezing, the patient expels droplets of saliva and mucus from the upper respiratory tract together with existent microorganisms, and they remain in the air for a long period of time. A healthy person who breathes such air can become infected and, consequently, source of infection.

Infectious diseases of the digestive system occur after the agent is introduced into the body through contaminated water, food or directly by dirty hands. The most common signs of disease are nausea, vomiting, diarrhoea and abdominal pain and cramps. Such intestinal infections are usually accompanied by dehydration, to a greater or lesser degree, due to fluid loss through vomiting and diarrhoea, and possibly sweating from elevated body temperature.

Infectious diseases of the respiratory system are caused by the entry of pathogens into the respiratory tract in form of droplets, large drops or dust through the air. The basic symptom of most of these diseases is coughing, which, depending on the agent, can be accompanied by a runny nose, sore throat, but also general symptoms such as general weakness, elevated body temperature, etc.

Parasitoses are infectious diseases caused by parasites (numerous protozoa and helminths), which can be transmitted through food and most often parasitize in the digestive tract, but also in other body cavities, tissues and in the blood. They can be ingested with food and water, and sometimes actively penetrate the host's skin.

9. First aid basics

First aid is a set of procedures or assistance administered to an injured person or a person suddenly taken ill until the arrival of an ambulance or other qualified health professionals. In the case of failure of vital functions, administration of first aid as soon as possible is pivotal for the survival of the victim until the arrival of emergency medical help. By administering first aid, the rescuer maintains blood flow (external cardiac massage) and breathing (mouth-to-mouth resuscitation), which prevents further deterioration of vital organs and increases the chance of survival and recovery.

First aid is administered until the person starts showing signs of life or until the ambulance arrives.

1. Cardiopulmonary resuscitation (CPR) procedure

Resuscitation or reanimation includes cardiac massage and mouth-to-mouth resuscitation (artificial ventilation), in a ratio of 30 compressions on the chest to 2 breaths.

+ **External cardiac massage:** resuscitation begins with a heart massage. The victim must lie on a hard surface. The root of the palm should be placed in the middle of their chest, while the other palm should be placed over the first. The fingers can be intertwined or extended, but they must not touch the chest wall. The elbows must be extended and the shoulders positioned above the point of pressure. The compressions should be quick and short, while their intensity should be adjusted to the age and constitution of the victim. Compression force should be such that it compresses the chest by 4-5 cm (in an adult), in a rhythm of 100-120 times per minute.
+ **Mouth-to-mouth resuscitation:** The victim's head should, first, be reclined backwards and the nose closed by pressing together the index finger and thumb of the hand that is placed on the victim’s forehead. Their head should be held back throughout the rescue breathing. The rescuer should blow a normal breath into the victim's mouth. The insufflation should last for two seconds. After that, the victim's mouth should be covered so that the air does not escape. When the chest drops back to its original position, insufflation is repeated.

2. Releasing a foreign object from the respiratory system

Inhalation of any foreign object (water, morsel of food, small toys, in case of children) results in partial or complete obstruction of the airways. With partial obstruction, the victim can cough and breathe. They should be encouraged to cough, as coughing is a natural reflex of expelling a foreign object from the respiratory tract. The source of obstruction should be taken out of the mouth, if the object can be seen obstructing the airway.

When the airway is completely blocked, the victim cannot speak, cough or breathe and will eventually lose consciousness. In this case, it is necessary to apply a series of strikes between the shoulder blades or the Heimlich manoeuvre.

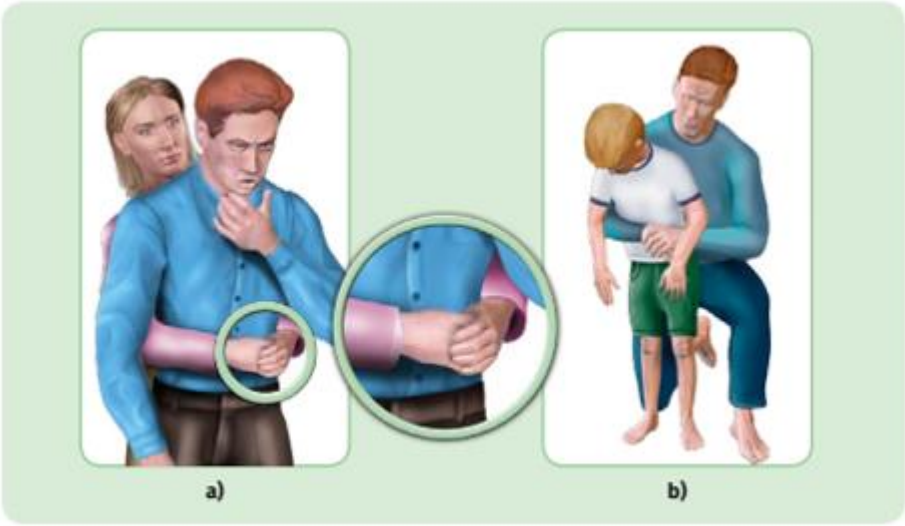


Figure 6. The Heimlich manoeuvre: **a)** for adults; **b)** for children

3. Loss of consciousness

Loss of consciousness can be harmless and momentary, if caused by a sudden drop in pressure, or severe and dangerous, as a result of poisoning, cardiac arrest, head injury, etc.

A person who is unconscious is at risk of suffocation on their own tongue, because the muscles of an unconscious person become weak, so the root of

the tongue falls into the pharynx and closes off the airway, and due to the loss of swallowing and coughing reflexes, suffocation can occur, which is why it is crucial to unblock the victim's airway by reclining their head back.

An unconscious person who is breathing independently should be placed in a stable lateral position until the ambulance arrives.

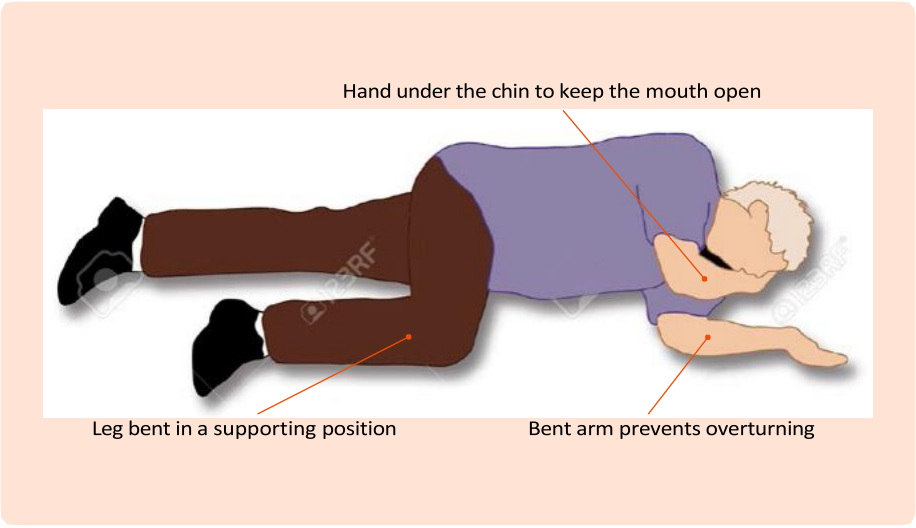


Image 7. Unconscious person in a stable lateral position

4. Wounds

A wound is a physical injury to living tissue that affects the skin or mucous membrane, can penetrate deeper tissue layers to varying degrees, and is most often caused by the action of some mechanical force. When dressing a wound, it is necessary to cover it with gauze and bandage. If foreign objects are thrust deep into the tissue, they should not be removed, but should be immobilised so as not to cause further damage to the tissue, while smaller foreign objects, such as smaller pieces of stone or glass, should be removed with a clean gauze. If it is a larger wound, it should not be washed out with liquids, nor should any powders, ointments or creams be applied. Only minor superficial wounds that do not bleed heavily should be washed with clean water.

5. Haemorrhage

Haemorrhage occurs when blood flows out of a damaged blood vessel. Bleeding can be external (bleeding from the inside to the outside, injured skin) or internal (inside the body, into body cavities or organs). In case of external bleeding, the main way to stop the bleeding is exerting pressure on the wound. This, in fact, compresses the damaged blood vessels and prevents further blood loss.

6. Burns

Burns are injuries to the skin or subcutaneous tissues caused by heat (hot liquid, steam, fire), electric current, chemical substances, friction or radiation. The severity of burns depends on the size of the affected body surface, but also on how deep they penetrated the skin.

Burns are divided into superficial burns (redness of the skin, swelling and pain to the touch) – first-degree burns; partially deep burns when deeper layers of the skin are damaged and the surface layer is destroyed, which is characterized by the formation of blisters on the skin – second-degree burns; burns in which all layers of the skin are damaged – third-degree burns.

In the case of surface burns, the most important thing is to cool the burned area with clean cold water as soon as possible, by immersing the burned body part in the cold water or placing it under a stream of cold water. The cooling should last for a minimum of 10 minutes (until the pain stops).

The burn should not be touched, and if possible, any rings, watches, belts, shoes and burnt or smouldering clothes should be removed from the victim before the tissues begin to swell. Clothing stuck to the burn should not be removed, and the injured area should be covered with a sterile gauze or a sterile bandage to protect it from infection.

Burns caused by electric current can cause muscle tension or even stop the heart.

7. Poisoning

Poisoning is a condition caused by poisons or substances that, in terms of quality, concentration or quantity, are foreign to the body, and, when introduced by any route (inhalation, ingestion or through the skin), they have a (physico)-chemical effect, causing disruption of the anatomical structure and functional harmony of the organs.

Signs of poisoning can be diverse, depending on the type of poison, amount, place and speed of entry into the body. In case of food poisoning, the usual symptoms are nausea, vomiting, cramps, diarrhoea, and sometimes fever and fluid loss, with crucial imperative of replenishing the fluids.

In case of acid and alkali poisoning, chemical burns are incurred, and in this case, if the person is conscious, it is necessary to rinse out the skin and oral cavity, and take large amounts of water by mouth.

Vomiting must not be induced in case of poisoning with acids, alkalis, salts, heavy metals, petrol, kerosene, paint solvents and foaming agents!

Inhalation of toxic gases or steam may cause coughing and a feeling of suffocation, and the most common is carbon monoxide (CO), a colourless and odourless gas.

The biggest hazard is defective chimneys and stoves. Signs of poisoning are malaise and general weakness of the whole body, shortness of breath, nausea, headache and dizziness, unconsciousness, suffocation, heart failure.

The victim should be taken out of the room immediately and, if not breathing, resuscitation measures should be initiated without further delay.

Publisher
Croatian Institute of Public Health

EDUCATIONAL MATERIALS FOR ATTENDEES OF THE
FOOD SAFETY AND PERSONAL HYGIENE COURSE
EXTENDED PROGRAMME

Graphic editor Željko Podoreški

Proofreader and editor Ana Kranjčić

Pre-press services Tko zna zna d.o.o., Zagreb

Illustrator www.freepik.com | www.123rf.com