



Student material

Contet

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On the pages 29, 33 and 34 Presented Diagrams Based on
illustrations Paper
Food Hygiene, Environmental Hygiene, Food and Environmental Technology, Hannu
Korkeala (ed.), WSOY 2007

The diagrams on pages 19, 22, 26, 27 and 53 and the presentation of food poisoning bacteria
as a table are based on the Food Hygiene Drawing Film Series, SEFO Consulting, 2001

Illustrations by Linda Praulina and Laura Vainio

FORERD

The aim of this Permission to Cook material is to promote food hygiene skills, especially among comprehensive school and upper secondary school students.

The Permission to Cook material is suitable for teaching food hygiene as part of optional courses in comprehensive school and upper secondary school. Based on this, the pupil can also complete the official hygiene proficiency certificate of the Finnish Food Authority, i.e. the Hygiene Passport.

The content of the material was updated in 2013, and support from the Ministry of Agriculture and Forestry has been used for this work. The first edition was produced by Sitra as part of the Food and Nutrition Programme's Hygiene Passport project in 2008. In 2021, the information about Evira was updated to the Finnish Food Authority.

You can also find the learning material as an electronic version on the Ruokatieto website at www.ruokatieto.fi/lupakokata.

1 Hygiene skills

Welcome to learn more about food hygiene.

We will start with the concepts: hygiene from home kitchen to professional food handling, hygiene proficiency certificate, i.e. the so-called hygiene competence certificate. Hygiene passport, food and food hygiene.



1.1 From home kitchens to professional food processing

Since we were babies, we have learned different practices to protect ourselves and others from getting sick from food and prevent food from spoiling too quickly.



These and many other familiar parental admonitions have laid the foundation for understanding food hygiene and acting hygienically.



The old rules apply and new ones must be learned.

The food industry develops new semi-finished products and products, preservation methods and packaging for our everyday use. Food, nutrition and packaging research produce information that can enable sometimes very revolutionary novelties, such as xylitol or plant sterols. The new products and packaging are intended to serve the needs of retailers or consumers. Some novelties, such as gas packaging or drastic reductions in fat, sugar and salt content, have changed the shelf life and risks of traditional products. Our stores will also have new exotic ingredients that even parents will be puzzled by:

- Does fresh tuna last the same way as pike?
- What exactly is a gas pack, what is UHT milk?
- Does a light spread last as long as it can?

Clean and careful handling of food in the home kitchen is important for our health. Professional food operations are not possible at all without systematic hygiene. There can be a long time between the manufacturer of the product and the diner, transports, cultural differences, etc. We need common rules, laws and monitoring of compliance with them so that we can confidently eat the products on sale. The labelling of the packaged product and the seller of the product must provide sufficient information for the safe use of the product.

1.2 Hygiene passport

A pizza chef, an ice cream seller, a food factory worker are examples of people who handle perishable foods in their work. They must understand food hygiene and know how to act in such a way that the products do not cause illness or food poisoning to the diner. They must demonstrate their knowledge by taking a hygiene proficiency test within three months of starting such work. Those who pass the test will receive a hygiene proficiency certificate from the Finnish Food Authority. hygiene passport. *"The Food Act (23/2006) requires that persons handling perishable unpackaged foodstuffs in approved food premises for a living*

must demonstrate their hygiene skills with a hygiene passport in accordance with the Finnish Food Authority's model. The food business operator ensures that this requirement is met for its employees as part of its own-check activities."

In practice, a hygiene proficiency certificate is required for almost everyone who works in kiosks, cafes, fast food establishments, grocery stores or food factories.

One of the purposes of this study material is to help you prepare for the official hygiene proficiency test.



Tasks

- Who does the requirement for a certificate apply to according to the law?
- How many questions are there in the test? How many must be answered correctly?
- How long is the certificate valid?

Hint: Ruokavirasto.fi / Hygiene Passport

1.3 Foodstuff

Food refers to almost everything we eat and drink:

Ingredients:

- potatoes and carrots picked from the field, fruit
- vegetables, fish, meat, eggs, milk
- flour, spices

Semi-finished products:

- marinated meat strips
- peeled and chopped vegetables
- fresh pasta

Food industry products:

- pastries, sweets, soft drinks, canned food
- Frozen foods
- Food portions

All of these and even drinking water are foodstuffs. The main raw materials of foodstuffs, foodstuffs, are biological materials and they will spoil sooner or later.



Perishable foods

Animal-based ingredients, chopped vegetables and ready-to-eat foods are perishable foods. Their properties and structure provide good growth conditions for a wide range of microbes. Harmless microbes as well as spoilage microbes and food poisoning microbes can multiply very quickly in these foods. Many food poisoning bacteria can multiply in dangerous quantities without any sensory changes in the product. Therefore, there are a lot of rules for handling such food.

The storage temperatures of the products vary somewhat. Many perishable foodstuffs should be stored either at a low temperature below +6 °C or at a high temperature above +60 °C. However, some perishable foods need to be stored at other temperatures, such as fish at a storage temperature of 0–3 °C.

Perishable foods

Fresh bread, buns, whole vegetables and fruits become unusable, sometimes faster, sometimes slower, depending on the storage conditions. Pollution begins with physical or chemical changes that we can observe; For example, milk will become lumpy, bread will dry out, and peeled potatoes will darken.

The shelf life of these products is significantly affected by the storage temperature and humidity. We can assess the usability of products by the senses.

Other foodstuffs

Other foods can be stored correctly for long periods of time due to their chemical and physical properties. Canned food, crispbread, nuts, flour, spices and sweets spoil very slowly. These can be used for long periods of time in a dry warehouse at room temperature, protected from light.

When foods are processed, their susceptibility to spoilage can change.

A whole carrot is a perishable food, the usefulness of which we can assess organoleptically, grated carrot is easily perishable foodstuff and Dried carrot chips remain safe for years.

Tasks

- Which group do you place in based on perishability:
- Dry peas
- Hernesoppa
- Unopened canned pea soup
- Opened canned pea soup
- Fresh pea pods
- Frozen peas

1.4 Food hygiene

In Greek mythology, Hygieia was the goddess of health and cleanliness, associated with preventing disease and maintaining health.

Hygienic food is clean, healthy and suitable for human consumption. Hygiene includes the safety and shelf life of products and that the composition of the product complies with regulations. Hygienic food does not cause illness.



Food hygiene refers to all the arrangements and working methods needed to prevent food poisoning and to ensure that food is fit for human consumption.

Good hygiene practices include: protective headgear, droplet guards in self-service furniture for bulk products, cooling milk immediately after milking, purifying water, and slicing and packaging bread in a clean room in the bakery. There is room for big and small, expensive and cheap solutions.

Hygienic food handling methods refer to everything that is

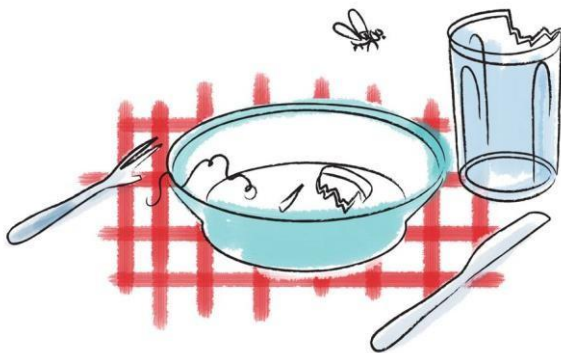
- ensures that the product complies with the recipe and labelling;
- reduce the risk of additional contaminants entering products
- weaken and slow down Harmful Microbes Possibility increase in food.

Careful hygiene is not a disadvantage in any situation. Strict hygiene must be observed when you want to extend the serving or selling time of perishable products or when the product is intended for particularly sensitive consumers such as babies, the elderly, expectant mothers or the sick.

Tasks

- Compare the preparation of strawberry kissel and strawberry jam.
- Compare making a burger at home and in a hamburger restaurant?
- Compare homemade meatballs and ready-made meatballs?
- What are the differences between these products and how they are handled?

2 Threats to food hygiene



The safety and shelf life of a food can be ruined by hazards, which may be chemical, physical or microbiological in nature. The page summarises the sources of hazards and where hazards can get into the food.

2.1 Hazards

Issues that threaten the safety and shelf life of a food are called hazards.

A health hazard refers to any microbiological, chemical or physical factor or condition that may endanger the safety of a food.

Risk is the probability of a hazard occurring and the severity of the situation it causes.

The assessment of the risk is affected by what kind of consumption and how sensitive the product is intended for. For example, candies that are eaten infrequently and in small quantities allow dyes that could be a questionable factor for the baby's health in their daily food.



A *chemical hazard* arises if a edible product contains a substance that does not belong to it or if the concentration of a substance is too high.

A *physical hazard* is caused by extra objects in the product, so-called foreign objects. These are usually perceptible to the senses.

The *causes of microbiological hazards* are living, invisibly small organisms. They can survive alive in food, and some even multiply in food.

Microbes, parasites, protozoa and pests pose a *biological hazard*.

Contamination refers to the ingress of any hazardous factor into a food.

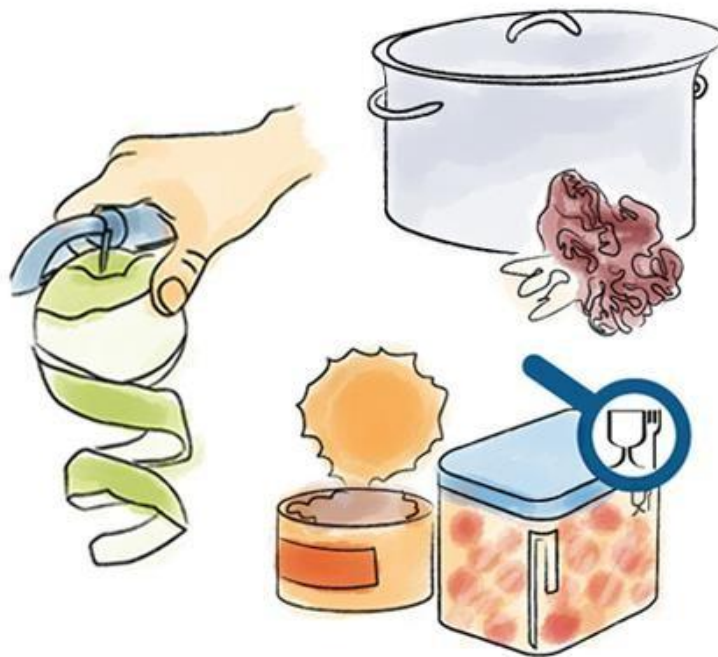
Food poisoning is the name given to illnesses caused by all these risk factors.

2.2 Chemical hazards

Ready-to-eat foods can contain chemical substances that do not belong to them in many ways. These can cause a chemical hazard either immediately, such as food poisoning caused by false morels, or in the long term, such as environmental toxins accumulating in the body.

Examples:

Natural toxins in raw materials	Poison of fungi (especially false morels)
Microbes toxins excreted as metabolites	Bacterial toxins, Mycotoxins
Environmental toxins	Mercury, dioxin, lead, cadmium
Residues of chemicals used in crop production	Pesticides
Residues of medicines in production animals	Antibiotics
Substances transferred from containers or packaging	Aluminium, plasticisers for plastics
Ingredient causing hypersensitivity not listed on the label	Nuts, fish, milk
Detergent, equipment lubricant or other chemical substance completely not included in the product	



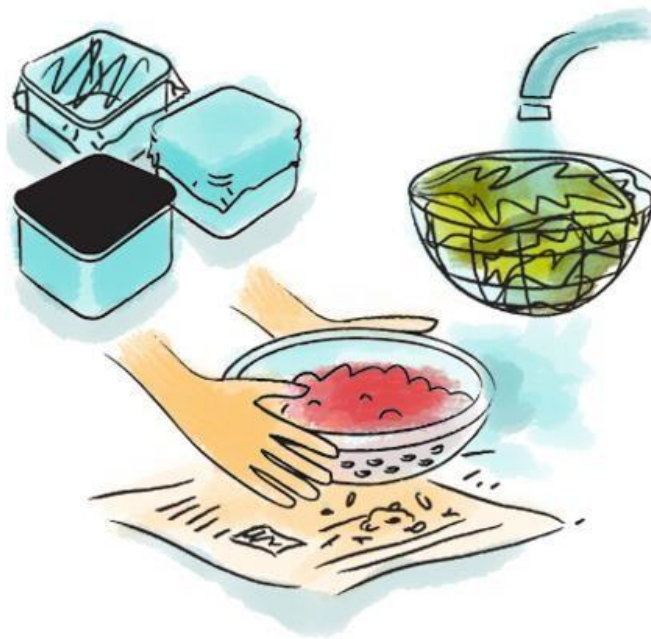
Tasks

- What kitchen utensils/practices are used to reduce chemical risks?
- Why are products not stored in an opened can?
- Why are cleaning products not stored in a dry matter store?
- Whence Know Is it okay plastic bucket or
 other plastic container food preservation?

2.3 Foreign objects

Causes of physical or mechanical hazard are often referred to as foreign objects.

Excess items in the food can cause unpleasant harm to the diner. A tooth can be broken, the mouth, throat or oesophagus can be damaged if there is a stone, a piece of metal or glass, a button, a piercing jewelry, a hard fruit seed or a piece of bone in the food. Hair, patches and flies are unpleasant surprises. These finds, which do not belong to edible food, are called foreign objects.



Tasks

- Have you ever found something extra in a product you bought, what? Where did it come from?
- What kitchen utensils are used to reduce the risk of foreign objects?
- Why are wooden buckets and other tools not accepted in professional kitchens?
-

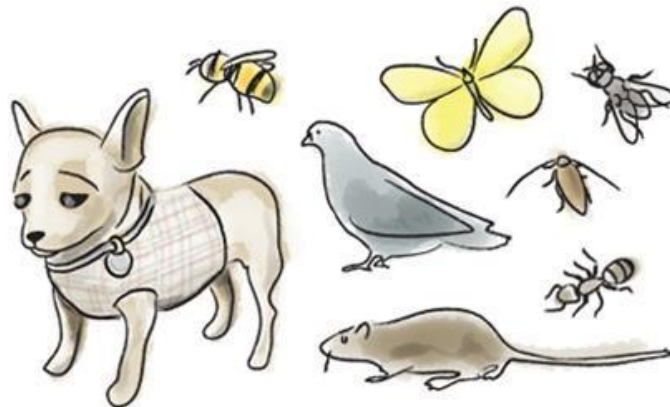
2.4 Biological hazards

Biological hazards include organisms that are invisible to the naked eye, microbes and other organisms, such as Protozoa and Parasites. These Deals Chapters microbiology and food poisoning.

Pests include

- pests multiplying in food,
- indoor insect pests, • outdoor insects, and
- other animals.

No animals belong in food processing facilities or warehouses. Flies, birds, cats and dogs all bring with them hygiene risks. Pets are allowed in the restaurant serving areas with the permission of the restaurateur. A guide dog for a disabled person is always a permitted animal in customer premises.



Storing dry food in a warm place provides suitable conditions for the eggs of food pests that may be present in the product to develop into larvae and further into adult beetles, which again lay eggs, etc. Moth butterflies can contaminate the entire dry matter store particularly quickly, because the adult form flies from one place to another.



BSE, bovine spongiform encephalopathy

The risk of contracting mad cow disease is very unlikely. It is caused to the cow by a transformation in the central nervous system tissue. A person can become infected only by eating meat that is contaminated with such tissue. The disease occurs to some extent in old cows. Surely the disease has been found in Finland once. At the time of slaughter, the carcasses of old cows are inspected to ensure that contaminated meat does not end up in use.

Tasks

- Why are pets not accepted in food handling facilities or warehouses?
- Why should shops and restaurants store bakery boxes indoors and not outdoors?
- Why shouldn't food be refrigerated outdoors even in very cold weather?
- Can you get mad cow disease by drinking milk?

2.5 Spoilage

Foodstuffs are mainly made from biological raw materials: vegetables, meat, fish, milk, grains. The majority of foodstuffs spoil to the point of being unusable faster or slower, depending on the processing and storage temperatures.



Souring of milk, mould in bread, rotting of fish, slime of ham, fermentation of berry kissel are spoilage caused by microbes.

The rancidity and rancidity of fat is chemical spoilage, as is the darkening of fruits and potatoes.

The drying out of bread or frozen foods or the separation of water- and fat-soluble deposits is physical spoilage.

Tasks

- What products have you thrown out of use? In what way have they been unusable or suspicious from the point of view of health?
- How do you prevent food from being thrown away?

2.6 Sources of hazards

Where can hazards get into food?

When there is a button in a dish of food or a snail in a salad, it is often quite easy to deduce where and how they have ended up on the plate. More in-depth detective skills and investigations are needed in many other situations to determine the source of the contamination, especially if there are serious illnesses or significant financial compensation. At any stage of processing, a food can become contaminated by everything that surrounds it:

1. Raw materials, water
2. Food contact materials (contact materials), tableware, utensils, machinery, packaging
3. Handling environments, air
4. People, especially staff, but also customers



Kuva: Espoon kaupunki Valokuvaaja: Kai Linqvist

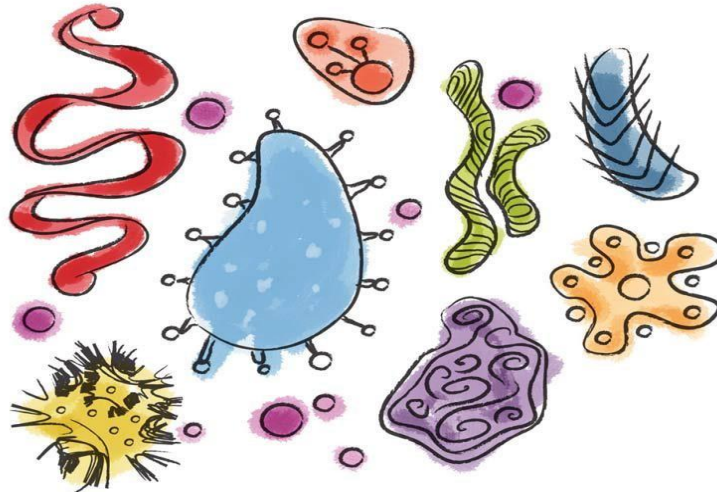
Regardless of where the contaminant in food comes from, it does not belong in the food and its entry into the food must be prevented with good hygiene practices. Food legislation and supervision by the authorities guide companies throughout the food chain: agriculture and fishing as well as the food industry, trade, transport and professional kitchens.

The longer the shelf life is desired, the cleaner the conditions and processing required.

Tasks

- Bread gets moldy? Where can mold get into the bread?
- Look for potential sources of contamination in the image.

3 Microbiology



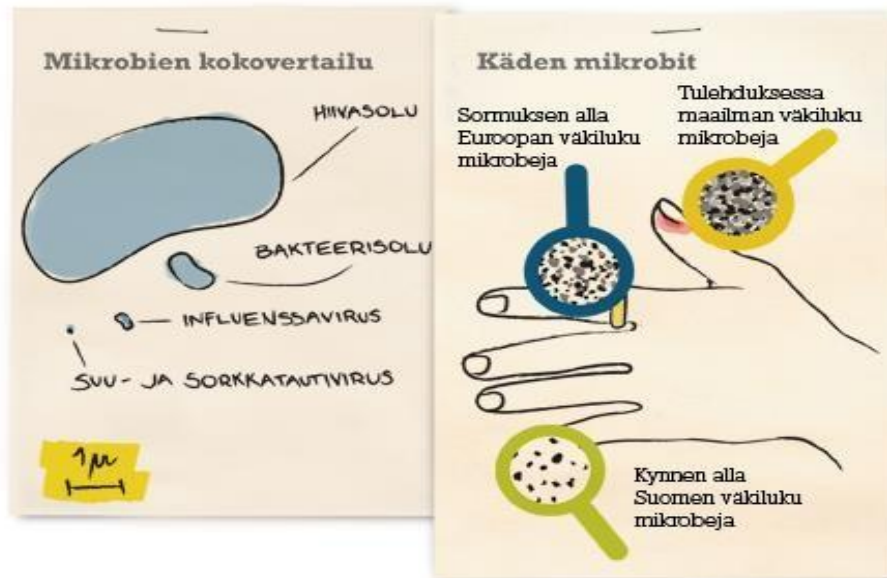
Microbes are single-celled organisms. They are everywhere in our environment, but we cannot see them with the naked eye.

The following is information about the main groups of microbes and their reproduction, the factors affecting reproduction, and the beneficial and harmful microbes.

3.1 Main groups of microbes

Microbes are single-celled organisms. Microbes cannot be seen with the naked eye, but a microscope that magnifies at least 1000 times is needed to examine them. Bacteria and fungi are about a thousandth of a millimetre in size, while viruses are much smaller.

Microbes are everywhere: in the air, in waterways, in the soil, in plants, animals, in humans. Most microbes are harmless to food hygiene. For example, a healthy person has about 250 different species of bacteria in their body. A huge number of live microbes can be seen in a packet of baker's yeast or in the mold growth on bread.

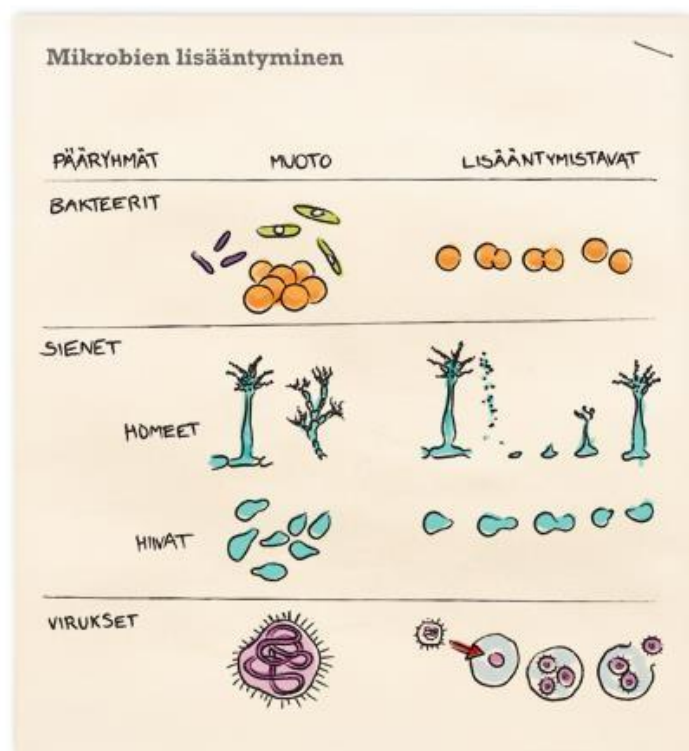


The main groups of microbes are:

- bacteria
- Fungi: mold fungi and yeast fungi
- Viruses

All the main groups include a huge number of species.

Microbes multiply by division.



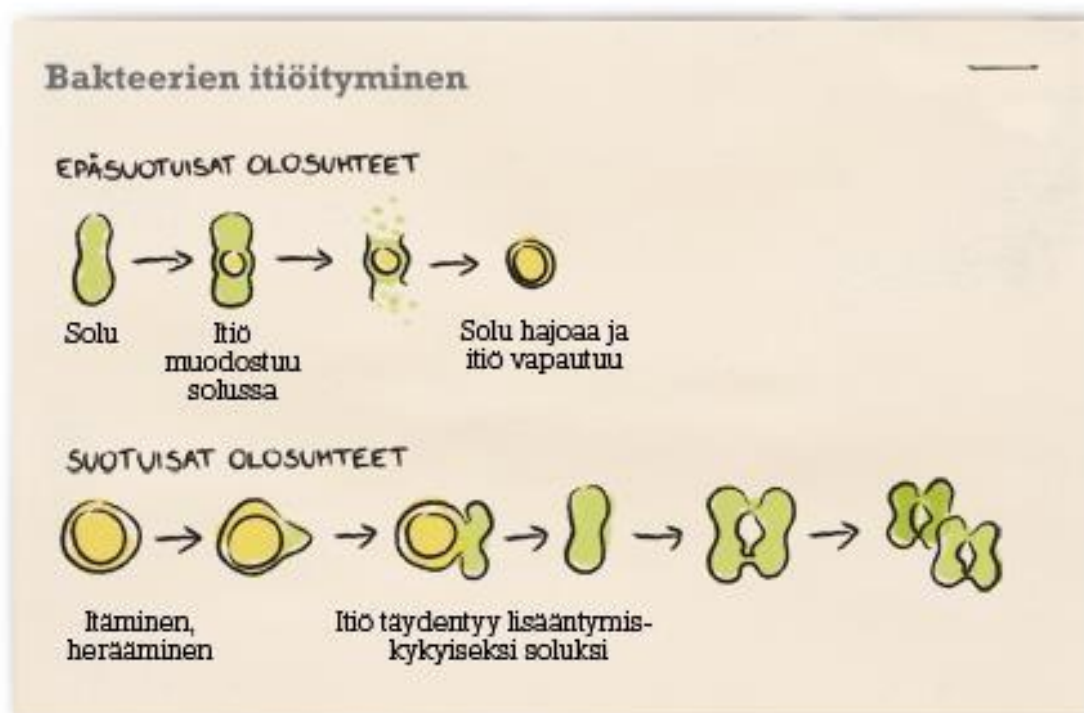
The only way bacteria reproduce is by dividing into two identical bacteria. The more densely the cell divides, the more ideal the conditions for the bacterial species in question, even several times an hour.

Mold fungi, molds, grow in mycelium and multiply from pieces of mycelium and by spreading reproductive spores. Yeasts and yeasts reproduce by shrinking and spreading reproductive spores.

Viruses need a living host cell within which they multiply. Viruses cannot multiply in food or water. However, there are viruses that are able to remain reproductive for long periods of time, for example, in water or frozen foods.

Bacterial Sporulation

Some bacterial species have the ability to produce bacterial spores. The spore is called the dormant and permanent form of the bacterium, because the spore form does not multiply and, on the other hand, the bacterial spore can withstand much more difficult conditions than a bacterium capable of reproducing, such as drought and boiling. Sporulation occurs, for example, when drying out or when the temperature rises very slowly. The spore is "awakened to germinate" by boiling, for example. In this case, under favourable conditions, one spore is replenished back into a single bacteria capable of reproducing.



Sterile

Sterile refers to something that has no living microbes, including bacterial spores. Sterile can only be inside a specially sterilized airtight container.

Microbial research

Because we cannot know with our senses whether or not there are microbes on the table, and if so, which microbes and how many, we need special methods to investigate the matter. The simplest stages of the study are:

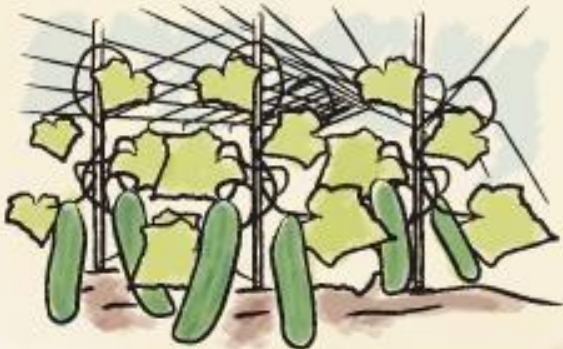
- Taking a representative sample cleanly
- increasing the number of microbes by growing them in a suitable culture medium
- calculation of the quantity.

For example, when determining the cause of food poisoning, further research is needed to define the microbial species more precisely. There may be several and many types of research phases and methods required. They can be selective culture, immunological, biochemical or molecular biological tests, or microscopy.

Tasks

- Do you know examples of sterile?
- You empty the dishwasher of clean dishes, are there any microbes in them?

3.2 Beneficial and harmful microbes

PÄÄRYHMÄ	HYÖTYKÄYTTÖ	HAITTOJA
BAKTEERIT	- Maitohappobakteerien avulla valmistetut elintarvikkeet  - Terveysvaikuttavia maitohappobakteereja sisältävät tuotteet - Pakkaskuivatut maitohappobakteerit - Etikkahappobakteerien avulla valmistetut väkiviinaetikka, viinietikat	- Elintarvikkeiden pilaantuminen: mätäneminen, hapaneminen (käyminen), limautuminen - Ruokamyrkytykset tartuntatauteina ja bakteeritoksiinien aiheuttamina
HOMEET	 	- Elintarvikkeiden pilaantuminen: homehtuminen - Homemyrkyt, mykotoksiinit aiheuttavat ruokamyrkytyksiä
HIVAT		Elintarvikkeiden pilaantuminen: käyminen
VIRUKSET	Hyönteisten torjuntaan kasvihuoneissa 	Ruokamyrkytykset

Most of the microbes in nature and in food are harmless in terms of food hygiene. Microbes that are deliberately used in the manufacture of food, for example, are called beneficial. Microbes are harmful to humans if they cause food spoilage or illness. Disease-causing microbes are also called dangerous and pathogenic.

Tasks

- Why do people start eating lactic acid bacteria capsules when going on a beach holiday in the south?
- Which chemical substance produced by mold is an important medicinal substance?

3.3 Factors affecting reproduction

Reproductive conditions

Microbes are everywhere. In order for them to multiply, the conditions must be suitable. All microbes need food and water to reproduce, and the temperature should be above zero as a rule. Acidity and oxygen situation affect which microbes are able to multiply.



Foods are complex in composition, the following is a review of the general rules for the influence of conditions on microbial reproduction.

The requirements of yeasts, molds and bacteria for reproductive conditions are subject to the following factors:

- nutrition
- water
- temperature
- oxygen present or not
- acidity

The better the conditions correspond to the ideal conditions (optimal conditions) of the microbial species, the faster the microbes multiply, i.e. the more densely the cell is able to divide. The residence time of a situation that favours the proliferation of microbes is also essential.

Moulds and yeasts need sugars in particular, while bacteria generally need amino acids in proteins.

The importance of water, temperature, oxygen and acidity has its own pages.

Tasks

- How can food be reduced or removed from microbes in kitchen operations?
- Are there microbes on a clean desk?
- A glass of milk is forgotten on the table, can a microbe multiply in it?

3.4 Water

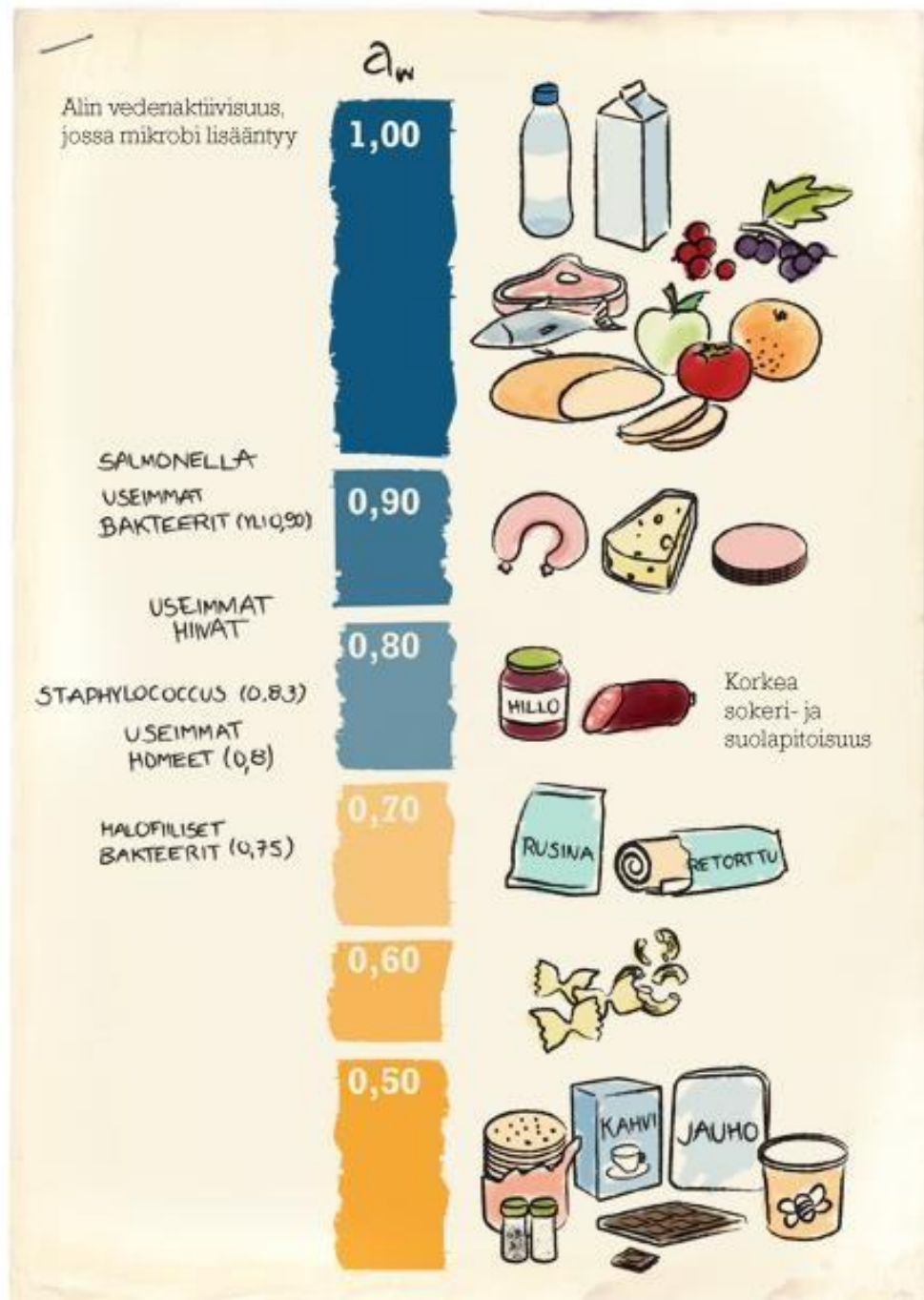
Water is essential for microbial reproduction.

The good shelf life of dry products is based on the fact that they do not contain water for microbes. Many dried products are dried at temperatures between 30 and 70 degrees. Evaporating the water out of the product prevents the growth of microbes, but the microbes have not actually been destroyed from the product. It may contain spores of bacteria, yeasts, and molds.

In microbiology, the water content of a product is referred to as active water, water activity. It refers to water that is free for microbes to use. It is not chemically bound to an ingredient. The use of salt and sugar in preservation is based on the fact that they bind water in a form that microbes cannot use it. A sugar content of more than 50% in marmalade or a salt content of more than 10% in salted mushrooms prevents the proliferation of microbes. The table below shows that dropping the AW number indicating the amount of active water below 0.80 by drying or chemically preventing microbial proliferation is effective. Only some molds are able to multiply even when the aw value is 0.60.

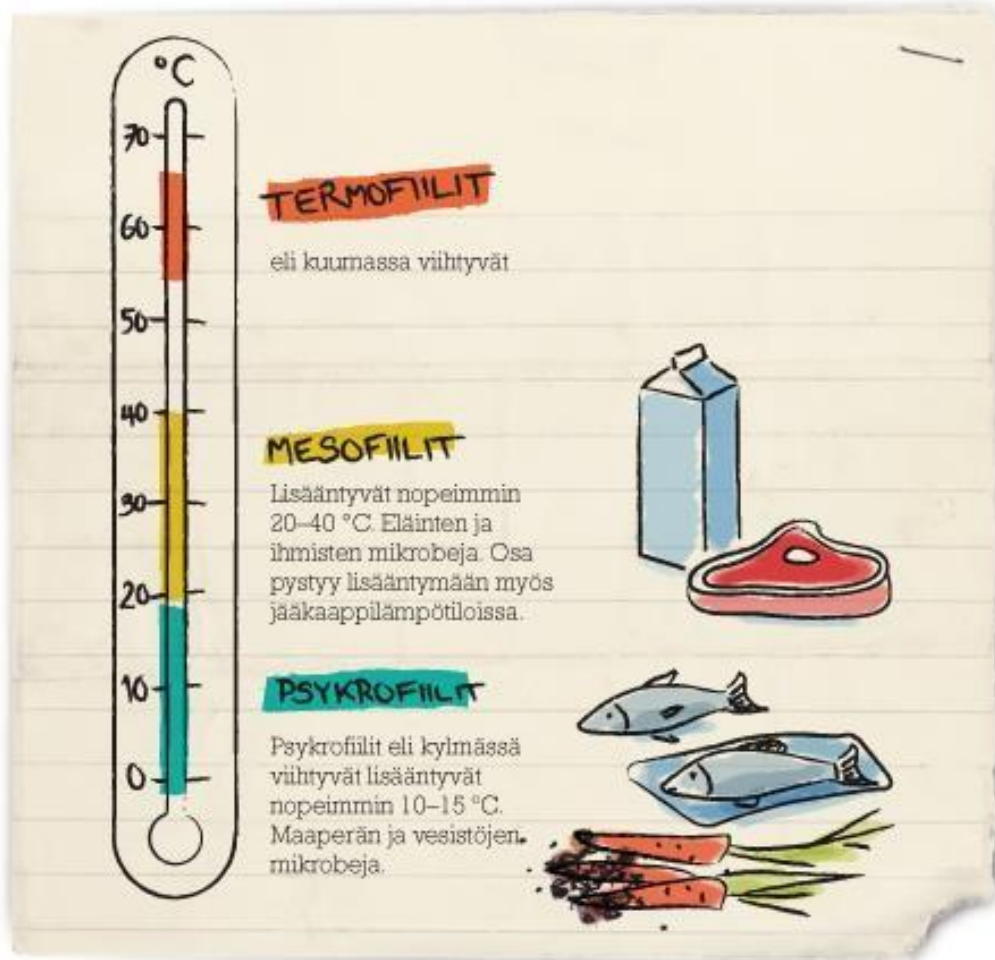
Tasks

- Where to store raisins, wheat flour?
- Why should milk made from powdered milk not be stored?
- You mix the spice mixture with sour cream. What is the shelf life?



3.5 Temperature

Temperature is a very important circumstance factor affecting the reproduction and reproduction rate of microbes. Each microbial species has its own ideal or optimal temperature range, where its reproduction is the fastest. In colder than ideal conditions, microbes multiply more slowly. At temperatures below zero degrees, microbes do not multiply, but generally remain capable of reproduction.



PSYCROTROPHIC *

They are bacteria adapted to cold 0+20C conditions, which multiply best at +20—+25 C. Commonly found in fish.

*Update 2021: Bacteria that have adapted to cold conditions are called psychrotrophs. (Finnish Food Authority).

The most favourable temperature for microbes in the human and animal bodies is often found to be between 20 and 45 degrees. There are microbes in the soil and waterways that have adapted to cooler conditions. Many molds and food poisoning bacteria *Listeria* and *Yersinia* are able to multiply even in very cold refrigerator temperatures.

Tasks

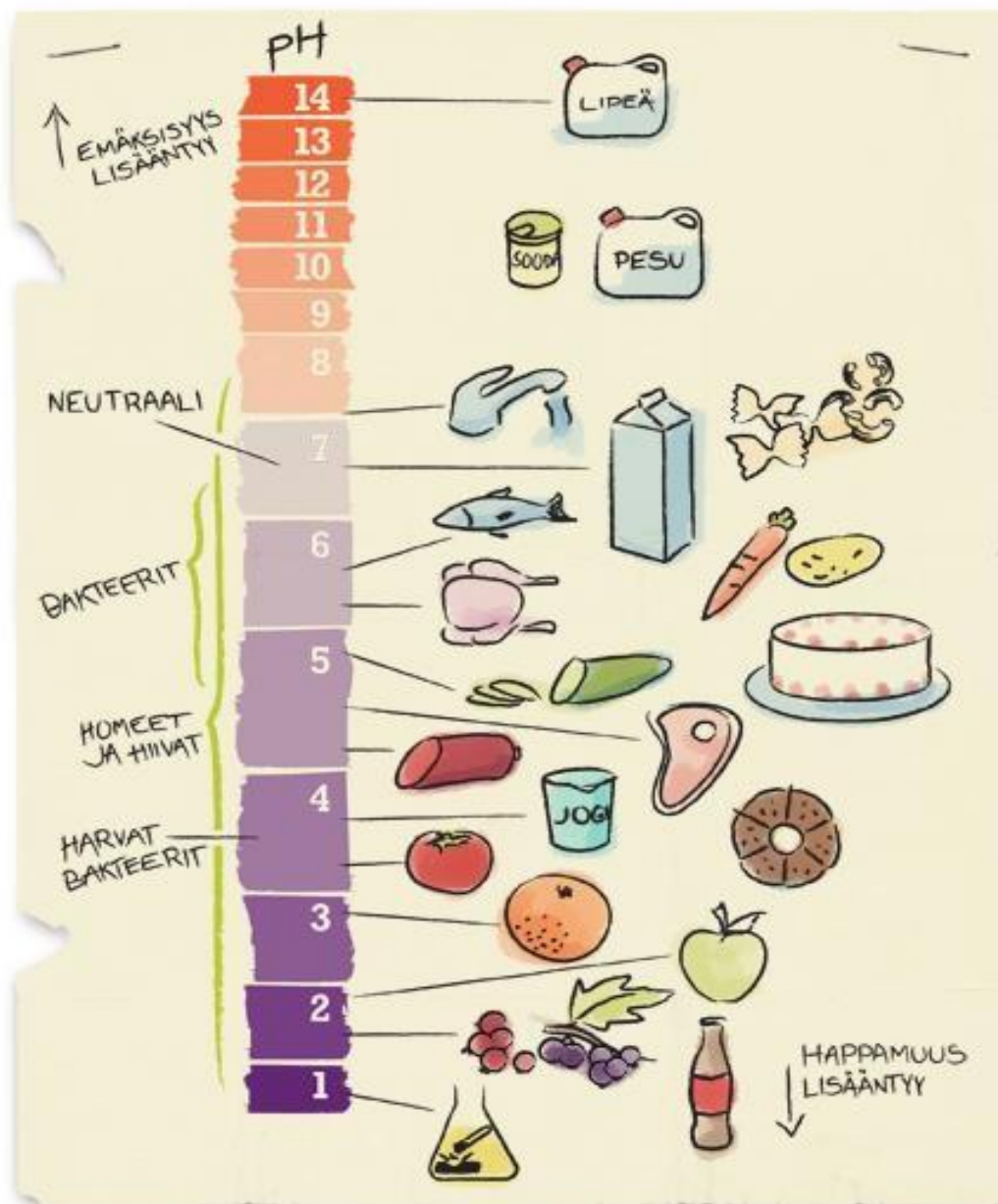
- Have you ever found spoiled food in the fridge, what kind?
- There are several temperatures for making viili or mead, why?

3.6 Acidity

The measure of acidity is pH. The middle point of the scale, pH 7, is called the neutral point. As the numerical value decreases, the acidity increases. As the numerical value increases, the alkalinity increases.

Bacteria that threaten food hygiene multiply best in a neutral area. Their growth can be prevented by increasing the acidity of the product. Fermenting vegetables and milk and preserving vegetables in vinegar broth are ancient preservation methods based on this.

Molds and yeasts are able to multiply over a wide pH range.



Tasks

- How does the shelf life differ: cucumbers in the open field, greenhouse cucumbers, sliced cucumbers, pickles, pickles?

3.7 Presence of oxygen

Normal air consists of nitrogen N₂ (78%), oxygen O₂ (21%) and small concentrations of carbon dioxide, water vapour and noble gases.



For oxygen-using microbes, moulds and many bacteria, the oxygen content of normal air is suitable. The growth of these microbes is prevented by removing the air from the packaging of the food completely or by replacing it with oxygen-free or almost oxygen-free air. There is no air at all in the vacuum packaging (vacuum packaging). The air in the MAP packaging is oxygen-free or contains only a small concentration of it. These packaging methods, combined with an unbroken cold chain, extend the shelf life of many foods, such as meat and fish products, convenience foods and cheeses.

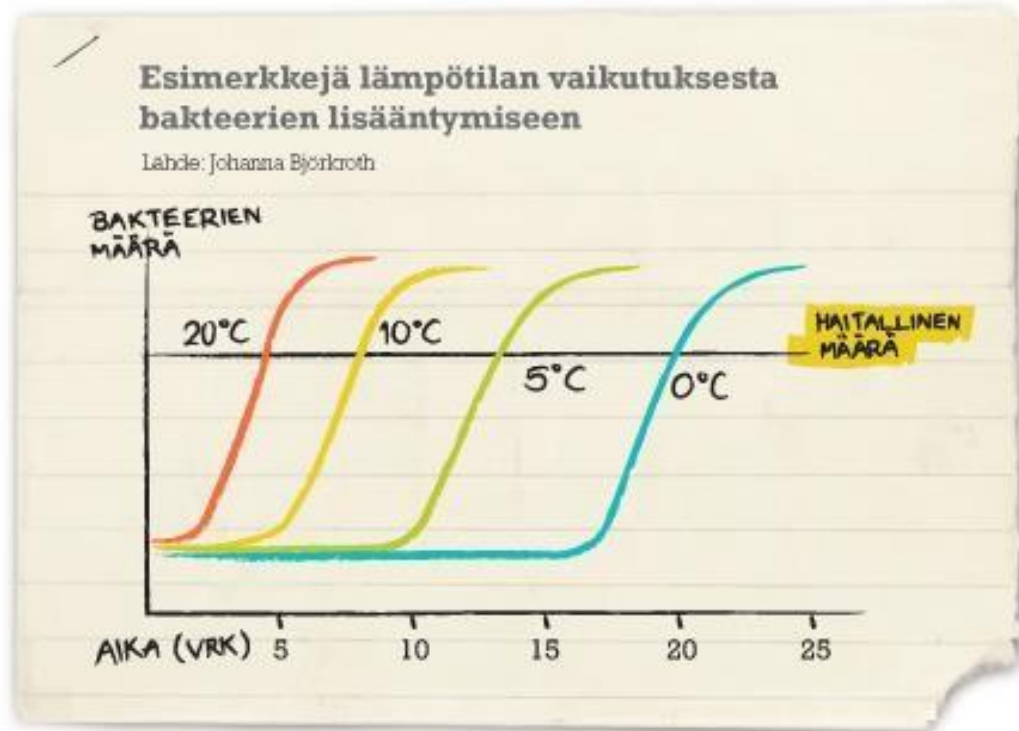
Many food poisoning bacteria are able to multiply even in these conditions. Bacteria of the genus *Clostridium* are only able to multiply in oxygen-free conditions. In addition to vacuum packaging, such a situation can be, for example, inside a large mass of cooked food.

Tasks

- Are there microbes in vacuum-packed cold cuts?
- Do meatballs in gas packaging have microbes?
- Can some microbes multiply in these?
- Can these be stored at room temperature without risk?
- Can vacuum-packed smoked fish cause food poisoning?

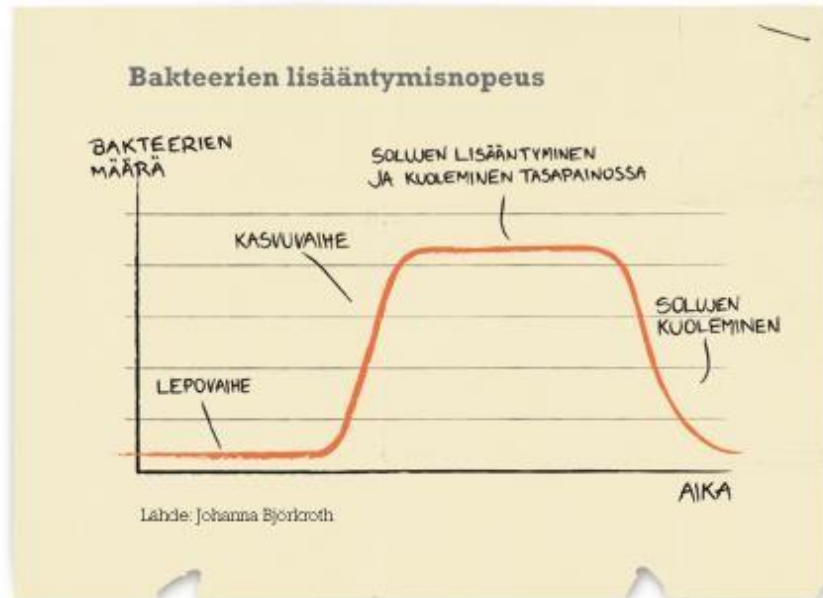
3.8 Bacterial Multiplication Rate

The proliferation of microbes is affected by how well the conditions correspond to the ideal conditions of the microbe in question and how long such a situation prevails. In a situation that is worse than ideal, such as colder, microbes multiply more slowly.



There are four phases in the reproduction of bacteria in a given situation: the resting phase (lag), the phase of vigorous growth, the equilibrium phase of cell proliferation and death, and the phase of cell death.

In the phase of vigorous growth, the multiplication can be staggering, as each bacterium divides at certain intervals, for example once every 20 minutes. The total number of bacteria increases in the so-called exponentially. After four 20-minute periods, the number is already 16 times, not fourfold. Therefore, a health hazard can arise or the food can spoil quickly under favourable conditions.



Careful cold storage, freezing and other measures that improve shelf life worsen the conditions for microbial reproduction. The aim is to extend the resting phase of harmful microbes. The aim is to have time to distribute the products for sale, serve them and enjoy them in time before the growth phase.

Tasks

- Why do the products in refrigeration cabinets in stores have to be within the marked limits?
- Why for example gas-packed Minced meat no
Keep freeze on the expiration date?
- Does it matter how long milk, cakes or salads are kept on the dinner table?
- Sometimes in shops or cafes, sandwiches and rolls from the day before are displayed in a warmer place than fresh ones. What is the problem?

4 Food poisoning

Food poisoning is an illness caused by the consumption of food or drink. Bacteria, viruses and parasites that cause food poisoning, epidemics and food poisoning are discussed below.



4.1 Food poisoning and epidemics

Food poisoning is an illness, infectious disease or sudden poisoning caused by the consumption of food or water. It can be caused by a microbial or fungal poison, other toxic substance, microbe, protozoan or parasite.

A food poisoning epidemic is a situation in which at least two people experience the same type of symptoms after drinking the same water or eating the same food.

Symptoms may begin even less than an hour after ingestion of the contaminated food, or the incubation period of the disease may be several days. A healthy adult recovers from several food poisonings in a day or two. For those affected in risk groups, the situation may be more serious and last longer. Risk groups include small children, pregnant and breastfeeding women, the elderly and people with weakened immune systems.



The causes of food poisoning are investigated jointly by doctors at health centres and the authorities responsible for food control. The illnesses reported to both of them from food or household water are compiled into food poisoning statistics, which are maintained in Finland by the Zoonosis Centre, a cooperation body between the Finnish Food Authority and the National Institute for Health and Welfare.

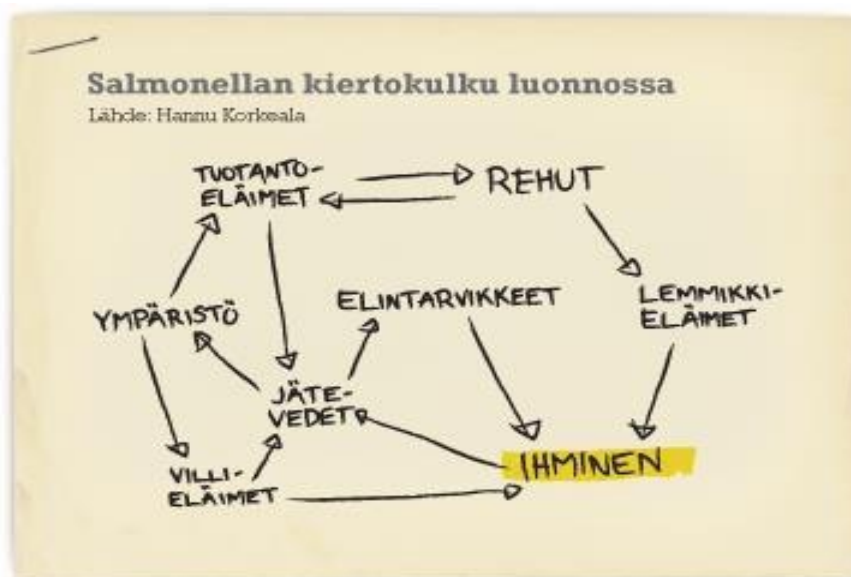
If two customers suspect that they have fallen ill from food in a restaurant, for example, the person in charge of the restaurant must report the situation to the health inspector, give them all the help they can to investigate the matter and follow the instructions they receive to stop the risk and determine the cause of the illness.

In case of such situations, a professional kitchen takes a sample of the day's food in a clean freezer box, marks it well, freezes it and stores it for a couple of weeks. The sample can then be submitted for laboratory testing if necessary.

4.2 Food poisoning bacteria

There are about twenty known species of food poisoning bacteria. They are the same in different parts of the world. Which species is the most common cause of illness depends on the raw materials, cooking methods, water purity and food handling.

Sometimes food poisoning can be caused soon after the food has been contaminated, when the number of microbes is relatively small, sometimes only tens to hundreds of cells. However, food poisoning is often caused by too long a storage time of food at a danger zone temperature, too slow cooling or inefficient heating. These are situations where the bacteria have had time to multiply in the food many times over.



Typical chains of events for food poisoning

Staphylococcus aureus, a common bacterium and wound infestant on our skin, is poor at competing for living space, but is able to multiply well even in salty conditions and whether oxygen is present or not. For example, sandwiches or pizzas use ingredients that have been subjected to heat treatment to destroy microbes. If cold cuts, cooked pieces of meat or tuna are handled with sore hands or sneezed into, bacteria are infected. If these contaminated substances or products are stored for a long time in a warm place, staphylococci multiply and secrete a chemical poison, a toxin. Even a toxin alone can cause a diner to become ill. The toxin is not destroyed by heating, so this kind of food poisoning can even be contracted from boiling hot pizza, from which the bacteria themselves have been destroyed.

Bacterial spores do not necessarily die during the heating required to cook food. On the contrary, heating acts as a "wake-up call" for spores, and there are hardly any competing microbes in heated food. Keeping warm for too long or inefficient cooling can give the spores time to return to reproducing bacteria, start multiplying, and produce toxins. This kind of food can also cause illness as such or reheated.

Infectious disease bacteria (e.g. *Salmonella*) that do not have the ability to produce spores can be destroyed by pasteurizing milk and cooking food by heating. Typical routes of transmission include:

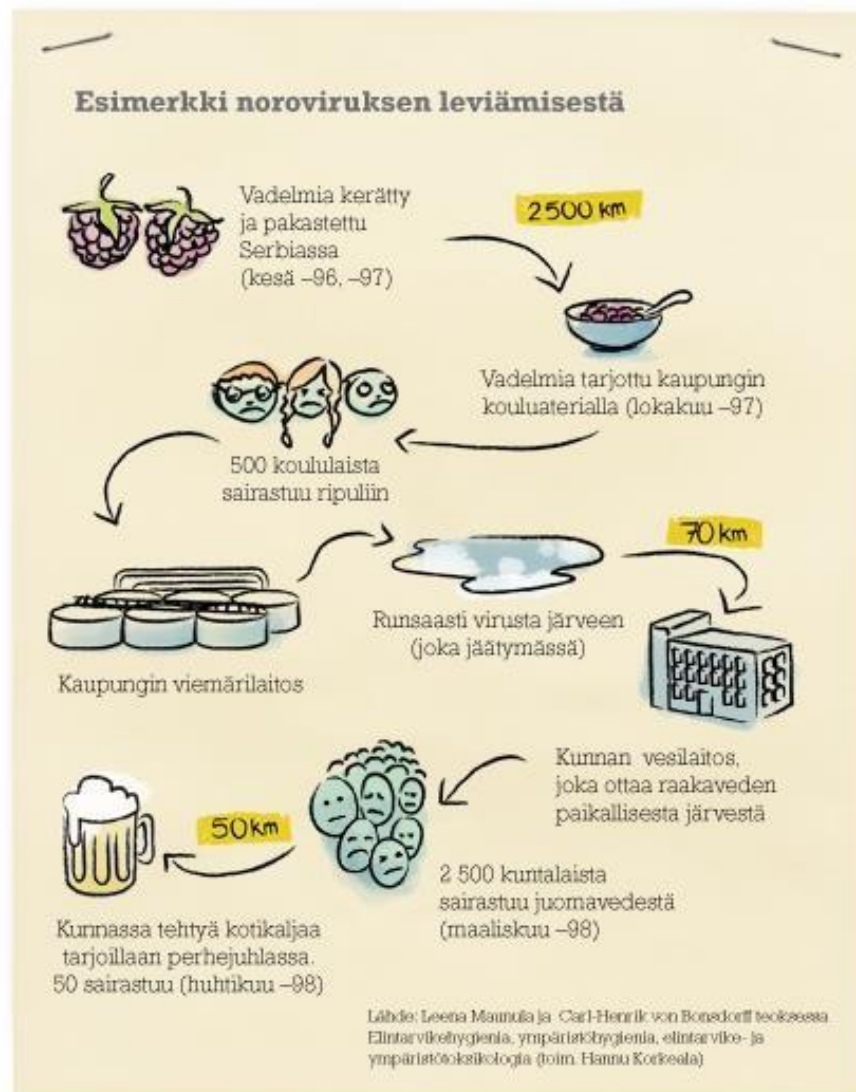
- Eaten Contaminated Food without heating or when heated insufficiently.
- Storing food at a danger zone temperature of + 12 °C to + 60 °C.
- Cross-contamination or post-contamination – a contaminated raw material, water or utensil is used to contaminate a ready-to-eat food
- A symptomatic or asymptomatic person spreads the infection through their hands.

Food poisoning bacteria can cause intestinal infections and a variety of sequelae, e.g. arthritis. An infected person may remain an asymptomatic carrier of the infection and a carrier of the disease for a long time.

If the food smells rotten or otherwise suspicious, it may contain a lot of food poisoning and should not be used. Since we cannot detect microbes with our senses, the food may appear impeccable and still contain dangerous amounts of food poisoning bacteria.

The main food poisoning bacteria are listed in the attached table. See Appendix 1.

4.3 Viruses that cause food poisoning

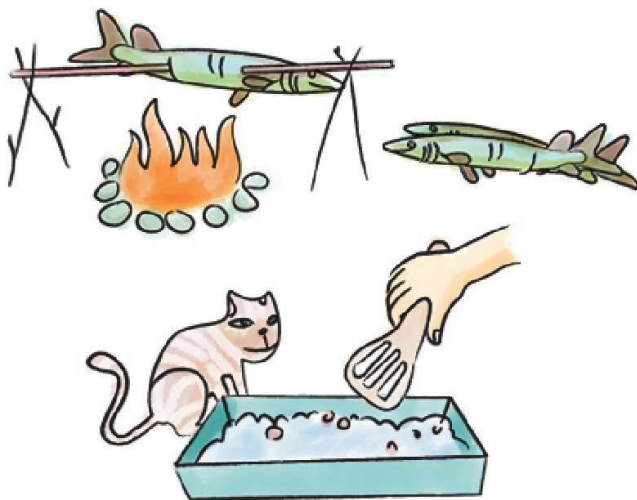


Viruses only multiply in the right kind of living host cells. Viruses that cause diseases in humans only multiply in certain human cells. The main viruses that multiply in the human intestine and that are at risk when processing food are the norovirus and hepatitis A virus. Both remain infectious for long periods of time even in the cold, even in frozen foods. The carrier of the infection can spread them on food or contact surfaces and cause illness. Foodborne epidemics are mediated by water contaminated with human faeces. Seafood caught in contaminated water or vegetables or berries soaked with contaminated water that are not cooked properly before eating have been the cause of the largest epidemics, in addition to contaminated drinking water.

According to January 2021 information, the COVID-19 coronavirus does not cause food poisoning. Up-to-date information on the coronavirus related to foodstuffs can be found on ruokavirasto.fi/korona website.



4.4 Parasites and protozoa that cause food poisoning



In addition to microbes, animal parasites, i.e. parasites and protozoa, can also cause food poisoning. The most important risks to be taken into account in Finland are:

Parasites

Tapeworm (tapeworm) *Diphyllobotrium latum*, which can grow up to 15 meters in the human intestine and cause vitamin B12 deficiency. Infectious forms of the parasite can be found in the musculature and roe of lake fish (perch, pike, burbot or ruff). Properly cooking or freezing the fish and roe for a couple of days kills the larva.

Anisakiasis is actually a parasite of marine mammals, but it has also been spread by marine fish eaten raw or inadequately heated: herring, salmon, mackerel, cod and squid.

Trichinella parasites are found in pigs, wild boars, horses and bears. Every carcass of all these animals that goes on sale is inspected for parasites at the time of slaughter. Careful heating destroys the parasite.

Protozoa

The main host of toxoplasma is a feline that secretes oocysts in its feces. Humans and other mammals can be intermediate hosts. *Toxoplasma gondii* infection can be contracted through cat feces or by eating contaminated, inadequately heated meat or vegetables. An infection contracted during pregnancy can damage the fetus.

Cryptosporids are protozoa, of which *Cryptosporidium parvum* can cause a disease called cryptosporidiosis in humans. Animals that carry *Cryptosporidium parvum* secrete oocysts in their faeces. This allows *Cryptosporidium parvum* to spread to the environment, other animals, and humans. Cryptosporidium can get into food through contaminated household water or directly from feces containing oocysts.

The symptoms of cryptosporidiosis include diarrhoea and possibly fever, headache, muscle aches, stomach cramps and nausea. In some cases, the disease may be asymptomatic. The disease heals on its own.

5 Food law



Food legislation contains common societal rules, guidelines and requirements concerning foodstuffs and their handling from field to table. In the following, the concepts and key requirements of the legislation are discussed, e.g. requirements concerning food premises. The page on official supervision presents how the implementation of these rules is supervised in Finland.

5.1 Concepts and key requirements of legislation

The expressions "legal requirements" or "regulatory requirements" refer to all regulations concerning foodstuffs and food operations of different scopes and from different levels of authority.

EC regulations of a general nature apply to the entire EU area. These are implemented in each Member State through national legislation. In Finland, there are four levels of national regulations:

- Food Act
- Preferences
- Authority Regulations
- Instructions from the authorities

The EC regulation requires, for example, that perishable foodstuffs are stored and transported at a sufficiently cold temperature. The laws are very general, so instructions are needed to specify the laws.

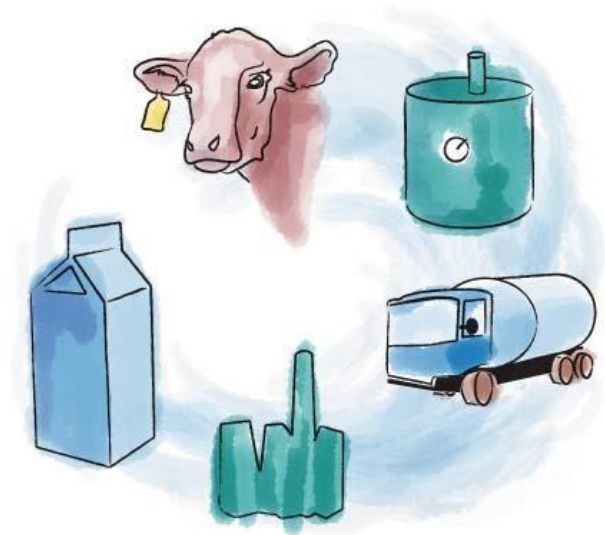
The closest legal expert to a food company is the health control authority of your municipality, such as a health inspector. They have the information needed in an individual catering service, café or shop on the requirements of legislation.

Food Act

The Food Act (23/2006) applies to all foodstuffs and all professional or otherwise regular food operations from field to table.

The purpose of the Act is, among other things:

- ensure the safety of food handling and the safe quality of foodstuffs;
- ensure that correct and sufficient information is provided on foodstuffs;
- protect the consumer from health risks and financial losses caused by products that do not comply with food regulations
- ensure traceability of foodstuffs
- ensure high-quality food control;
- and improve the operating conditions of food companies.



The Food Act applies to all products

The name of the product must not be misleading. For example, there are regulations on when a product can be called butter, chocolate or juice.

Package labels include requirements for what and how the product must be disclosed at a minimum, but also restrictions on the promise of health effects. The composition of the product should indicate not only the ingredients, but also the additives used, there is a list of allowed additives. In addition, the ingredients contained in the product that cause allergic reactions must be mentioned, of which there is also a common EU list. The origin of the product must be clear. Packages must have a Best Before date and certain products must have an Expiration Date. This and voluntary clarifications are necessary if a defective batch of products needs to be traced. There are instructions on how to report all of these.

The legislation includes lists of the maximum permitted concentrations of contaminants that do not belong in the product. The list includes, among other things, agricultural chemicals and environmental toxins.

Food Information Regulation

The Food Information Regulation on the labelling of foodstuffs is a decree that entered into force in 2011 and specifies the legislation related to labelling. The regulations specify the labelling so that they provide consumers with as much accurate information as possible about the product. For example, allergens must be indicated in a clearly distinguishable way. In addition, with the regulation, nutrition labelling will be mandatory. In addition to the energy content, the products must state the amounts of fat, saturated fat, sugars, protein and salt.

In addition, Finland is subject to national decrees on the batch number and language requirements of packaged foodstuffs, the declaration of high salt content, and the indication

of the country of origin of meat, milk and milk used as an ingredient in milk and dairy products and certain similar preparations.

The Food Act applies to all food business operators

Restaurateurs, food vendors, market café or kiosk operators, sausage manufacturers, frozen pizza delivery companies and even sausage grillers at summer events are all food industry operators who must report their activities to the local food control authority. A virtual apartment in an online store that sells food is also a food premises and the same rules apply to it. The notification must be made before the operations begin.

The regulations do not apply to cooking at home or at family gatherings. A separate notification is not required when the activity is low-risk and the seller is a private person or the activity cannot be considered to be a business. Such activities can be, for example, school sales.

If a food establishment, such as a sausage factory, is established, the operations must be approved in advance.

The operator must decide on the product range and in what form they are served or sold, so that the expertise, facilities and equipment are sufficient for safe food operations.

Tasks

- Check a few food packages to see what information can be found there about the product's composition, origin, manufacturer, storage, uses, and effects of the product.

5.2 Food premises

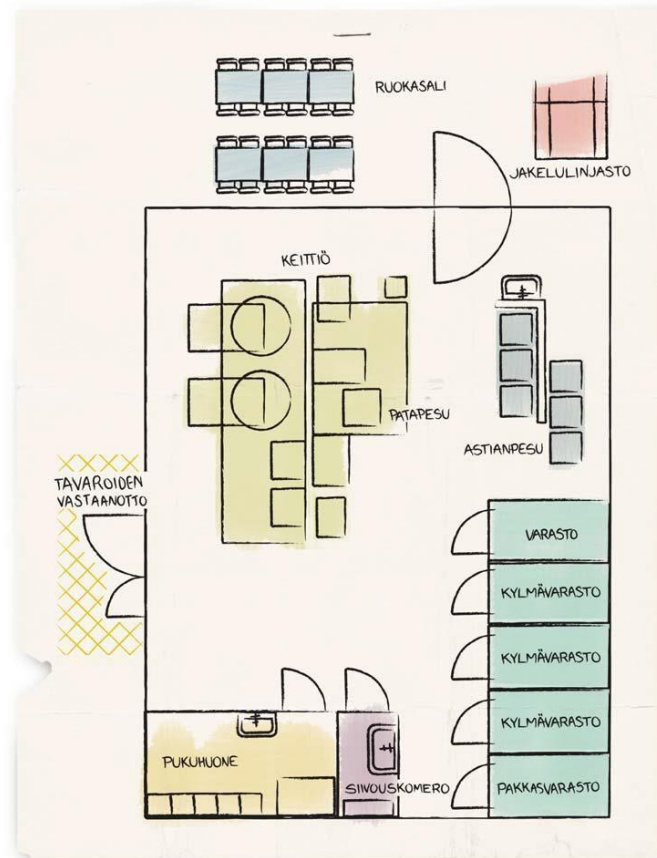
The name food premises is used for all premises – large or small, indoors or outdoors – where foodstuffs are manufactured, sold or stored.

There are technical requirements for such a space, and the space must be approved.

There must always be enough space to do what you are going to do hygienically. Even a temporary restaurant tent must have a canopy, a functioning heating device, a cold room if there are products to be stored in the cold, and hand washing and dishwashing equipment. A lot more is required from the kitchen of a school restaurant:

- Sufficient space for different work phases
- Easy-to-clean spaces
- a wide range of storage spaces, especially several cold storage areas
- good quality water
- adequate sewerage, lighting, ventilation
- broom closet
- The staff needs a dressing room with separate storage for clean work clothes.
- Restaurants and cafés need separate toilets for staff and customers.

- In addition to social facilities, hand washing stations are needed near food processing facilities.



Institutional kitchens, such as hospital kitchens, should have separate facilities for different work phases, such as processing root vegetables, baking, handling ready-to-eat meals, dish maintenance, etc. to prevent cross-contamination.

In food factories, raw materials are processed in their own facilities and transported through their own routes. The cooked products are processed in their own facilities and transported on their own routes. Similarly, the movement of packaging materials and waste and the movement of personnel are organised in a way that prevents contamination.

Tasks

- Why are the staff not allowed to visit the customers' toilets?
- What kind of materials have been used in the walls, floors and furniture of the school's kitchen?

5.3 Regulatory oversight

In Finland, most of the food safety control is the responsibility of the municipality. The municipal health control authorities, many of whom are called health inspectors, carry out inspection visits to food premises, such as grocery stores, restaurants and food factories.

Health inspectors process notifications of food premises and inspect own-check plans. Consumers can notify the health inspector if they see suspicious handling of foodstuffs or contact them if they have any other questions about the topic.



The municipal health control authorities are supported by experts in the provincial governments and nationally in the Finnish Food Authority.

The preparation of laws and regulations concerning foodstuffs and their processing will be centralised to the Ministry of Agriculture and Forestry.

The Finnish Food Authority steers the development of food safety throughout the country and at all stages of the food chain from field to fork.

Oiva smile

The Oiva smile is a system coordinated by the Finnish Food Authority, the purpose of which is to publish food control inspection data to consumers. Oiva uses smiley faces to assess food safety, such as food hygiene and product safety. Municipal food inspectors inspect the control plans. By following the law, you can achieve the best smile. A smiley face is therefore a sign that food safety is in good shape.

Oiva is accompanied by the Oiva assessment guidelines, which are used by food inspectors around the country. The aim is to harmonise inspection practices. Oiva aims to increase transparency so that consumers have the opportunity to see the inspection results. In

addition, Oiva provides an opportunity for companies to highlight their own good operations to consumers.

6 Self-monitoring

Both small and large food industry operators must ensure the safety of their products through self-monitoring.

More information on the self-monitoring obligation, the self-monitoring plan and critical control points is provided on the following pages.



6.1 Own-check obligation

A food business operator must be a professional in their field. The operator must be familiar with its own raw materials, the impact of its treatments on them and its products. Operators must be aware of the risks associated with their own products and operating methods. It is professional skills to be able to develop products and choose such forms of operation that do not pose a danger to consumers.



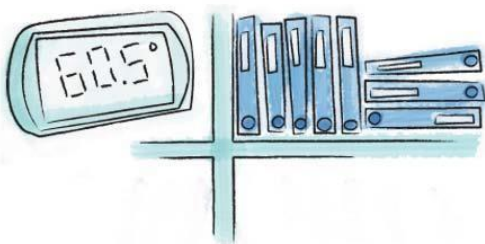
Each operator must draw up a plan suitable for their own operations to ensure the safety, good shelf life and compliance of foodstuffs. The plan comes

- write
- make sure that all staff are familiar with it
- implement
- Record various measurement results and logging data
- keep up to date by updating
- approved by the municipal health authority if it is a food establishment such as a sausage factory.

The obligation applies to small shops selling only packaged dry products, the kitchen of a school or a large hospital, and the food industry.

6.2 Self-monitoring plan

Each actor makes a plan that works for their own situation. In fact, it is not a single plan, but a collection of plans, guidelines and arrangements. Most of this is good hygiene practice choices and guidelines to ensure food safety.



Even in a small and simple café, you need to think about and plan:

- Use of facilities
- Recipes and work instructions
- Buying raw materials
- Inspection and storage of purchased and incoming products
- Monitoring Heating and Cooling Temperatures
- Samples to be taken for food poisoning
- Cleaning plan
- Cleanliness monitoring
- Personnel health information, uniform maintenance
- Education, hygiene proficiency certificates and many other things.

The basis for the planning of these practices is provided by the other side of self-monitoring, the identification of special critical control points in the handling of foodstuffs. In addition to good hygiene practices, such a HACCP system is needed especially if, for example, perishable products are manufactured for the commercial distribution chain.

Tasks

- Why should a café or restaurant have written recipes for pastries and dishes?

6.3 Critical control points

People who handle food must understand that they have their own responsibility for the health and safety of those who eat the products, and therefore they are also required to have expertise. An entrepreneur engaged in professional food operations must be aware of the health risks in all of their operations, whether they are related to raw materials, manufacturing, storage or distribution. Despite good hygiene practices, there may be special risk areas associated with the handling of foodstuffs, where the success of safety must be ensured separately each time.

These are the critical points from which the critical control points are selected. The HACCP procedure is used here. The name describes the two different work phases of the procedure. First, risks are sought, HA stands for hazard analysis, hazard identification and analysis. Then the hazards are identified and the critical control points CCP are selected.

The HACCP procedure was developed in preparation for the first manned space flights. Nothing was allowed to ruin the astronauts' lunches. A method was created to rewind all the steps that happen to the product before ingesting it in a spaceship. For each stage, it is investigated separately whether microbes, chemical hazards or foreign objects can get into the product at this stage, how likely it is and how dangerous it is.

As we have already learned, there are many opportunities to compromise the safety of the product in the handling of foodstuffs, something extra may fall into the product, or the delay

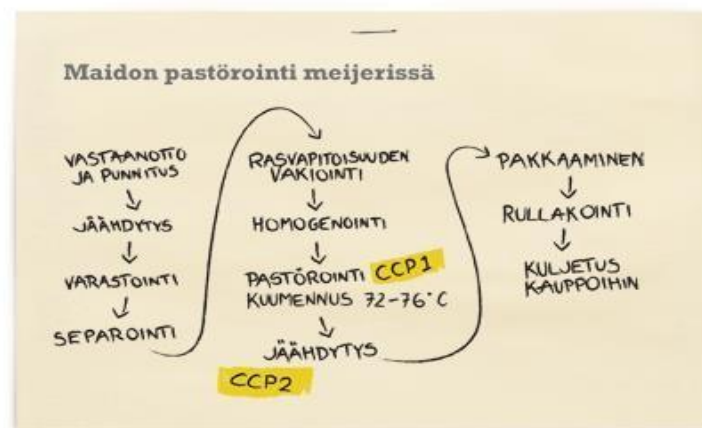
time may be extended, for example, when serving festive food. There are many critical points. However, not all of these are CCPs critical control points. These are selected using a special procedure. Not all food processing has critical control points.

A critical control point is a food processing step where

- may pose a health risk
- it can be verified by inspection or measurement
- The realisation of the risk can be prevented.

If critical control points are found, the other side of the HACCP procedure is then to plan continuous careful monitoring of these points. It must be possible to set a clear limit for the thing to be monitored, such as temperature, what is acceptable and what is rejected. In addition, instructions are needed on corrective action, what to do and how to ensure a safe product again.

All measurement results and corrections must be recorded. The accumulated information is needed for the development of operations and as evidence that self-monitoring is being implemented.



For example, raw milk contains a lot of bacteria after milking. Naturally, there are also bacteria that could cause illness if they multiply in milk. After milking, the milk is cooled quickly and stored, transported and stored cold. In the dairy, most of the microbes in the milk are destroyed by heating (pasteurization). After this, the milk must be cooled quickly to prevent spore bacteria from multiplying.

The success of these treatments is essential every time every moment of the milk treatment. Whether it's the processing of milk from your own farm or a large dairy controlled by automatons, pasteurization and subsequent cooling must be monitored with temperature time measurements. And if for some reason heating is not possible, a corrective measure must be taken. Depending on the problem, for example, heating is repeated or the milk is discarded. Here, too, all measurement results and corrections must be recorded. The accumulated information is needed for the development of operations and as evidence of the implementation of self-monitoring.

7 Hygienic handling of foodstuffs



Food safety and sufficient shelf life are created with the right processing methods. These include preservation and packaging methods, uninterrupted cold storage, efficient heat treatments and providing correct information about the product.

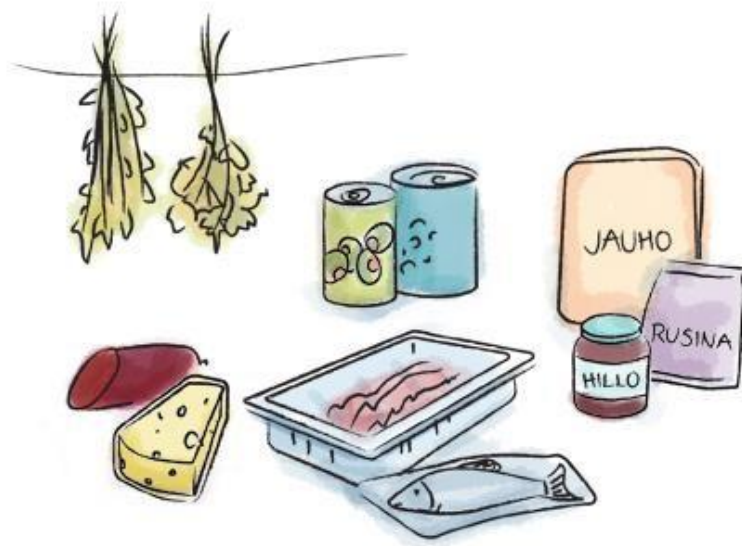
7.1 Improving shelf life

Foodstuffs are mainly biological material. They undergo many kinds of changes over time. Nor can we completely prevent spoilage microbes or even dangerous microbes from entering or multiplying in products.

Harvesting at the right time, removing or reducing impurities from raw materials are the first steps to improving shelf life. Berries and mushrooms are picked in dry weather, fish are gutted after catching, and the soily parts of vegetables are removed.

On the other hand, it is also necessary to avoid chopping raw materials and combining perishable raw materials too early before use. For example, vegetables are better preserved whole due to their natural protective mechanisms.

Microbes Caused by Pollution Can slow down Different preservation-
and packaging methods.



Drying

Microbial proliferation requires water. Evaporating water away is an ancient way to prevent pollution. For example, the grain harvest can be made into a form that can withstand long-term storage and transport. However, the processing of traditional mill products, dried peas, spices, herbs, nuts and raisins, does not involve heating that would destroy microbes. In dry products that are made with heating, such as crispbread, biscuits or milk powder, a large part of the microbes have been destroyed. The shelf life of all dry products is based on keeping them dry at all stages of transport and storage. As long as the products remain dry, the microbes in them will not be able to multiply.

Strong salting binds the water in the food to a form that prevents microbes from multiplying. Even heavily salted mushrooms and fish are stored in the cold to prevent microbes growing on the surface from spoiling them.

Also, a high sugar content, such as in marmalade or sweets, binds water in such a form that microbes cannot multiply.

Freezing also prevents microbes from multiplying, as microbes cannot use frozen water to multiply.

Adjusting the acidity

Increasing acidity in foods reduces bacteria in particular. Few bacterial species are able to multiply in fermented products such as buttermilk, aged cheeses, pickles or sauerkraut. Fermented products have a long history and are made in large parts of the world. Milk, meat, fish, soy and vegetables have been fermented for thousands of years, and leavened bread has also been baked. Preserving vegetables in an acidic broth is also an old and widely used preservation method, pickles and pumpkin cubes preserved in vinegar broth are familiar examples.

The shelf life of foods is also improved by adding preservatives to them. Preservatives authorised in the European Union have been given the designation of the so-called "Sustainable Substances". The E code, for example, E 200 is sorbic acid, E 296 is malic acid. Permitted preservatives can be found in the E-code list, as with other additives. Some preservatives are found naturally in berries and fruits, such as lingonberries and citrus fruits.

Packaging

Packaging is an important part of protecting products from contamination. With the right materials, dry products are kept dry or juicy ones. Removing the air inside the package or adjusting its composition is a way to improve shelf life.

Vacuum packaging (vacuum packaging, vacuum packaging) does not contain any air at all and prevents the proliferation of microbes that need oxygen.

Normal air has been replaced with oxygen-free or low-oxygen air in the modified atmosphere package, thus preventing the proliferation of oxygen-using microbes.

Other features that increase shelf life can also be attached to the packaging. There will be a variety of smart packaging with features that indicate the condition of the product.

Even traditional preservation methods combine several factors that improve shelf life. For example, in cured sausages, metwursts and salami, shelf life is created by acidity, low water activity and nitrite added as a preservative. Even today, food developers plan the shelf life of a product by making it more difficult for microbes to multiply in several different ways.

Although there are several ways to improve the shelf life of food, it is always necessary to ensure an uninterrupted cold chain and to define a safe shelf life.

Tasks

- What is the shelf life of the following products based on?
 - potato salad ○
 - ready-made pizza
 - cereal ○
 - ketchup
- Are they able to some Microbes Replication in vacuum packaging or in a modified atmosphere package?

7.2 Temperatures in food processing

Time and temperature are a constant consideration when handling food. Hot food must be kept hot and cold food cold. Deviating from this always affects the shelf life of the product. The preparation and serving of food is planned so that perishable ingredients, semi-finished products and products stay at room temperature for as short a time as possible.

Both spoiler and food poisoning bacteria multiply most rapidly at room temperature and human body temperature (+20 ° to +40 °C). The storage period for perishable products at these temperatures should be kept as short as possible. The temperature range to be avoided, the so-called temperature range. danger zone is +12 °C to +60 °C. The law lays down certain temperatures for the storage, transport, sale and serving of foodstuffs. The main temperatures are tabulated in the tables below. A short-term deviation from the regulated temperatures to 3 °C is accepted. If the temperature deviation is greater, the food business operator must take corrective measures.

The following temperatures must be observed for the storage of perishable foodstuffs:

Foodstuff	Maximum storage temperature
perishable foodstuffs, including milk, cream, chopped vegetables	+ 6 °C
Fresh fishery products	close to 0 °C, melting ice temperature
cold-smoked and freshly salted fishery products, as well as vacuum- and modified gas-packed processed fishery products	+ 0... 3 °C
perishable milk-based products	+ 8 °C
minced meat and minced liver	+ 4 °C
Frozen foods	Minimum – 18 °C

The following temperatures must be observed when serving perishable foodstuffs:

Foodstuff	Maximum serving temperature
food portions to be sold/served hot (selling/serving time up to 4 hours)	at least + 60 °C
Foodstuffs served cold during serving (sales/serving time max. 4 hours)	up to + 12 °C

The recommended temperature for eggs is + 10–14 °C. When storing vegetables, the different storage temperature requirements of different vegetables must be taken into account.



Cold storage

Cold storage of food (below +6 °C) slows down the proliferation of microbes, as microbes multiply more slowly at temperatures colder than the ideal temperature (and the temperature range to be avoided).

Food premises often require many warehouses and storage furniture cooled to different temperatures. All of these must have a thermometer. Even in a professional kitchen, it is important that incoming fresh products are moved to the right storage facilities immediately after reception and inspection, so that the cold chain is not broken. In the food industry, the handling, manufacture and packaging of products are often carried out in refrigerated facilities.

Heating

Heating destroys microbes. Both in cooking at home and in industrial food preparation, a wide range of heating methods are used. How high the temperature rises inside the food is essential for the destruction of microbes. **Service**

Hot food must be kept at a temperature of at least +60 °C throughout serving or transport. When cold food is served, the temperature may not exceed +12 °C. Cold and hot food may be served for a maximum of four hours, and the products must be disposed of after serving. In some cases, the hot food served can be donated to charity food aid. However, in this case, you must always make sure that the temperatures are correct.



7.3 Heat treatments

Heating destroys microbes and thus improves the safety and shelf life of products.

Torrenting

Blanching is a rapid boil that, for example, stops the enzymatic activity of frozen vegetables and destroys the microbes on their surface.

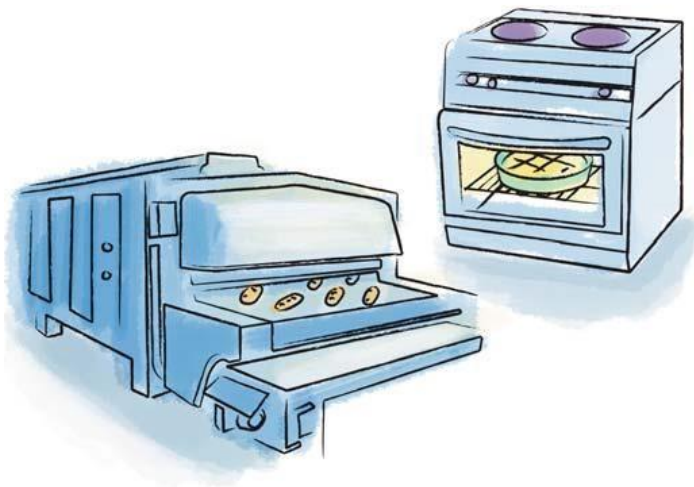
Pasteurisation

In pasteurisation, milk or other liquid products are heated to a temperature of at least +72°C for 15 seconds and cooled immediately. The treatment, invented by the Frenchman Louis Pasteur, makes milk safe without losing the taste and usability of milk. A large number of

microbes, such as bacteria that can reproduce, are destroyed. Not all microbes have been destroyed, so pasteurized milk should be stored in the refrigerator below + 6 °C.

In Finland, packaged milk is almost without exception pasteurized milk. On the other hand, the raw milk purchased from farms, i.e. bargained milk, has not been pasteurised. Raw milk refers to milk that has not been heated to a temperature above 40 °C. Nothing has been removed from the raw milk and nothing has been added to it. Because raw milk is not pasteurized, pathogenic bacteria, i.e. bacteria that cause diseases, can be present in it. The most important bacteria in raw milk that endanger food safety are EHEC, campylobacter, *Listeria monocytogenes* and salmonella bacteria.

If raw milk is used as food, it is worth remembering that you need to be very careful when storing raw milk. The storage temperature should be low enough and the storage times should be short. There may be differences in the raw milk of different farms, so it is a good idea to try to check the quality class of the raw milk in advance. Raw milk is not recommended for young children, the elderly, pregnant women, or people with serious underlying medical conditions.



Cooking food

Boiling, frying, grilling, cooking food in the oven should raise the internal temperature of the food to above + 70 °C, poultry meat to at least + 75 °C.

In cooking, the temperature rises up to the boiling point of water + 100 °C. Most microbes are destroyed, but even prolonged boiling does not necessarily destroy bacterial spores.

UHT, Shock Heating

In ultra high temperature (UHT, ultra pasteurization), milk or other predominantly liquid products are sterilized by rapid heating to a high temperature and packaged in disinfected packaging in a clean state (aseptic packaging). Unopened packages can be stored at room temperature, as most of the bacterial spores have been destroyed.

Sterilization

Sterilization destroys all microbes, including bacterial spores. In the production of canned food, filled and sealed cans are heated in a steam boiler under pressure (the boiler is called an autoclave), which makes the boiling point of water higher. The cooking program is designed for different products so that all bacterial spores, including the spores of *Clostridium botulinum*, are destroyed, hence the name botulinum soup. In this way, products that can be stored at room temperature for years can be obtained from perishable raw materials.

Irradiation

Foodstuffs can also be sterilized by irradiation. In Finland, only dried herbs, spices and herbs may be sold irradiated. EU member states may have their own legislation that allows the irradiation of other food groups as well. E.g. Small doses of radiation can prevent potato sprouting or destroy insect pests, or preservation can be used to improve the shelf life of fresh meat and fish by reducing the concentrations of spoilage and lactic acid bacteria naturally occurring in food. This is not done in Finland.

UV and infrared radiation can be used in the food industry to kill microbes in packaged products, such as long-selling pastries. Irradiation must be indicated on the package labels.

Reheating

When chilled food is reheated, it should be done efficiently and the food should be heated thoroughly to over + 70 °C, poultry meat to at least + 75 °C.

Microwave heating does not heat foods of different compositions evenly, so it cannot be considered a reliable heating method in terms of destroying microbes.

Avoiding post-contamination

Heated food must be protected from post-contamination after heating. Clean hands, utensils, dishes and air keep the products safe and shelf-stable. Slicing cold cuts and packaging ready-to-eat foods and pastries also require very clean conditions and working methods in industry.

Raw materials and their processing equipment are kept separate from cooked products to prevent cross-contamination. For example, reserving cutting boards and other utensils of different colours for raw vegetables, fish, meat and cooked products will help prevent cross-contamination. In the food industry, there are completely separate facilities for the work

phases of different levels of cleanliness, and people do not move around and goods are not transported from a dirtier area to a cleaner one.

Tasks

- Why are unopened baby food jars and infant formula packages stored at room temperature?
- You grill meat marinated in spice broth. How do you prevent post-contamination?

7.4 Cold chain

Cold does not destroy microbes. Cold slows down the multiplication of microbes and thus gives the product more shelf life.

An uninterrupted cold chain from the field and fishing vessels to the table enables the nationwide distribution and availability of many important and familiar food products and raw materials.

Foodstuffs that can be bought from far away, such as frozen lamb roasts from New Zealand, fresh tuna, Italian cheeses, flying tomatoes, are available in the local store thanks to a carefully planned cold chain.

Cold storage and serving temperatures

Perishable foodstuffs are stored at a temperature below +6 °C. Some dairy products, such as cheeses, can be stored at +8 °C. When serving cold foods, the target temperature is +6 °C, and during serving, the temperature may rise to +12 °C. Such foods should be discarded at the end of the serving time. The serving time may not exceed four hours per serving portion.

A lower storage temperature is required for fresh minced meat at + 4 °C. Fresh fish and shellfish must be stored at the temperature of melting ice, and freshly salted and cold-smoked fishery products, as well as vacuum-packed and modified atmosphere-packed fish products, must be stored at 0 to + 3 °C. Frozen foods should be stored at a maximum temperature of -18 °C.

There are more detailed instructions for industry, transport and trade for each product group.

Refrigeration

Cooling hot cooked food to below +6 °C should be done as soon as possible immediately after cooking. It should take no more than four hours to cool down. After this, the products can be transferred from the refrigeration unit to cold storage according to the product group.



Photo: Fazer Bakeries

In kitchens, cooling is accelerated by dividing a large portion into smaller flat containers in an ice bath and stirring. Hot fumes should be released into the air. In professional kitchens where cooling is constantly carried out, refrigeration cabinets or rooms are used. In bakeries, the breads circulate on cooling tracks after the oven. A wide range of cooling technologies are used in industry.

Freezing, freezing

Cold products to be frozen are packed tightly.

With a home freezer, you can freeze by turning on the freeze function in time. In a professional kitchen, semi-finished products and pastries are frozen using a separate freezing device. Frozen products are moved to a freezer cabinet, storage room or freezer compartment for storage.

In industry, freezing is accelerated with more efficient equipment. Wind tunnels, spiral freezers and liquid nitrogen-based equipment are used. In these, the temperature can be as low as $-40\text{ }^{\circ}\text{C}$.

Freeze-drying (freeze-drying) uses even lower temperatures. After the freezing phase, the frozen water is evaporated without thawing. The result is, among other things, dry products that retain their aroma and colour well. Instant coffee, dry yeast and lactic acid bacteria products are freeze-dried, and berries are also freeze-dried. Freeze-dried products are stored in the same way as other dry products.

The storage temperature of frozen products may not exceed -18 °C. During transport, a maximum temperature of -15 °C is allowed. There is also flexibility in the supply. For example, an ice cream kiosk has no restrictions on the temperature of ice cream, but of course the seller should make sure that the products sold are of high quality. Who would want to buy melted ice cream?

Frozen products must be marked "frozen" on the packaging.

Freezing or freeze-drying does not destroy microbes.

Melting

Frozen foods are thawed in the refrigerator at +6 °C. Thawed or partially thawed products should not be refrozen. When seasonal products, mämmi, Christmas hams and pastries have been frozen and are sold partially thawed, they must be accompanied by the information "stored frozen, must not be refrozen after thawing".

Tasks

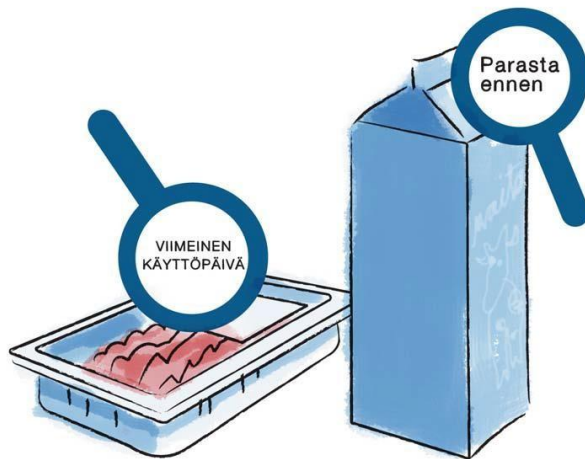
- Why is it important for consumers to know, for example, whether fish sold in bulk has been frozen or not?
- Why should you not refreeze thawed frozen vegetables?

7.5 Expiration date, best before

All packaged foodstuffs must have a date marking. The best before date indicates that the product retains its typical properties when properly preserved, at least until today. The product may be kept for sale and used after the date. The usability of a product can be assessed organoleptically. This date can be found on products sold at room temperature, but also on e.g. milk and dairy products.

The expiration date must be indicated on microbiologically perishable foodstuffs. The labelling must be based on the results of shelf life studies. The product may not be sold or used after this date. The marking is often found on vacuum and shielding gas packaging. This packaging is used to package many foodstuffs that involve microbiological risks that we cannot detect with our senses. This packaging (combined with the cold chain) significantly extends the shelf life of many perishable products. For example, the sell-by date for minced meat prepared in a store is the day after production. The shelf life for minced meat packaged in a protective atmosphere by the industry is about 10 days.

If, in exceptional cases, a food business operator wishes to use a raw material that has passed the 'best before' date for the manufacture of a food, it must be able to demonstrate to the control authority that the raw material and the final product are of impeccable quality. The end product must also be shown to be preserved throughout the product's lifetime. The operator must take responsibility for ensuring that the consumer is not misled and that the other requirements of the food legislation are met.



Food aid

Food companies can donate food as food aid to charities. In this case, practices that deviate from commercial activities may be allowed. Both food companies donating food and charities as recipients have a responsibility for food safety. Safety should not be compromised in this case either. Important issues include the cold chain, fast handover and stock rotation also in charity.

Food donated to charity can be frozen, but only before the expiration date. When defrosting, quick use after defrosting and sufficient heating must be taken into account.

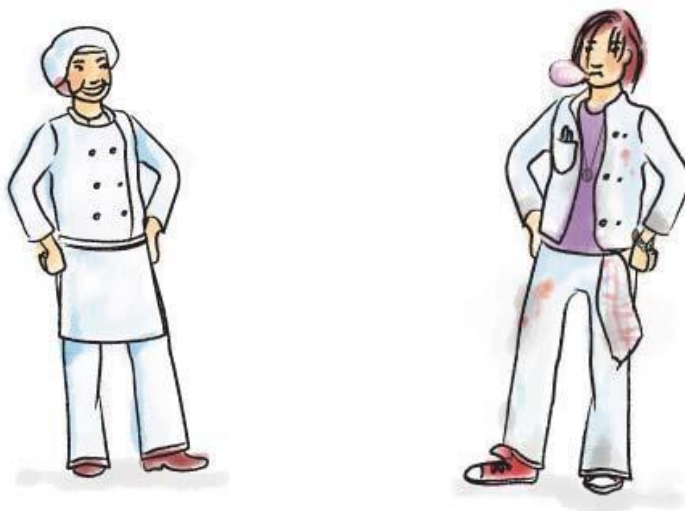
8 Personal hygiene

The health, protective clothing and, in particular, hand hygiene of persons handling foodstuffs are an absolute prerequisite for the safety of products.



8.1 Employee health

A new employee entering food work undergoes a pre-employment examination, a public health nurse's or a doctor's appointment. Both the employee and their employer must continue to take care of their health and health information.



A person who carries or is suspected of carrying a foodborne disease must not handle foodstuffs.

Finland's good salmonella situation is the result of our extensive national salmonella control programme. Part of the programme is salmonella testing of people working in food work.

The aim of these is to find possible asymptomatic carriers. A sample for salmonella testing must be given (check the thl.fi website for up-to-date information):

- When entering food work as a new employee, the report is required from everyone, including trainees and other similar persons who work at the workplace without an employment relationship for at least one month. An explanation is not required for those who have been working for less than a month, but it can be done if the employer deems it necessary.
- If there are symptoms or otherwise reason to suspect that the person has been infected, for example after a family member has fallen ill.
- Salmonella testing is no longer requested from asymptomatic employees after the trip.

The skin on the hands and face should be healthy. A person with inflamed wounds or other infections on the hands or visible areas of skin should not handle unpackaged foodstuffs. Small wounds on the hands are cleaned, protected with a waterproof plaster and a disposable glove is used.

There are plenty of different bacteria on the skin, mouth and nose, including those that cause food poisoning, which is why touching the skin should be avoided when handling food. Also, if you have a fever or a very bad cold, you should not handle food.

Eating, snuff and smoking are prohibited when handling foodstuffs and when working in food premises.

Tasks

- Why is it not allowed to eat in the kitchen?

8.2 Dress at work

The appearance and dress of a person handling food is part of protecting food from excess contamination.

When handling unpackaged foodstuffs, a separate clean work suit is worn, which is used only at work. The work suit should be easy to clean, preferably made of light material, which makes it easy to see whether the suit is clean or dirty. Clean work clothes are stored separately from outerwear.

The person handling unpackaged food must wear a headgear. Jewellery and piercing jewellery do not belong to work attire, or they must be covered with protective clothing. In food premises, work uniforms also include footwear that is only used there.

Only a waiter's outfit can be used for commuting. In the waiter's work uniform, the headgear is not mandatory.

In industry, there are often even more detailed dress codes for those working in rooms with different levels of cleanliness.



Tasks

- Why do you need a headdress?
- Why do clean work suits have to be separated?
- Why are there separate instructions for waiters?
- What does a waiter mean in these rules?

8.3 Hands

Food is handled with clean utensils. If hand touching is necessary, it is done with healthy, clean hands that do not have anything extra, such as a watch, jewelry, artificial nails, nail polish or hand cream. Wash your hands often and thoroughly using liquid soap. After rinsing, dry your hands with a paper towel and close the faucet with a towel or otherwise so that you do not touch the faucet with a clean palm.

Wash your hands

- when starting work
- After going to the toilet
- when moving from one work phase to another
- when removing protective gloves
- After eating
- after blowing your nose
- after handling the money, etc. both
- whenever they feel dirty.

There are many separate hand washing stations in the food premises that are not used for other washing purposes.



The products are also protected from unnecessary touching, tongs and ladles are used, a clean spoon is used for tasting, and the temperature of the food is checked with a thermometer.

A person with infected wounds or a rash on the hands or face should not handle unpackaged foodstuffs.

If you get a wound on your hand, it should be cleaned and covered with a waterproof, preferably bright blue plaster. In addition, disposable gloves should be used.

Disposable gloves improve hygiene, especially when handling ripened products. The work must be planned so that nothing is done with gloves on except handling a product that is susceptible to post-contamination. The gloves are changed after each work session.

In such tasks, the effect of hand washing can also be enhanced by using a disinfectant hand sanitizer containing ethanol.

When using other protective gloves, it is important to keep the gloves clean by washing and drying them properly.

Customers can also contaminate products at self-service points or at a buffet. The risk is reduced by reserving enough product-specific handles, protecting products with lids, droplet guards and arranging products in a way that reduces cross-contamination.

Tasks

- Why can't I use nail polish?
- Why are blue patches used?
- Why do I always have to wash my hands after going to the toilet?
- Why is the water tap not turned off by pressing with the palm of your hand?



Kirva: Espoon kaupunki Valokuvaaja: Kai Linqvist

The handling of dirty dishes and the handling of clean dishes must be sufficiently separated. Washing the cutlery always proceeds

1. Removing loose dirt.
2. Pre-rinse with a cool water jet. Water that is too hot can burn the protein dirt on the surface of the container and form a suitable breeding medium, a biofilm, for microbes.
3. Wash with a warm detergent solution. When washing by hand, the effect of the washing solution is complemented by brushing. In a dishwasher, the corresponding mechanical work is done by a water jet.
4. Rinse with hot water. Hot water (over 80 °C) reduces microbes and speeds up the drying of dishes.
5. The dishes are stacked only when dry. Avoid unnecessary touching of dishes.

The kitchens, where food is also prepared, have a separate so-called pot washing system with its own soaking basins and machines. They are used to wash cooking utensils and utensils. Baking dishes and other cooking and frying utensils are often soaked before washing. It helps to loosen dirt during the actual wash.

The dishwasher is cleaned regularly. Only with a clean machine can clean dishes be obtained. The cleanliness of the dishes can be monitored by taking microbiological surface cleanliness samples from clean dishes.

Tasks

- Why are the dishes stacked only when dry?

9.2 Cleaning plan

Cleaning can only be achieved with clean cleaning equipment and by using a washing solution suitable for the dirt and the surface to be cleaned, as well as smooth working methods. In food handling facilities, a wide range of dirt is generated on various surfaces. Flour dust is removed from a smooth surface more easily than grease burnt into the oven. Cleanliness is essential, but cleaning must not take up too much of your working time. The diverse cleaning of the food premises must be carefully planned, and the entire staff must be trained to do their part. Taking care of good order and cleanliness is part of everyone's work in the food premises. Cleanliness also brings comfort and occupational safety.



The cleaning plan includes schedules and instructions, who, when, with which cleaning method and detergent will take care of which cleaning site, separately the desks, shelves and utensils in the food preparation facilities, and the floors and doors. These follow the following order:

1. Rubbish, waste and loose dirt are removed with a dryer, cleaning cloth or scraping.
2. Rinse or moisten with cool water.
3. Wash with a detergent solution and, if necessary, by brushing. To remove dirt from the surface, chemical soaking energy, mechanical energy and their duration of action are required.
4. Rinse. The tables are dried with a dryer.
5. If high-risk raw materials have been processed (such as raw meat, fish, root vegetables with soil) or there is a high cleanliness target, the site is disinfected at the end in accordance with the disinfectant's instructions for use.
6. Wash the cleaning equipment and put it out to dry.

The same order of progress is applied in all washing situations, when desks are washed in the kitchen between different work phases during the working day, when the places are cleaned at the end of the working day, and also in places that are cleaned less often. The

order of progress is the same in plumbing systems or foam washes in the food industry, but the scale is different - a bucket of washing solution can be replaced by a detergent tank of hundreds of litres or a foam detergent dispensed into tap water.

The goal of cleaning is clean surfaces. The monitoring of the cleanliness result is part of self-monitoring. The result of the cleaning is primarily assessed on a sensory basis, whether it looks, smells and feels clean. In addition, it is recommended to take surface cleanliness samples to examine whether microbes or organic matter in general have remained on the surfaces.

Tasks

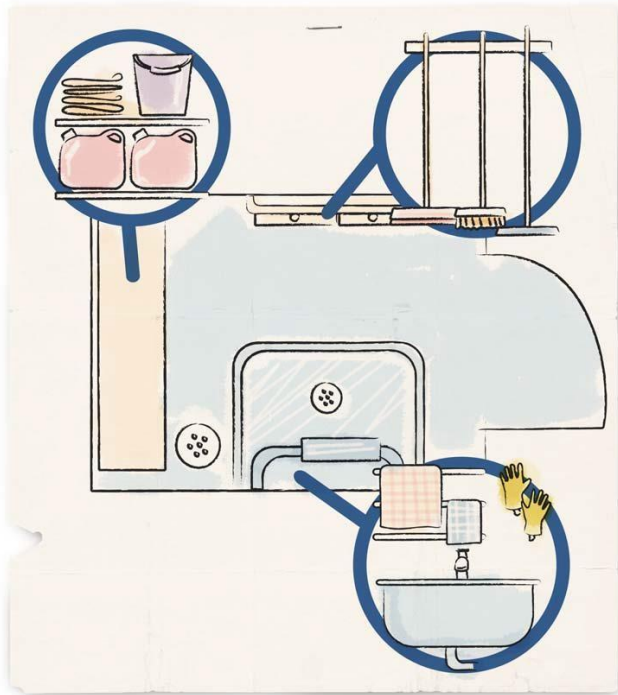
- Why do you need a written cleaning plan?

9.3 Cleaning products and equipment

The food premises use detergents specially developed for this purpose, dosed according to the instructions for use. Detergents are stored in the cleaning closet in their original packaging. Safety data sheets for these chemicals should be kept nearby so that every user can familiarise themselves with the first aid instructions, for example. Completely water-soluble detergents are used in the food premises, which, when used according to the instructions for use, do not leave chemical residues on the surfaces.

Food premises often require a wide range of detergents and disinfectants, as there are many different surface materials, many types of dirt and different cleanliness goals. Detergents are usually grouped according to the pH value of the solution. Hand dishwashing detergents used at home are also neutral (pH 6–8). In professional kitchens, a weakly alkaline detergent (pH 8–10) is often used to wash desks and floors. An alkaline detergent (pH 10–11) is needed to wash greasy pans and preparation equipment. A highly alkaline detergent (pH 11–14) is used in the washing of ovens and grills and in machine dishwashing, and even a lye solution (pH 14) is used in closed circuit washing in industry. Acidic detergents (pH below 5) are only used to remove specific deposits, not as all-purpose detergents.

Protective gloves are always used when cleaning.



The cleaning closet must have a sink for washing cleaning equipment, a floor drain and a rack for drying cleaning equipment, and good ventilation. The cleaning closet is used to store both new and cleaned cleaning equipment: brushes, dryers, scrapers, and cleaning cloths. The equipment must withstand both use and washing and disinfection without the bristles coming off, for example. Equipment has also been developed for food facilities in different colours, so that it is easy to keep the equipment used for different purposes separate. Different equipment is used in the raw material handling room than in the processing rooms of heat-treated or ready-to-eat foodstuffs.

In the café and restaurant, various cleaning equipment is reserved for the kitchen and customer areas.

Tasks

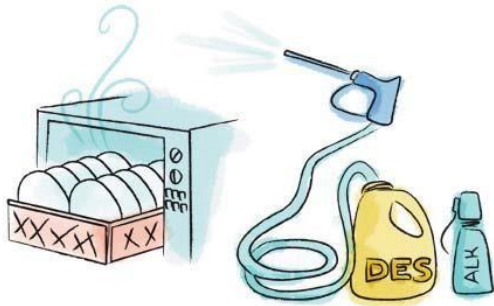
- Why are the cleaning equipment in the café's customer areas not used in the kitchen?
- Why do professional kitchens use dishwasher-safe brushes and dryers?

9.4 Disinfection

Disinfection reduces microbes from equipment and work surfaces.

Thermal disinfection

Hot rinsing water Dishwasher Destroys Microbes dishes.
In addition to hot water, water vapour can be used in closed pipe washes in the food industry.



Chemical disinfection

There are many different types of disinfectants in terms of their mode of action and use, depending on the active chemical, among other things.

When using them, it is important to take into account the concentration, temperature and duration of the working solution. Some common disinfectants, such as chlorine-containing ones, are also corrosive, so the desired result in chemical disinfection can only be achieved by carefully following the operating and safety instructions. Microbes can become resistant to a certain disinfectant, such as otherwise usable quat compounds, and therefore the disinfectant should be changed from time to time. There are also alcohol-based solutions that can be sprayed and left to evaporate on the surfaces to be disinfected.

Disinfectants may only be used to disinfect surfaces, utensils and dishes. Food must not be treated with disinfectants.

UV light

UV light can be used to disinfect air, as well as water and other clear solutions. Blue UV lamps are used, for example, as night lights in laboratories. UV lamps can also be installed in enclosed spaces, such as inside a packaging machine, to disinfect the air.

Tasks

- Why is the disinfectant solution not applied to the workbench directly after handling the food?

9.5 Pest control

The most important thing in pest control is to prevent the entire problem from occurring.

Let's keep cats, dogs, rats, mice, birds and outdoor insects away from the kitchen and shop premises. Doors and windows are kept closed. The products are not refrigerated or stored outdoors. All supplies, such as bakery boxes, are stored inside. Waste, on the other hand, is taken out of the food premises as soon as possible.

Cleanliness, good order and cleanliness are the most important means of prevention. Protecting products with lids and the like.



When operating outdoors at a market or in a restaurant tent, canopies and other suitable protections are used.

However, if pests do occur despite preventive measures, there are a few accepted methods of control.

Flying insects can be caught with electric traps. Rats and mice can be caught with bait boxes. There are some pest control sprays that are allowed to be used in the warehouses of packaged products.

The entry of beetles and moths that breed in dry matter with products cannot be completely prevented, but their reproduction can be prevented by taking care of:

- Cool dry matter storage
- products on shelves, not on the floor
- The condition of the products is monitored
- Fast turnover of products, not acquiring too large stocks at once
- first come first (FIFO - First In - First Out)
- Storage containers are used empty and cleaned regularly.

If larvae or beetles are seen, the contaminated products must be disposed of and other products in the same warehouse must be examined to limit the problem. The warehouse is cleaned.

Monitoring the pest situation is also self-monitoring.

Tasks

- Why can't you spray any insecticidal aerosol into the kitchen or dry matter storage?
- Why are pets not allowed in food premises?

9.6 Waste disposal

When food is prepared or served, different types of waste are generated:

- vegetable peels, egg shells, coffee grounds, food scraps
- a wide range of packaging materials: paper, plastic, cardboard, glass, metal. These are often wet.

Foodstuffs must not come into contact with waste or odours from them, etc. with the disadvantages.



Different types of waste are sorted into their own collection containers. The containers must be intact, have a lid and be cleaned regularly. Waste is transferred from the food premises to its own storage facilities. Biowaste is taken away from food facilities at least once a day.

Tasks

- Why does biowaste in particular need to be taken out at the end of the working day, even if the container is incomplete?

10 Hygiene results

The success of hygiene arrangements and competence can be measured and a lot of different information can be collected on it. The most important monitoring methods are summarised below.



10.1 Measuring and monitoring the success of hygiene

Perhaps the most important result and indicator of successful food handling is a satisfied customer, a diner who does not get sick.

We can always check the deliciousness of the prepared food or other food organically before serving. We can also measure the temperature of food, but we cannot quickly check the microbial content from it. The success of hygiene is monitored through inspections and measurements that indicate that the planned hygiene arrangements are working. The results are recorded and stored as part of the own-check records. Tracking data is stored for at least one year after the product's shelf life.

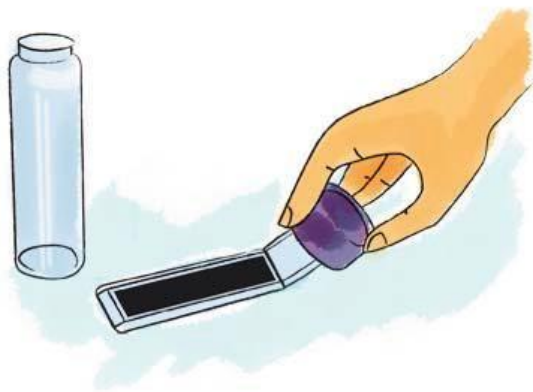
Acceptance inspections

For professional kitchens, raw materials, industrial foodstuffs and other supplies are usually supplied from a wholesaler. The condition of incoming products is checked and the temperatures of perishable products are measured. The results and any deviation mentions can be recorded, for example, in a load packing slip.

Measuring temperatures

Cold storage and storage furniture must be equipped with a thermometer. The temperatures of warehouses and even smaller refrigerated equipment and furniture are checked regularly. The temperature of hot foods is measured during the preparation of the food, when it is served and at the end of the serving time. The length of stay for supply and transport will be monitored.

The measurement results are recorded. Large cold stores use recording thermometers.



Microbiological samples

Microbiological methods are based on microbes multiplying on a certain type of culture medium into a spot that can be seen by the naked eye. This usually takes a few days. More detailed examinations using microbiological, chemical or other methods will take more time. This usually requires the equipment and expertise of a microbiological laboratory.

Ready-to-use growing media have been developed for use in food premises, which can be used to take surface cleanliness samples and obtain monitoring data without laboratory equipment, for example. The growing mats come with instructions for interpretation.

Microbiological tests do not provide information quickly enough to stop a suspicious product. However, when carried out regularly, studies produce valuable information, for example, on the success of cleaning.

Water samples

The purity of tap water is monitored organoleptically. Water samples can be sent regularly for chemical and microbiological testing.

The need for studies depends on the results. If, for example, the purity of the water varies, the testing of samples must be made more frequent.

Qualified research laboratories

When chemical or microbiological laboratories are used to examine water, food, or purity samples, it should be ensured that the laboratory is qualified. The Finnish Food Authority approves laboratories that examine foodstuffs.

Taking food samples

When a lot of food is prepared, you should also be prepared for the unpleasant situation where the customer suspects that they have fallen ill from the food they have eaten.

Samples of all the foods of the day are taken into a clean freezer box. The date and contents are marked on the box and the sample is frozen. The samples are stored for a couple of weeks, after which they are disposed of. If food poisoning is suspected, these samples can be

examined to see if they contain the microbe that causes the disease and even the same strain as in the samples taken from the infected person. In the case of food poisoning caused by microbes, the time from eating to illness varies from two hours to two weeks.



Photo: City of Espoo Photographer: Kai Linqvist

Other indicators of success

In addition, the food company's self-monitoring monitors customer feedback, stock turnover, the amount of waste and many other things that directly or indirectly describe the success of hygiene and self-monitoring.

Tracking Information

All measurement results, information on incoming and outgoing products, etc. are logged and stored. The recorded information may be needed to track any errors or issues.

And only the stored monitoring data proves that self-monitoring is carried out as planned.

ANNEX 1: Main food poisoning bacteria (updated 2021)

RUOKA-MYRKYTYS-BAKTEERI	LUONNOLLISIA ESIINTYMIS-PAIKKOJA	LUONTEEN-OMAISTA	RISKIELINTARVIKKEITA JA -TILANTEITA	RISKIN EHKÄISEMISSÄ TÄRKEÄÄ
<i>Staphylococcus aureus</i>	Human skin, nose and mucous membranes Animal skin	Produces a poison, a toxin that does not break down when heated	Heated Product Handling	Continuous cold chain Hand hygiene
<i>Bacillus cereus</i>	Soil, waterways	Toxin Bacterial spore	Handling large batches of food Rice, pastas, pastries Root vegetables, vegetables, grain, spices, potato flour Raw milk, milk powder, puddings	Sufficient heating Leftovers from hot foods are not used Efficient cooling 4h +6C Cold chain < 6C The spore is destroyed during sterilization
<i>Clostridium perfringens</i>	Soil Animal intestines Dust	Bacterial spore Only in oxygen-free conditions Toxin	Handling large batches of food Foods rich in meat and protein	Effective heating +75C No hot food residues are used Efficient cooling 4h +6C Cold chain Food not +12–60 °C The spore is destroyed only by sterilization at
<i>Clostridium botulinum</i>	Soil, waterways Animal intestines Meat, fish, honey (Honey not for children under 1 year)	Bacterial spore Only in oxygen-free conditions Produces toxin, botulinum, which is a neurotoxin, causes botulism Produces gas	Vacuum-packed, inert-gas-packed, cooked products, Smoked Fish Canned Meat Inadequate sterilization Handling of large batches of food handling	Efficient heating No hot food residues Used Efficient cooling Cold chain, fish < 3C Food not +12–60 °C The spore is destroyed only during sterilization
Listeria	Soil In waterways, very general in raw milk	Oxygenated and oxygen-free Increases in -0.4°C to 45°C Increases salty Keeps well in frozen foods	Vacuum-packed fish, cold cuts, ready-to-eat foodstuffs Mould and cream cheeses made from unpasteurised milk	Destroyed by pasteurization, heating > 72 °C, poultry meat > 75 °C Cold storage for a limited period of time Fish < 3C
Yersinia bacteria	Pig Wild animals contaminated water	Oxygenated and oxygen-free Vegetables Increases from 0°C to 44°C	Freshly eaten vegetables contaminated in the field or in storage Undercooked pork Post-contaminated Meat product Raw milk	Slaughter and handling hygiene Destroyed by pasteurization, heating >72 °C

RUOKA- MYRKYTYS- BAKTEERI	LUONNOLLISIA ESIINTYMIS- PAIKKOJA	LUONTEEN- OMAISTA	RISKIELINTARVIKKEITA JA -TILANTEITA	RISKIN EHKÄISEMISSÄ TÄRKEÄÄ
Salmonella bacteria	Intestine Poultry intestines Eggs Production animals intestines (Prevalence in production animals in Finland is low)	Oxygen-rich and oxygen-free Keeps well in frozen and dry products Infection can be asymptomatic and long-term	Contaminated vegetables, e.g. Sprouts Eggs that have been insufficiently heated, poultry meat Mayonnaise Cross-contamination Carrier of infection spread	National Control Program Destroyed by pasteurization, heating >70 °C, poultry meat 75 °C
Cambylobacteria	Poultry Natural waters Raw milk	Keeps well in gas- packed poultry meat products	Insufficiently heated poultry meat, epidemics usually in summer Unpasteurized milk Inadequately treated drinking water	Destroyed by pasteurization, heating at >70 °C, with poultry meat 75 °C
EHEC bacteria (Escherichia coli)	Bovine intestines	Tolerates acidity freezing hamburgers Unpasteurized milk Contaminated vegetables	Deficiently Withstands Heated minced meat patties, Unpasteurized milk Contaminated vegetables	Teurastushygienia Milking hygiene Destroyed by pasteurization, heating to >70 °C
Vibrio bacteria	Salty coastal sea waters in warm regions	Salt-seeking Infestation	Raw Fish Has Not Been Insufficiently indigenous heated, too kept warm Sea creatures	Seafood fast Cooling Cold Chain Destroyed by pasteurization, heating to >70 °C
Shigella bacteria	Man and ape intestines Water contaminated with feces Flies spread		Carrier of infection spread Contaminated household water	Destroyed by pasteurization, heating >75 °C

Source: ruokavirasto.fi / Bacteria that cause food poisoning. Retrieved January 2021.

