



## NZQA UNIT 168

Food Contamination Hazards &  
Control Methods in a Food Business

# Study Resource

Name : \_\_\_\_\_



**INNOVATIVE  
HOSPITALITY**

**Hospitality Assessors**

0800 929 8646 – Wellington/Wairarapa  
0800 0200 32 – Elsewhere in NZ

Assessors in based in  
Horowhenua, Hawkes Bay,  
Auckland, Wellington, Kapiti

**Advanced**

**Food Safety  
For Food Workers**

Version : APRIL 2015





# INNOVATIVE HOSPITALITY

## TRAINING AND DEVELOPMENT SERVICES

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- Behaviour Guidelines
- Disciplinary Procedures

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### Directors:

**Clive Long & Pamela Douglas**

**RD 31 Levin 5573**

**☎ 0800 0200 32**

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# Contents

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<b>Course Aim .....</b>	<b>1</b>
<b>Course Objectives .....</b>	<b>1</b>
<b>The Assessment.....</b>	<b>1</b>
<b>Knowledge of Food Borne Hazards.....</b>	<b>2</b>
Common signs of food spoilage .....	2
What causes food spoilage .....	3
Biological Spoilage.....	3
<i>Parasites, Viruses, Fungi (Moulds, Yeast) Algae</i>	
Chemical/Metal Contamination.....	5
Physical Spoilage.....	6
Possible sources of contamination .....	6
Examples of spoilt food, Causes, Signs and How it happened .....	8
Metal Contamination Table.....	9
Workplace Procedures & Legislative Requirements .....	9
<b>Where are Bacteria?.....</b>	<b>10</b>
Conditions that bacteria need for growth .....	10
Spores.....	11
Pathogens.....	11
Spoilage bacteria .....	11
Useful bacteria .....	11
<b>Specific Bacteria Types .....</b>	<b>12</b>
Salmonella .....	12
Campylobacter .....	13
Clostridium .....	14
Bacillus Cereus .....	15
Listeriosis Monocytogenes .....	16
Yersinia Enterocolitica.....	17
Escherichia Coli .....	18
Staphylococcus Aureus.....	19
Clostridium Botulinum .....	30
Cryptosporidium & Giardia .....	21
<b>Food Allergies .....</b>	<b>23</b>
<b>Preservation Methods .....</b>	<b>24</b>

<b>Specific Virus Types .....</b>	<b>25</b>
<b>Preventing Cross Contamination.....</b>	<b>26</b>
Personal hygiene standards .....	26
Handling procedures .....	28
Cleaning & sanitising .....	28
Pest control procedures .....	28
Waste management procedures.....	29
<b>Controlling Bacterial and Fungal Growth in Food.....</b>	<b>30</b>
Purchasing food .....	30
Food delivery & receipt.....	30
Storage .....	30
Preparation .....	31
Cooking.....	31
Cooling.....	31
Reheating.....	31
Holding food for service or sale .....	31
Selling or service .....	33
Left over and/or unsold food.....	33
<b>Developing a Food Safety Programme (including HACCP).....</b>	<b>34</b>
How do I develop my Food Safety Programme? .....	34
What is HACCP?.....	34
7 Principles to the HACCP programme .....	35
Identifying the hazards / The main hazards to food .....	35
Control points .....	36
Establish critical limits .....	36
Establish a monitoring system / Establish corrective action .....	36
Establish verification procedures / Establish records and documentation .....	36
Things to consider when developing your food safety programme .....	37
The raw material .....	37
The buildings / Controlling the operation .....	37
The premises and equipment, cleaning and maintenance .....	37
Training the staff / Transportation and storage of food .....	37

## APPENDICES

- Complaints Procedure
- Re-sits or Reassessment of Unit Assessments
- Learner Behaviour Guidelines
- Learner Disciplinary Procedures

# **Unit 168**

## **Demonstrate knowledge of food contamination hazards & control methods, used in a food business**

### **Course Aim**

People completing this unit will be able to identify food hazards and sources of contamination. They will know the causes and signs of food spoilage and food borne illness, and be able to implement systems to prevent these and control the growth of bacteria.

### **Course Objectives**

#### **Knowledge of Food Borne Hazards**

- Hazard identification
- Source of contamination
- Characteristics of bacteria, mould, yeast
- Food borne illnesses
- Causes and signs of food spoilage

#### **Methods used to control hazards**

- Prevention of cross contamination
- Kill or control bacteria and fungi
- Other forms of control
- Prevention of food spoilage
- Principles of HACCP (hazard analysis and critical control points)

### **The Assessment**

There is a written assessment to complete which confirms your understanding of food safety practices. The assessment is written by the ServiceIQ, who are the Industry Training Organisation for the hospitality industry.



# Knowledge of Food Borne Hazards

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On many occasions you will have come across a soft potato or a slimy steak, mouldy bread or weevils in the walnuts. All foods deteriorate over a period of time and eventually they will reach the point where their physical appearance, smell and texture changes and we regard them as unappetising, unappealing and not nice to eat.

## Common signs of Food Spoilage

<b>Smell/odour</b>	Rotten smells develop from bacteria breaking down the food.
<b>Taste/souring</b>	<p>Foods may go sour when the micro-organisms produce acids e.g. sour milk.</p> <p>Some meat products become sour if packaged in certain types of plastic.</p>
<b>Appearance/slime</b>	Food becomes slimy when there are so many bacteria they touch one another.
<b>Discolouration</b>	<p>Food may become discoloured from microbiological growth, some moulds have coloured spores, e.g. black mould on bread or blue and green mould on citrus fruit.</p> <p>Sometimes meat becomes green due to the growth of micro-organisms.</p>
<b>Gas (fermentation)</b>	Bacteria often produce gas as a by-product which can affect the food, e.g. meat becomes spongy in texture; packages, cans or vacuum packs will smell and may bulge before being opened.
<b>Texture</b>	<p>Texture may change and could include lumps or partial thinning, separating or any sign of decomposing.</p> <p>Fluid foods spoil rapidly because micro-organisms can spread easily throughout the food. Semi fluid foods, such as stews and minced foods spoil as quickly as fluid foods. Solid foods spoil less quickly.</p>

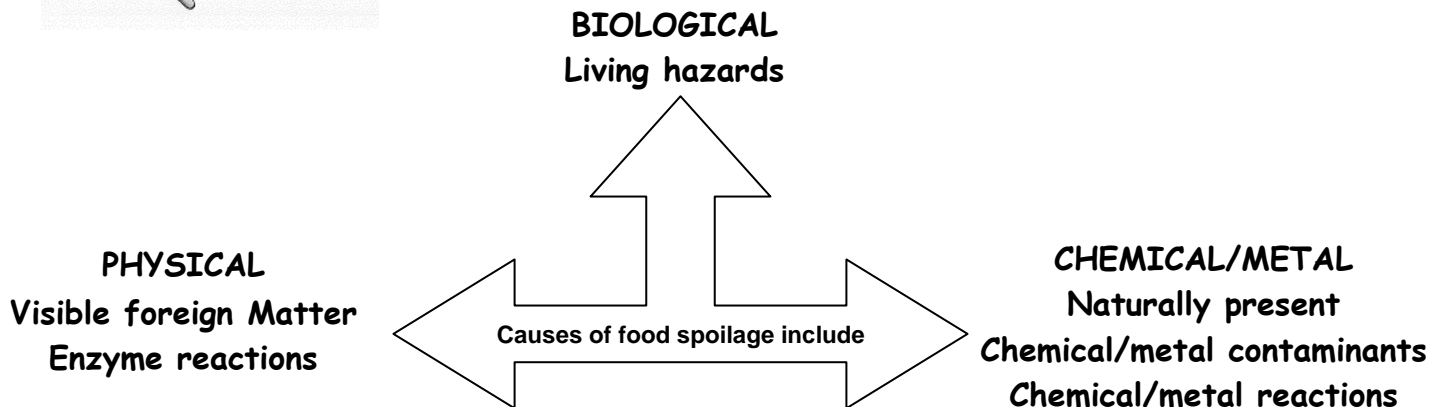
For all intents and purposes we cannot stop prolonged deterioration. Even under refrigeration or freezing conditions food will eventually break down. However the food handler can prevent avoidable food spoilage.





## What causes food spoilage?

Food can be spoiled in a variety of ways as outlined below. In this programme we focus on food spoilage or illness that is caused by contamination only. It is good to be aware however that there are other causes as they can be very important.



### Biological Spoilage

There are many biological agents that can cause food borne illness and spoilage such as pests, parasites and micro-organisms.



#### Insects and pests

The spoilage caused by pests is immense. Approximately one fifth of the world's food supplies are destroyed by insects.

Much of the damage due to pests does not cause harm but many pests also carry bacteria that can cause food borne illness.

The best way to prevent pest damage to food is to prevent their entry into the manufacturing warehouse, storage area, kitchen or retail premises.

#### Parasites

Parasites live off other living things and most commonly they contaminate food through water. This can easily be controlled by suitable water treatment – filtration or chlorination, and should not be a problem if correct food handling practices are used. If treated water is not available water must be boiled hard for at least one minute.

Food supplies should always be bought from a trusted or approved supplier to minimise the risk of parasite contamination.

Parasites may be present in foods of animal origin such as; pork, beef, lamb, fish, and shellfish.

In plant foods the parasite, as part of its life-cycle, may be contained in or on the plant or carried by insects that inhabit these plants.

Sometimes the infective stages may be present as a result of contamination by manure being used as a fertiliser.

**Food borne parasites include the protozoa, flakes, tapeworms and roundworms.**

#### Viruses

There are a number of cases of food borne illness which are caused by viruses that are extremely small and very difficult to identify and study. Viruses cannot strictly be called 'organisms'. They are very primitive and need a living cell in order to multiply. They can remain inert outside of a living cell for very long periods.

The most important viral food and water borne diseases have been poliomyelitis, infectious hepatitis and viral gastro-enteritis.

Viruses are shed in the faeces of infected humans and contaminate foods by sewage

or by direct mishandling. Fortunately many of the control measures used to control bacteria and fungi can be used to control viruses.

### **Fungi (and Fungal Aflotoxin)**

There are many types of fungi that can cause spoilage and sometimes illness. They include; yeast, mushrooms, moulds and mildew, and aflotoxins.

Moulds and yeast as far as food safety is concerned are primarily spoilage organisms, although some moulds produce toxins that cause food poisoning.

Some fungi produce toxins that cause severe reactions in humans if eaten. One of these called Aflotoxin, is a carcinogenic drug which can cause cancer. The fungus, which grows on peanuts and cereals, is known to produce Aflotoxins.

*Control methods to prevent fungal contamination could include;* checking the date of food products when they arrive, storing products at the correct temperature, when storing food use the 'first in first out' methodology and discard any food if it has passed its 'Use By' date.

### **Moulds**

Moulds are very widely distributed in nature. They produce a great many light spores that are readily air borne and are consequently found everywhere.

Moulds are multi-cellular, that is they have more than one cell and they consist of branching thread like filaments called Hyphae.

Any organic substance can be attacked by mould.

Although moulds need moisture for growth they can get it from humid air, or once established, they can produce it by decomposing the material on which they are growing.

Mould thrives in conditions that do not favour bacterial growth. Some moulds can grow in the presence of chemicals that would kill most bacteria and others can grow at ordinary refrigeration temperatures.

A few moulds are pathogenic, causing such diseases in humans as athlete's foot and ringworm.

Errgot, a fungus that attacks rye, can produce a serious illness called ergotism in people who eat bread made from the infected grain.

Certain moulds are used in food production, particularly in cheese making. They are also well known for their use in making antibiotics.

### **Yeasts**

Yeasts are also widely distributed in nature, particularly in the soil. From the soil they are carried in dust by wind. They may reach the skins of fruit, where they multiply, often forming a bloom on the skin.

Yeast may cause spoilage in certain foods, for example fruit juices, jams and meats. These yeasts are usually called wild yeast to distinguish them from those used commercially to produce alcoholic drinks and bread.

Yeast resembles bacteria in that they are also single celled organisms, but they are normally two or three times bigger than the largest bacteria. Their methods of reproduction are, however different. The bacteria split into two, yeasts form buds in the cell wall which on reaching maturity, separate from the cell. Each cell may have a number of buds at any given time.

### **Algae**

Algae are found in water sources like lakes, rivers and the ocean. It affects any food living in the water or animals and people who drink the water or who eat the contaminated food. It is usually coloured brown, reddish brown or bluish green.

The most important types have been associated with shellfish bio-toxins. Shellfish concentrate the toxins as they feed and when eaten can cause a variety of symptoms from tingling of limbs to diarrhoea, vomiting, paralysis and amnesia.

#### *To prevent algae poisoning:*

- Buy your seafood from reputable suppliers.
- Do not use seafood sourced from an area infected by algae bloom.

## Chemical/Metal Contamination

Many chemicals cause food borne illness. While some may just cause off flavours or odours, others can be quite severe.

Chemicals can be naturally occurring or can be introduced to the food.

### Naturally occurring chemical poisons -

- Heamagglutimin - found in undercooked kidney beans.  
*Destroyed by thorough cooking*
- Toxins - found in some berries, flowers and fruits
- Solanine - found in green potatoes
- Oxalic acid - found in rhubarb leaves  
Avoid using the poisonous part of the plant..  
*Remove the poisonous parts of the plant and dispose of them carefully.*  
*Clean in the correct manner any utensils or equipment that came into contact with the poisonous part of the plant.*

### Introduced or added chemicals include:

- Pesticides (e.g. rodent bait, DDT)
- Insecticide (e.g. fly spray)
- Herbicides (e.g. weed killers)
- Metals
- Food additives

Many pesticides were of the organochlorine type that can be very persistent in the environment. The breakdown of one of these products (DDT) can still be found in soil and food products after being banned from use since 1968.

Pesticides are poisons but the toxic hazards of different compounds vary greatly.

Possible risks from pesticide exposure can be:

- Acute poisoning (likely for uses of pesticides)
- Chronic risks from long term exposure to small quantities

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## Likely Risks to Consumers of Chemical Hazards in Food Products:

### Herbicides and Pesticides

The majority of herbicides are water-soluble and operate mainly by hormone

action, interaction with photosynthesis or destruction/rupture of plant cells. Many of these herbicides can still be very toxic to humans, e.g. parquat, diquat.

Herbicides and pesticides may enter food as the result of spraying the crop, or accidentally by contamination in the food premises. The greatest care should be taken when spraying against flies and other insects. Food surfaces should be covered during spraying and aerosols should not be used excessively or indiscriminately.

### Metals *(also see table on page 9)*

All metals can be toxic if ingested in sufficient amounts but many such as iron are also essential to metabolic function.

### Lead

Can come from a variety of sources including; lead pipes, paint and vehicle exhaust emissions. Lead is a cumulative poison. If taken regularly in small quantities in food or water it causes plumbism. This is a permanently disabling disease that affects the digestive tract, the nervous system and the brain. The main danger of lead contamination is from old lead paint that may fall into food or be in the soil.

### Mercury

Fish or shellfish living in water polluted by trade waste from paper mills may contain a dangerous amount of mercury compounds, because the fungicides used to prevent the growth of slime in the paper making process are organic compounds of mercury.

Poisoning by small quantities of mercury causes; loss of appetite, soreness of gums, excessive saliva production, kidney damage and anaemia.

### Food Additives

Many customers suffer from food intolerance conditions and the reactions vary from mild to very severe.

Food additives can be a major contributor and include such things as; **MSG, food colourings, flavourings and preservatives.**

It is very important for staff to know what ingredients are in products being sold and

for the products to be clearly labelled, to prevent customers suffering from an illness as a result of a food additive.

Food additives and processing aids such as emulsifiers have occasionally been linked to food borne illness in susceptible individuals, as have animal remedies like worm treatments. Certain groups of the population such as children and those with increased sensitivity are more at risk.

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## Physical Spoilage

This can be divided into two main groups:

### 1) Foreign Matter

*Natural (insects, spiders, worms, slugs, snails)*

These are commonly not hazardous in themselves but they may carry harmful micro-organisms. They come from crops, improper storage, inadequate cleaning and poor environmental control.

### *Plastic Objects*

Generally not as inherently hazardous as glass but still of concern. Sources include packaging materials used for additives and raw materials. Introduced from raw materials, bags, workers' pockets, and jewellery. They may produce hazardous fragments or even give off a toxic product when subjected to heat.

### *Miscellaneous*

Medical dressings, make up, cigarette butts, chewing gum, paint.

Fragments, rust flakes, residues from conveyor belts.

The list is limited only by imagination.

### 2) Enzymatic Reactions

Many enzymes naturally present in foods contribute to spoilage such as those that cause fruits and vegetables to over ripen.

Examples are:

*Peroxides enzymes* in vegetables which can cause off flavours during storage

*Lipolytic enzymes* that break down fat leading to soapy and rancid flavours

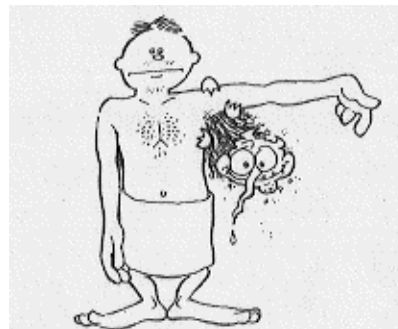
*One of the reasons we blanch, chill or freeze foods is to reduce the activity of enzymes.*

## Possible Sources of Contamination

The main sources of contamination can be identified as:

### People or Food workers

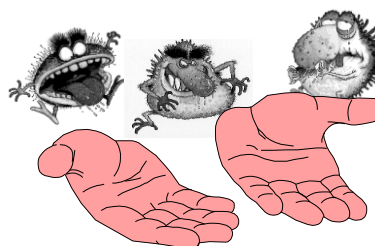
All human beings carry pathogenic bacteria.



After people have recovered from illness, they can go on excreting large numbers of the pathogen that caused the illness. This may go on for a few days or longer. Food workers who suffer, even from a mild illness, can affect food and cross contaminate utensils and food surfaces.

Even as a healthy person, you may have other food poisoning bacteria on your skin and in your nose or nasal passages.

Certain bacteria that cause food poisoning may live normally in your intestines. You may be healthy and still carry and excrete pathogens. After using the toilet, therefore you must wash your hands every time.



### Food

Raw foods such as meat, poultry or vegetables may contain food poisoning bacteria. Many raw foods become contaminated during growth or harvesting or slaughtering before they reach the premises where they are finally processed. During slaughter and butchery, meat is easily contaminated from the contents of the animals' intestines.

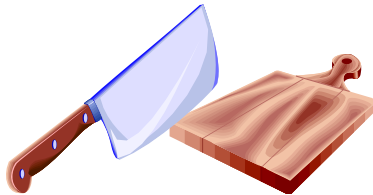
## Soil

Many types of soil contain bacteria, particularly those soils which are used to house stock. This soil may be transported into your work environment in many ways - from the shoes of workers, the roots of vegetables or on the side of boxes etc.

## Equipment

If not cleaned properly after use, equipment can carry and cross contaminate food during processing. Smaller pieces of equipment and those pieces that are used often carry the biggest danger of cross contamination, these can include;

- Chopping boards
- Knives
- Tongs
- Tea towels
- Trays etc.



All small equipment should be washed and sanitised often, the easiest and most simple solution is to change often and put contaminated equipment through the dishwasher/steriliser.

Larger equipment often faces similar dangers of cross contamination through lack of cleaning but often has the extended danger of contamination from leaking parts, or places that are difficult to clean.

## Buildings

Food service facilities are busy places where lots of food is prepared over long periods of time. The law asks for certain things regarding floors, walls and ceilings, ventilation, lighting, food contact surfaces, staff facilities, toilets and hand washing basins.

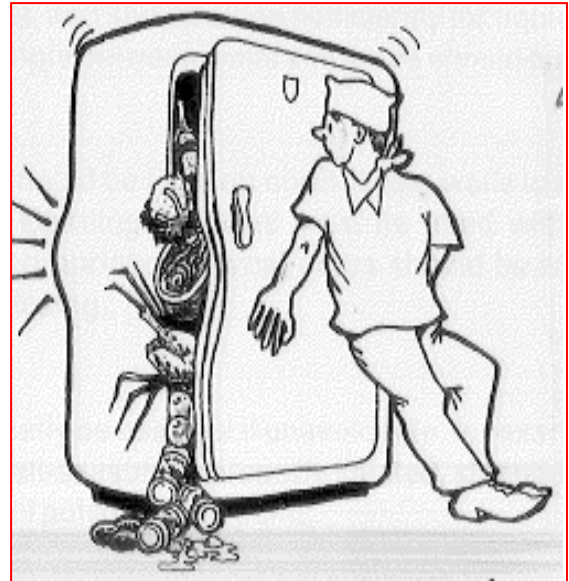
Badly maintained premises pose a high risk of contamination from flaking paint, badly maintained work surfaces, doors and windows allowing dust and dirt to enter the food processing area.

Restrictions need to be placed on access to members of the public and delivery persons etc.

## Storage areas

These must always be maintained in a clean dry and pest free atmosphere. They must be organised in a logical manner, all articles must be dated and labelled and organised in such a way that the oldest stock is always used first.

The risk of contamination in storage areas is high if they are not maintained in a satisfactory manner.



## Preparation areas

Wherever food is prepared or processed a high standard of cleanliness is required and hygienic conditions should be maintained at all times.

The risk of contamination is high where a variety of raw and cooked product are processed in the same area.

Strict controls and cleaning routines need to be established to maintain a high level of food safety. Food can be easily cross contaminated from dirty work surfaces, unhygienic food workers, unwashed hands, soiled equipment etc.

## Service areas

Services area where outside persons such as customers are allowed, pose a high risk of cross contamination. We can be as vigilant as possible but an introduced person can be a carrier of food borne illness.

We must always be aware of the possibility of the transfer of bacteria from the service area to the usually adjacent food processing area. This may be done by staff, the sharing of wiping supplies, trays etc.

### Pests

Pests carry a variety of bacteria and virus on their bodies feet etc. They soil food with their droppings and destroy food by eating it. A constant awareness of their presence is a must for all premises.

A proactive strategy must be embarked on to discourage the entry of vermin, through blocking holes in outside walls, maintaining fly screens etc in good order and checking all incoming goods for signs of pest presence or contamination.

If signs are discovered in storage areas, it is best to seek professional help to destroy the active invaders and set up systems to keep the areas clean and pest free.

### Rubbish

Often a source of bacterial growth because in general it has all the conditions that bacteria need to reproduce quickly. Once a source is established it becomes relatively easy to cross contaminate a careless food worker who does not clean their hands after contact, or who fails to clean and sanitise rubbish bins and areas in the correct manner.

Rubbish containers stored outside for collection can also be very attractive for flies, mice, rats etc. therefore, a good waste management procedure should be in place.

## Some Examples of spoilt food, the cause, signs and how spoilage happened

Food type	Cause of spoilage	Sign of food spoilage	How the spoilage happened
Cracked eggs	<b>Physical</b>	Visible cracks in the egg shells	Careless handling leading to damage – when an egg is cracked salmonella can enter the egg through the crack where it can multiply and cause food-borne illness if used in food preparation.
Mouldy bread	<b>Biological</b>	Spores (often green) are visible on the surface of the bread	The bread has been left for too long in an environment that is warm and moist – mould grows rapidly in such an environment. Bread can go mouldy in as little as a day if the conditions are right. In addition to the mould the bread may also have invisible bacteria growing.
Brown apple slices	<b>Chemical</b>	Browning of the slices	Apples have an enzyme which helps to speed up the chemical reaction between apples and oxygen. When an apple has been sliced this chemical reaction is able to happen quicker as a greater surface area of the apple is exposed to oxygen.
Sour milk	<b>Biological</b>	Sour taste	Milk contains bacteria. During the pasteurisation process many of these bacteria are destroyed but not all. If milk is kept for too long the remaining bacteria reproduce and spoil the milk.



# Metal Contamination Table

Metal	Source	Harm caused	Suggested Control
<b>Lead</b>	Lead based paint, petrol, lead water pipes and food cooked in contaminated water.	Gathers in the bones, tissue & blood. Eventually damages the brain and nervous system.	Don't use water from lead pipes. No flaking paint near food preparation areas.
<b>Cadmium</b>	Found in the food's growing environment (water) and accumulates in food, especially seafood (older shellfish) and offal.	Cadmium is very toxic and causes illness in humans including; nausea, vomiting, inflamed chest and lungs, coughs and kidney stones.	Eat only young shellfish and offal (e.g. lamb instead of mutton), bought from an approved vendor and use water from an approved source.
<b>Copper</b>	Prolonged contact with copper cooking utensils and containers. Acid foods such as tomatoes, stored in copper containers.	Nausea, vomiting and diarrhoea. Long term accumulation affects the central nervous system.	Don't store acid foods in copper containers.
<b>Aluminium</b>	Aluminium pots, cookware and equipment. Acid foods (such as tomatoes) stored in aluminium containers.	Linked to Alzheimer's disease.	Don't purchase or cook food in aluminium cookware and never store acid foods in aluminium containers.
<b>Mercury</b>	Contaminated water (near paper mills in particular) and seafood.	Very toxic and could affect brain function. If severe it can cause permanent brain damage.	Buy seafood from reputable suppliers who test the waters where they fish and use an approved water source.

## Workplace Procedures & Legislative Requirements that should be followed to prevent food spoilage

**Time** - The Food Standards Code states food cannot be sold past its 'use-by' date. Food businesses can use FIFO (First In First Out) to ensure that foods are not kept past their use-by date.

**Quality Checks** - Workplace procedures can specify how and when quality checks are to be undertaken. Quality checks will help identify such things as damaged packaging and products that have past their use-by dates. Records of these checks will help the business meet the requirements of their Food Control Plan.

**Storage** - Workplace procedures should specify how food is to be stored, e.g in pest proof containers and clearly labelled. These procedures will help to ensure the food business meets its obligations under the Food Act 1981 and the Food Hygiene Regulations.

**Temperature** - Workplace procedures can specify how and when temperature checks are to be made. This will help ensure foods are not left in the TDZ (Temperature Danger Zone) where they will be susceptible to food spoilage. High risk foods must be kept out of the TDZ to minimise the growth of harmful bacteria and to prevent toxins forming in the food.

Any food that has been held in the TDZ for more than 2 hours must be thrown away. Food businesses are required to operate under the Food Hygiene Regulations or to adopt a Food Safety Programme under the provisions of the Food Act 1981.

# Where are Bacteria?

Bacteria are micro-organisms that exist virtually everywhere – on our bodies, on the food we eat and in the air that we breathe.

There are thousands of different types of bacteria, some good and useful to people, and of course some bad and harmful to us.

Examples of “good” bacteria can be found in cheese and yoghurt manufacture where specific types of bacteria are added in set doses to create a particular cheese or yoghurt product. These are known as *bacteria cultures*.

Our bodies have an immune system which fights off most harmful bacteria when they enter our body in reasonable amounts. However, if bacteria are allowed to multiply and enter the body, the immune system has a much more difficult job and sickness generally results.

Bacteria can only be seen through a microscope. A bacterium consists of **one cell** only.

There are 3 different types of bacteria most commonly in food. They are:

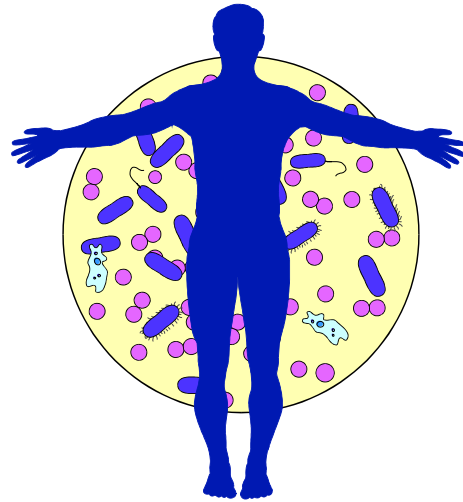
- Coccus - a spherical cell
- Bacillus - a rod shaped cell
- Vibrio - a comma shaped rod

Some bacteria can ‘swim’ in liquids but most cannot move by themselves. They are only transferred by direct contact.

When bacteria have the right living conditions they can grow and reproduce quickly. They reproduce by a process called binary fission. The cell grows to its maximum size and then splits into two identical cells.

In optimum conditions bacteria will divide into two every 20 minutes.

After six hours in optimum conditions it is possible for one bacterium to become **260,000** bacteria. Usually there is a lot more than one bacterium present in the food.



## Bacteria - requirements for growth and control:

### 1) Food

Prevent bacteria from contaminating food by keeping the food covered.

Bacteria live and multiply best in food with a neutral pH level and food rich in protein and moisture. For example:

- Meat, poultry and meat products
- Stocks, gravies, stews
- Milk, cream, egg custard

Bacteria do not like:

- Acid foods (pickles, citrus) or alkaline foods (egg whites, soda crackers)
- High concentrates of salt (olives, salted meat) or sugar (jam, sweets)
- Fatty foods (butter, fatty fish)
- Dry foods (flour, biscuits)

*Remember a drop of blood on the cutting board or a crumb in a crack on the table is sufficient food for thousands of bacteria.*

### 2) Temperature

Keep food OUT of the Temperature Danger Zone (TDZ) of 5°C to 60°C as bacteria multiply quickly within this temperature range, particularly at around 37°C (*body temperature*).

**If the temperature is decreased to -18°C (freezing), bacteria are not killed but lay dormant, i.e. they stop multiplying.**

At a temperature of 1°C - 4°C (*normal refrigeration*) bacteria will multiply slowly.



Above 60°C bacteria will gradually be killed. Most bacteria die within 2 minutes in boiling water (100°C). Some begin to form spores at high temperatures.

### **3) Moisture**

Dehydrate (dry out) food to preserve it and make sure all equipment is dried before being stored. Bacteria need moisture for growth. Most foods contain sufficient moisture but foods like dried milk, soup powder and dried egg powder are too dry. Bacteria are dormant in these foods. When any powder is re-constituted, it must be refrigerated.

### **4) Time**

Ensure that bacteria do not have enough time in the temperature danger zone to multiply to harmful levels. A few bacteria alone cannot cause illness but if left to grow in the right conditions they multiply and their sheer numbers make the food poisonous.

High risk food should not be in the danger zone for more than 2 hours; therefore food should be served / eaten as soon after preparation as possible or thrown out.

As a general rule bacteria double in numbers every 20 minutes, therefore millions of bacteria may be produced from one cell within 24 hours if conditions are right. However, because conditions change, that rate of cell division cannot be kept up for long. Often the food supply is used up or the waste products produced by many cells gradually poison the environment.

### **5) Oxygen**

Vacuum pack to prevent some types of bacteria from multiplying and do not use damaged tinned food. All bacteria respire, that is, they get energy by breaking down chemicals, usually sugar. In this sense, respiration differs from breathing.

- Aerobic bacteria need oxygen to grow.
- Anaerobic bacteria do not require oxygen to grow. In fact, some anaerobic bacteria will not actually survive if oxygen is present.
- Facultative bacteria can live in both aerobic and anaerobic conditions. If oxygen is present they often choose to use it.

## **Spores**

Some bacteria but not all, can form spores. A spore forms inside bacteria when conditions get tough. The rest of the cell is destroyed but the spore survives until conditions improve and they form new bacteria.

Spores survive up to 4 hours in boiling water and for years in dried foods. Bacterial spores are resistant to heat meaning they can survive in food when it is cooked. They are also resistant to cold and too many chemicals designed to kill bacteria, such as disinfectants.

## **Pathogens**

Only a few of all the thousands of bacteria are the cause of illness. These are called pathogens. A small number of pathogenic bacteria can be eaten with food without causing any ill effects. Normally they must be present in large numbers to cause illness.

***Food can contain large numbers of food poisoning bacteria, yet look and smell perfectly okay !!***

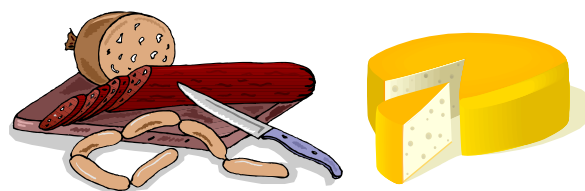
## **Spoilage Bacteria**

Some bacteria spoil food without making it poisonous. The change in odour, taste and appearance of pasteurised milk is due to acids produced by bacteria as they grow in the milk. Spoilage bacteria are not usually pathogenic.

However if food spoilage bacteria have had the chance to reproduce, any food poisoning bacteria which are also present will have had the chance to multiply as well.

## **Useful Bacteria**

Many bacteria have useful functions. They are used in the manufacture of cheese, yoghurt, salami, sauerkraut, antibiotics and vitamins.



# Specific Bacteria Types

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## ◆ Salmonella

A type of bacteria that causes food infection. The infection starts in the intestine as a result of eating food which contains large numbers of salmonella bacteria.

### Transmitted by:

- Animals (chicken, ducks, cats, dogs, rats and mice)
- Humans (faeces, human carriers-*often showing no symptoms*)
- Raw meat and shellfish could contain salmonella

### Foods most likely to be infected:

- Meat, poultry, egg products, shellfish
- Cross-contaminated foods from raw products
- Cracked eggs, eggs covered with faecal matter
- Unpasteurized milk or juice, cheese, contaminated raw fruits and vegetables (alfalfa sprouts, melons), spices, and nuts

### Symptoms include:

- Fever
- Abdominal pain
- Diarrhoea
- Vomiting

Symptoms can occur 12 to 36 hours after the contaminated food is eaten and usually, last 4-7 days. Most people get better without treatment.

### Other consequences:

Symptoms can be very severe. Death can occur in some people, usually due to dehydration. Antibiotics may be necessary if the infection spreads from the intestines to the blood stream.

### Prevention:

- Cook food thoroughly to a temperature at least 75°C on the inside.
- Thaw food completely and quickly before cooking
- Separate raw and cooked food
- Wash hands after going to the toilet
- Wash hands after handling raw meat
- Wash and sanitise all equipment after it has come in to contact with raw meat
- If food is to be eaten cold, cool quickly and place in the refrigerator at 4°C or less
- Never leave high-risk food between 5°C and 60°C for more than two hours
- Eliminate rats, mice, flies and birds
- Keep pets out of the kitchen and away from food preparation areas

## ◆ Campylobacter (jejuni)

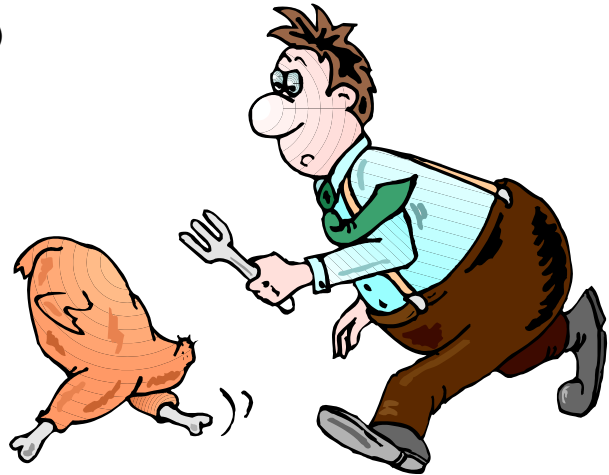
Campylobacter is the type of bacteria that **causes the most reported cases of food-borne illness**. The bacteria cause a food infection which starts in the intestine as a result of eating food with small amounts of campylobacter in it.

### Transmitted by:

- Animals (found in the intestine)
- Raw poultry may contain the bacteria
- Humans (through infected food handlers)

### Foods most likely to be infected:

- Raw chicken
- Unpasteurised milk
- Precooked meats
- Untreated water
- Seafood



### Symptoms include:

- Fever is the first symptom
- Diarrhoea (may contain blood)
- Abdominal pain

The symptoms usually develop 3 to 5 days after eating or drinking contaminated food or drink, but can take up to 10 days.

### Other consequences:

As only small amounts of Campylobacter causes illness, it can easily be passed from person to person or from domesticated animals to people.

### Prevention:

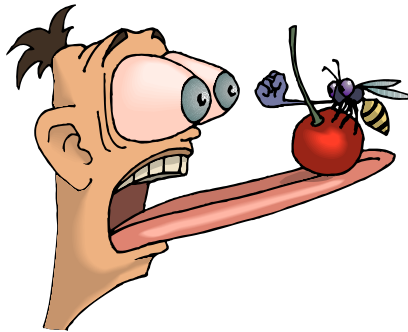
- **Cook food thoroughly to a temperature of at least 75°C on the inside.**
- Clean and sanitise chopping boards and utensils after each use and separate (colour coded) chopping boards should be used for different food types.
- **Wash and dry hands thoroughly after carrying out unhygienic duties.**
- Check food temperatures at critical control points.
- **Use approved suppliers.**
- Thaw food completely before cooking.
- Keep raw and cooked foods separate when preparing or storing.
- If food is to be eaten cold, cool quickly and place in the refrigerator at 4°C or less.
- Never leave high-risk food between 5°C and 60°C for more than two hours.
- Keep pets out of the kitchen and away from food preparation areas.
- Avoid eating raw shellfish.

## ◆ Clostridium (perfringens)

- Toxins are released in to the intestine when large amounts of bacteria grow in food and are eaten
- Bacteria are anaerobic and produce spores that are heat resistant

### Transmitted by:

- Animals
- Humans
- Present on raw meat
- Dirt and dust
- Flies and insects



### Foods most likely to be infected:

- Beef, poultry and gravies
- Reheated meat products that are cooled slowly and not properly reheated
- Foods that have been allowed to cool slowly and then eaten cold

Infections often occur when foods are prepared in large quantities and are then kept warm for a long time before serving. That's why outbreaks of these infections are usually linked to institutions (such as hospitals, school cafeterias, prisons, and nursing homes) or events with catered food.

### Symptoms include:

- Abdominal pain
- Diarrhoea
- Nausea

Symptoms occur 8 to 22 hours after contaminated food has been eaten and last 24 hours or less. In severe cases symptoms may last for 1-2 weeks.

### Other consequences:

Food handlers who do not wash their hands properly after going to the toilet can contaminate food.

### Prevention:

- Use separate preparation and storage areas for raw and cooked food
- Cool cooked food quickly then refrigerate at 4°C
- Avoid cooking food such as stews and casseroles in advance
- Avoid reheating food if possible
- If you do have to reheat food, reheat rapidly to at least 75°C in the centre
- Never reheat food more than once, the risk of food poisoning is very high

Cooking kills the growing *C. perfringens* cells that cause food poisoning, but not necessarily the spores that can grow into new cells. If cooked food is not promptly served or refrigerated the spores can grow and produce new cells.

## ◆ **Bacillus Cereus**

- Aerobic bacteria that produce spores and toxins
- Toxins are released into the food when the bacteria grow in the food
- These bacteria are present in foods and can multiply quickly at room temperature.

### **Transmitted by:**

- Soil
- Dust

### **Foods most likely to be infected:**

- Pre-cooked rice and cereals
- Cooked vegetables
- Cooked and reheated meat dishes
- Sauces and soups and left overs
- Food left too long at room temperature

### **Symptoms include:**

- Nausea & vomiting
- Diarrhoea
- Abdominal pain

Symptoms can occur from 1 to 24 hours (1 to 6 hours for vomiting and 10 to 12 hours for diarrhoea).

### **Other consequences:**

Can be cross-contaminated from raw to cooked food.

### **Prevention:**

- Cool cooked foods rapidly and refrigerate promptly at 4°C or less
- Reheat cereals rapidly, thoroughly and serve quickly. Never reheat rice more than once
- Wash hands before handling raw and cooked food

### **For cooked rice:**

- Prepare in small batches several times during the day
- Hold prepared rice hot above 60°C
- For storage, cool quickly in shallow containers and in small volumes at 4°C or less
- Cook fried rice thoroughly to a temperature of at least 75°C

## ◆ Listeriosis Monocytogenes

Found in soil and water and some animals, including poultry and cattle. It can be present in raw milk and foods made from raw milk. It can also live in food processing plants and contaminate a variety of processed meats.

- Can grow and multiply even under refrigeration
- Withstands high salt conditions and dry environments
- Can survive up to 2 years in soil and dirt
- Anaerobic (can grow without oxygen)

### Transmitted by:

- Humans (infected food handlers)
- Cross-contamination
- Dirty food surfaces and utensils
- Soil and water

### Foods most likely to be infected:

- Pre-cooked and processed meat and unpasteurised milk
- Contaminated vegetables
- Seafood eaten raw



### Symptoms include:

- Mild flu-like symptoms in healthy people
- Fever, stiff neck, confusion, weakness, vomiting, sometimes preceded by diarrhoea
- Can take the form of septicaemia and meningitis with elderly and sick people and babies
- Can cause miscarriages

The incubation period varies from 3 to 70 days.

### Other consequences:

In susceptible individuals the illness can be severe, resulting in a 30% death rate.

### Treatment:

Antibiotics given promptly can cure the infection and, in pregnant women, can prevent infection of the foetus

### Prevention:

- Food prepared more than 12 hours in advance may not be safe.
- Cooking food to an internal temperature of at least 75°C will destroy listeria, therefore canned foods, dry goods and freshly cooked foods are safe. If food is heated in a microwave, it must be heated right through and left to stand for the specified time.
- Re-heat food until piping hot (at least 75°C in the centre).
- Preventing cross contamination between cooked and raw foods.
- It is also killed by pasteurization.

## ◆ **Yersinia Enterocolitica**

- Bacteria non-spore forming
- Sensitive to heat and salt
- In New Zealand there could be up to 3,000 cases a year

### **Transmitted by:**

- Animals (especially pigs)
- Human to human (faecal contamination)
- Contaminated food and water.  
Foodborne transmission appears to be the primary route for infection, estimated at between 41.5 and 71% of New Zealand cases.

### **Foods most likely to be infected:**

- Pork products, beef, lamb
- Milk products
- Seafood
- Tofu
- Has also been isolated from fruit, vegetables, pastries, and sandwiches

### **Symptoms include:**

- Diarrhoea (may contain blood)
- Abdominal pain which can be mistaken for appendicitis
- Fever
- Headache
- Vomiting

Symptoms generally last 2-3 days but duration may extend to 3 weeks.

### **Other consequences:**

Complications can occur in susceptible individuals that may result in meningitis and arthritis.

### **Treatment:**

Antibiotics do not reduce severity or duration of gastrointestinal illness, but are of use in more serious manifestations of the disease.

### **Prevention:**

- Wash hands prior to food handling and eating and after handling raw meat. Prepare all foods in a clean environment
- Cook all meat, especially pork, thoroughly to an internal temperature of at least 75°C
- Protect water supplies from human and animal excreta
- Remove people with diarrhoea from food handling



## ◆ Escherichia Coli (e-coli)

- Bacteria that causes food infection
- Non-spore forming that can survive freezing and refrigeration
- Thorough heating will kill these bacteria

### Transmitted by:

- Animals
- Humans (through faecal contamination)
- Cross contamination

### Foods most likely to be infected:

- Meat, minced beef products
- Apple cider
- Fish
- Vegetables
- Dairy products



### Symptoms include:

- Diarrhoea (may contain blood)
- Abdominal pain
- Nausea

### Other consequences:

Some types of E-coli can be responsible for kidney failure and in some cases, death (usually young children).

### Prevention

- Prevention of cross contamination, especially from raw meat products
- Regular hand washing by food workers
- Adequate cooking of high risk products especially minced meat to an internal temperature of 75°C
- Effective time and temperature management of foods during storage, preparation, transport and display



## ◆ **Staphylococcus Aureus**

- Bacteria which causes intoxication
- Toxins released into food when bacteria grows in food

### **Transmitted by:**

- Humans (found in the nose, throat, ears and hands particularly in scratches, pimples, infected burns or unhealed cuts)
- 50% or more of people could be carriers of this bacterium

### **Foods most likely to be infected:**

- Meats, poultry, etc which are intended to be eaten cold and are touched by hands after cooking
- Custard, caramel creams, fish cakes, etc where hands are used to produce foods
- Ham, corned beef and other slightly salty foods are not able to resist staphylococcus growth and are high risk

### **Symptoms include**

- Severe vomiting
- Abdominal pain
- Diarrhoea
- Collapse

### **Other consequences:**

- Staphylococcus produces a toxin that is not destroyed by normal cooking
- Usually this bacterium gets into food from the hands of a food handler

### **Prevention:**

- Wash hands carefully before starting work
- Wash hands after blowing your nose or touching your face
- Remove jewellery
- Pimples, scratches and burns on the hands should be covered with a waterproof disposable glove. If a glove cannot be worn the food handler should stay home
- Touch food as little as possible with your hands
- Use tongs, spoons, etc
- Rapidly cool any danger foods to temperatures below 4°C
- Never have danger foods between 5°C and 60°C for more than two hours
- Keep the kitchen and equipment clean
- Avoid putting hands on the inside of plates and equipment

## ◆ Clostridium Botulinum

- Small amounts of toxins can cause food borne botulism, a severe type of food poisoning
- The bacteria will only grow if there is no air (Anaerobic)
- The bacteria produces spores and toxins while growing in food

### Transmitted by:

- Found in soil
- Found in meat, fish and vegetables that have come in contact with the soil

### Symptoms include:

- Diarrhoea
- Nervous system is attacked and vision
- Breathing and speech are affected
- Fatigue, headaches, dizziness and paralysis may result

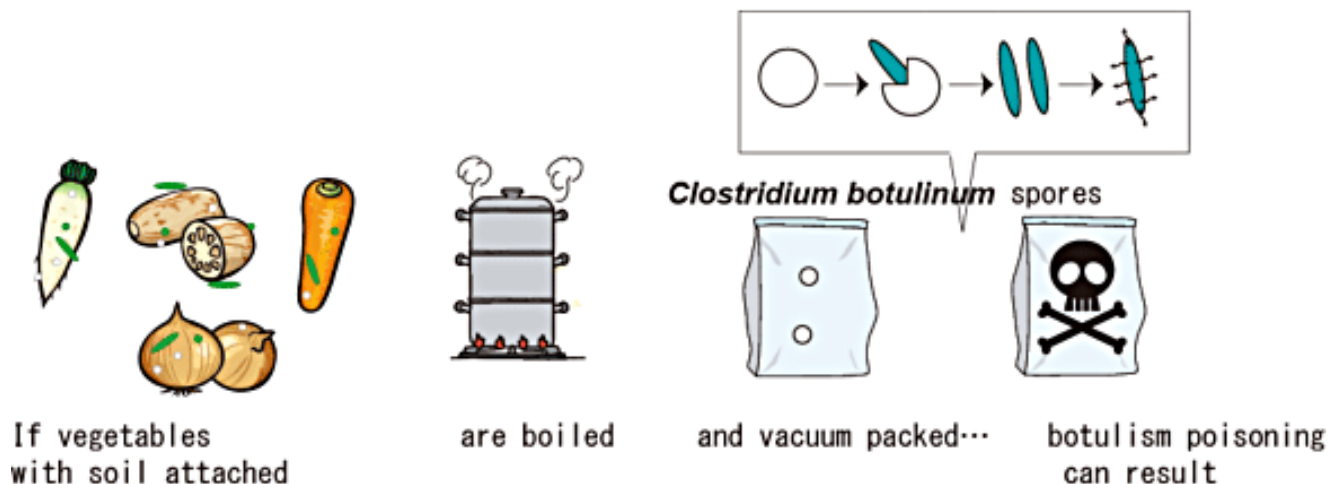
### Other consequences:

- Unless treatment is received in time, death can occur

### Prevention:

- Avoid eating home preserved meat, fish and vegetables
- If home preserving, use a pressure cooker at 121°C for 20 minutes
- Reject any cans that have blown
- Avoid eating raw fermented fish
- Refrigerate foods at 4°C or less
- Botulinum spores do not germinate and produce toxins in strong solutions of sugar, salt and vinegar

However these preventative methods have no effect if the spores have already started producing toxins.



## ◆ Cryptosporidium & Giardia

Cryptosporidium (pronounced crip-toe-spor-idium) and Giardia (pronounced gee are dee a) are parasites found in the gut of birds, fish, reptiles (e.g. geckos and turtles), humans and animals such as cattle, sheep, cats and dogs. They are passed on in the faeces of infected animals and humans. Both are widespread in New Zealand and are **most commonly found in water and fish**. The parasites can live in the environment for long periods, especially in water environments - lakes, rivers, streams and roof water. These parasites are hard to kill. They cause illness through dehydration as a result of diarrhoea.

### **Transmitted by:**

- Contaminated water and food
- Contact with infected animals or humans

### **Common signs and symptoms of the illness:**

- Diarrhoea (often watery)
- Stomach cramps and abdominal pain
- Lack of appetite
- Weight loss

### **More rarely:**

- Nausea and vomiting
- Fever
- Flatulence (wind)
- Fatigue

### **Other Consequences:**

- Symptoms appear between 2 and 14 days (usually 7) after becoming infected
- Illness may last for two weeks or more
- Faeces may remain infectious for several weeks after the symptoms have gone
- Some people may be infected but not develop any symptoms at all
- The infection may be prolonged and life threatening to people with a weakened immune system

### **Treatment:**

- For advice and testing you will need to visit your doctor.
- Currently there is no effective treatment. However, the doctor may prescribe medication to help relieve symptoms. Drink plenty of safe fluids while the diarrhoea lasts, to prevent dehydration. Follow your doctor's instructions.

### **Taking time off work:**

- Usually people can go back to work and children can return to early childhood centres and school when the symptoms are gone. However as cryptosporidiosis is a notifiable disease you will need to check with your doctor or public health office first.
- If you are working with food or employed in a hospital, rest home, school or early childhood centre you may be required to stay away from work until you are tested free from infection.

**Prevention:**

- If sick stay home if you work with food and get a Doctors clearance before returning to work.
  - Wash your hands thoroughly by using plenty of soap, cleaning under fingernails, rinsing hands well and drying on a clean towel before and after preparing food, and after going to the toilet.
  - Use water from an approved source, or if drinking water is taken from the roof, rivers, lakes etc. should be boiled for one minute or an approved filter (Standard AS/NZS4348: 1995) should be used.
  - Help keep the environment free of Giardia when tramping and camping;
    - √ Use toilets when they are provided. When no toilets are provided bury toilet waste and paper at least 50 metres away from any water source such as rivers and lakes
    - √ Do not wash your hands directly in the water. Instead, collect water, wash your hands in it and then drain it into the ground away from the water source. Washing hands in hot soapy water and drying them with a clean towel will help prevent the spread of cryptosporidium
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# Food Allergies

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**Food allergy** is an abnormal response to a food triggered by your body's immune system and should not be confused with a food intolerance or other non-allergic food reaction.

**Food intolerance** refers to an abnormal response to a food or additive, but it differs from an allergy in that it does not involve the immune system. For example, people who have recurring gastrointestinal problems when they drink milk may say they have a milk allergy, but they really may be lactose intolerant.

One of the main differences between food allergies and food intolerances is that food allergies can result in an immediate, life-threatening response called anaphylactic shock which can **result in death – it is very serious.**

The foods that most often trigger allergic reactions are:

cereals, shellfish, eggs, fish, milk, nuts, sesame seeds, peanuts, soybeans, sulphites, wheat, and bee products such as royal jelly, pollen and propolis. These foods are responsible for over 90% of serious reactions.

## **Avoid Cross Contact:**

Make sure food doesn't get contaminated with small amounts of an allergen from surfaces, utensils and equipment that have been used to prepare other foods, Ensure that clothing is clean and thoroughly wash your hands.

- Prepare food containing different allergens in separate areas using separate equipment and utensils. If this is not possible, then thoroughly clean all equipment and utensils to be used before preparing the food.
- Do not fry food in oil that has previously been used to fry food containing an allergen.

**Service staff** – if told by a customer that they have a particular allergy check with all kitchen staff that the dishes being order do not contain any ingredient the customer is allergic to and that no cross contact has occurred, for example a spoon used for peanut butter was not then used to prepare another dish.



Some people have severe allergic reactions to certain foods and if eaten it can cause swelling which can block their airway and cause death. Therefore, it is important to inform customers if the foods you serve contain any of these products, or are cooked with traces of these products (e.g. peanut oil).

If you are told by a customer that they suffer from an allergy, talk to them about which menu items may be appropriate for them to order. If you are not confident that you can produce food for them safely don't. It is better for them to eat elsewhere than risk an allergic reaction.

## **Allergic reactions can be linked back to the Health & Safety in Employment**

**Act 1992.** Staff must have product knowledge and know about the ingredients in a product. It is not good enough to guess. If a staff member is in doubt, they must check with the kitchen or supervisor as a customer could potentially die if their allergic reaction is severe enough. It is the responsibility of Management to train staff to ensure they are knowledgeable about food safety and what ingredients are in the food being prepared for customers.

## **If you think a customer is having a severe allergic reaction:**

- Immediately ring 111 and ask for an ambulance with a paramedic straight away;
- Immediately explain that your customer could be having an allergic reaction.
- Identify what led to the customer's allergic reaction.

# Preservation Methods

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Bacteria can be controlled by killing them or affecting the speed of their growth. The following methods are the most common ways of preserving food, to prevent it being spoiled by bacteria.

<b>Temperature control</b>	Freezing will stop bacterial growth whereas chilling will only slow the growth. Neither method will kill bacteria. Heating food above 60°C will start to kill bacteria, <b>boiling food at 100°C will kill bacteria.</b>
<b>Vacuum packing</b>	The removal of air through vacuum packing will prevent most bacteria from growing however some bacteria are anaerobic and can grow without air. Vacuum packing will also prevent cross contamination.
<b>Salting</b>	Adding salt to food makes it too salty for bacteria to grow and also dehydrates the food.
<b>Dehydration</b>	Removing moisture from food makes it too dry for bacterial growth.
<b>Smoking</b>	Burning wood releases chemicals into the food, which kills bacteria, as does the heat which is released during smoking.
<b>Crystallisation</b>	Adding sugar to food by soaking food in sugar syrup, then drying it until the food is full of sugar makes food too sweet for bacteria to grow.
<b>Pickling</b>	Pickling food in a high acid solution of vinegar will stop bacteria from growing.
<b>Canning/Bottling</b>	Certain foods can be preserved by sealing in an air-tight tin or bottle which is then heated to high temperature to kill micro-organisms. Once opened or dented with a hair line fracture the food is at risk of spoiling quickly if not stored in the right conditions.
<b>Irradiation</b>	Frequency radio waves or ultra violet light micro-organisms are killed. Many pre-packed foods are preserved by this method including vacuum packed soups and sauces.

# Specific Virus Types

Viruses are passed from humans to food, then on to humans again. They are highly contagious and can be spread by coughing, sneezing or blowing your nose etc, around food. It is vital that all food handlers wash their hands after going to the toilet, blowing their nose and smoking. If a food handler has been sick or is suffering from an illness they should not return to work until they are completely well so they do risk passing on their virus or illness.

Common viruses are; Colds, Flu, Norovirus and Rotavirus.

- Viral food poisoning - possibly up to 50% of food poisoning is caused by viruses.
- Viruses do not grow in food. Food acts as a vehicle for transferring them to living (human) cells where they cause illness. The viruses are passed in the faeces of infected persons. People get infected by swallowing faeces -contaminated food or water.
- Food borne viruses are sensitive to ionising radiation, UV, acids, freezing and drying.
- Viruses are resistant to some disinfectants, e.g. phenols and quats but sensitive to others, e.g. chlorine, iodine and ozone.

## Food most likely to be infected

Any food can be affected but the following are the most vulnerable;

- Oysters, clams, mussels
- Food prepared by infected handlers and not thoroughly cooked

## Prevention

- Do not work with food if you are ill
- Heat or cook food thoroughly
- Pasteurisation is effective in most cases
- Prevent contamination from faeces
- Buy shellfish from approved sources

## Common Viruses

Virus	Common Sources of contamination	Foods Commonly Affected	Methods used to control the source and spread of the illness
<b>Norovirus</b>	Poor hand hygiene.	Any food requiring a high level of handling during preparation	<ul style="list-style-type: none"> <li>• Wash &amp; dry hands thoroughly before starting work.</li> <li>• Minimise the number of times foods is touched with hands by using spoons, tongs and ladles.</li> <li>• Keep kitchen and equipment clean and sanitised.</li> </ul>
<b>Cold / Flu</b>	People coming to work when affected by cold/flu. People coughing & sneezing around food.	Any food handled by the sick person	<ul style="list-style-type: none"> <li>• Stay away from work to avoid passing on the infection.</li> <li>• Use paper tissues to blow nose, placed used tissues in the rubbish bin and immediately wash hands using the correct procedure.</li> </ul>
<b>Hepatitis A</b>	People with Hepatitis A preparing food – it can be passed by poor hand hygiene.	Any food handled by person with the virus	<ul style="list-style-type: none"> <li>• Allow follow the correct hand washing procedures after using the toilet.</li> <li>• Do not allow people with the virus to prepare food for others.</li> <li>• People working in a food business who have the virus must have a clearance from their Doctor and the Ministry of Health before returning to work.</li> </ul>

# Preventing Cross Contamination

## Methods Used to Prevent Cross Contamination of Foods

Preventing cross contamination should be a food handler's priority in any food preparation area. We should presume that all food, every piece of equipment and every person who works with food, is a source of contamination.

Cross contamination happens when harmful bacteria are transferred from a food, a person or a place to another food, person, or place. There are five common sources of cross contamination, these are;

### 1) People and their Personal Hygiene Standards

People cause cross contamination. Harmful bacteria live in and on our bodies, especially on and around our faces, hands, hair and on our clothing.

As they are usually present in small numbers they do not make us sick. If these bacteria are transferred from our bodies or clothes onto food and allowed to multiply, the food becomes unsafe to eat.

Personal hygiene has a special meaning for food handlers. Normal unconscious body habits such as scratching an itchy nose, face, hair or body generally don't

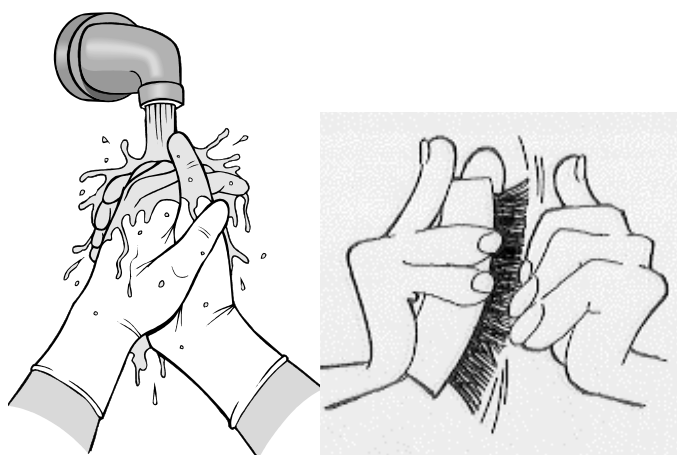


create any problems in normal life but can lead to a catastrophe when handling foods.

As our bodies are perhaps the biggest single source of bacteria in the kitchen it is important that we take our own standards of personal hygiene very seriously.

**Cross contamination from a food worker to food is the most common cause of food borne illness.** Human skin is never free of bacteria. Skin has all the right ingredients for bacteria to grow; moisture, protein, medium p.H. and warm temperature. The same statement is true for the mouth, nose, eyes, throat and ears.

**For this reason the basic practice of hand washing is perhaps the most important action you can take to prevent food borne illness.**



Food establishments are required by law to supply hand washing facilities close to the place of work. They should be conveniently located near rest rooms as well as next to food preparation areas and wherever they are needed. These basins should be used for hand washing only and must have a supply of warm running water, soap and a sanitary means of hand drying, such as disposable towels or an air drying device.

- **Do not dry your hands on a towel used by anyone else.**
- **Do not wash your hands in a food preparation sink.**

Gloves can cause cross contamination just like hands. Even if you wear gloves you and all workers must wash your hands thoroughly before putting on the gloves and handling or serving food.



**You must also wash your hands and change your gloves after any action that might cause contamination;** e.g. after using the toilet, smoking, coughing, sneezing, touching your body, handling raw poultry or meat, picking up objects from the floor, answering the telephone, handling money or soiled dishes.



**In addition to hand washing, be careful about touching soiled objects including clothing.** Do not wipe hands on your apron or tea towels. Aprons are a means of clothing protection only. When you wipe your hands on the apron and leave food particles, bacteria begin to multiply on the cloth. The next time you wipe your hands on the apron, they become contaminated.

**Hands and fingers should be kept away from faces, noses, mouths and hair.**

**Fingernails should be kept short and clean.** Micro organisms caught under long nails can get into food that is being prepared.



**Note :** Rings, bracelets, watches and other jewellery trap micro-organisms and are very difficult to keep clean. The best way to prevent contamination in food service from jewellery borne micro-organisms is not to wear jewellery when handling food.

No enamel fingernail polish should be worn as it can chip off and contaminate food.

## 2) Handling Procedures

How we handle and process food is a vital part of the chain. The equipment that we use is a source of cross contamination. After equipment has been used, fragments of food containing bacteria remain on it. If not properly cleaned, bacteria will be transferred to another food, when that piece of equipment is next used. Bacteria live and multiply in any cracks and crevices on equipment. Bacteria also live and multiply inside surface cuts on chopping boards.

When storing food we should be extra careful to cover, date and label in order to prevent cross contamination.

### **If you cut yourself while preparing food:**

A fresh cut can be a possible source of contamination from blood and other bacteria and virus. The wound is also at risk of becoming cross contaminated with bacteria from raw food etc, which can lead to serious infection and time off work.

1. **Clean and dress the wound with a water proof dressing**
2. **Wear a disposable glove if necessary**
3. **Check all equipment for signs of contamination, clean and sanitise**
4. **Check all food for possible contamination and if any, destroy food**
5. **Inform your supervisor of accident**
6. **Fill in the accident register if required by your work place policy**

Disposable gloves are only as good as you are. If you touch your body or raw food, bacteria will be on the gloves and can be transported to the next food product you touch. Gloves should be changed often and used with care.

### 3) Cleaning and Sanitising

Safe food service is only possible with a clean and sanitary environment in which to store, process and serve foods. Keeping equipment, utensils and work areas clean and sanitised is an important part of preparing safe food. Proper housekeeping practices reduce the risk of both chemical and physical contamination. Cleaning and sanitising procedures reduce the risk of biological contamination.

Cleaning alone is not enough to maintain a healthy food service area. Even when dirt and food particles have been removed from food contact surfaces they are not ready to use. You must sanitise to kill bacteria that could contaminate foods you prepare and serve. Washing with detergent and hot water helps destroy some bacteria, but sanitising with heat or chemical agents after cleaning does much more.

**Cleaning removes the visible dirt and sanitising kills the bacteria.** You can reduce bacteria to safe levels using proper cleaning and sanitising techniques.

Equipment and food surfaces come into contact with bacteria and dirt all day long. Wash, rinse and sanitise equipment and surfaces thoroughly and often, preferably every time they are used.



#### Manual Cleaning and Sanitising:

- ◆ Surfaces used in preparing food, for example bench tops, should be thoroughly cleaned with hot water, detergent and a sanitising agent.
- ◆ You must give special attention to rough surfaces, open seams and sharp angles. Make sure that mincers and meat slicers get special attention.
- ◆ Chipped, cracked or damaged crockery must not be used as it cannot be cleaned satisfactorily.

### 4) Procedures for Pest Control

Rodents, birds and insects can cause health hazards and economic problems by contaminating food.

The best way to prevent rodent and insect infestations is to eliminate their sources of food, water and shelter by keeping the kitchen area well organised, clean and sanitised. Keep all rubbish bins closed and have them emptied and cleaned frequently.

Check all openings/entry-points to your building and check all food deliveries for possible contamination. Small holes in doors or larger than necessary holes for pipes etc will provide access to all sorts of pests.

Keep the outside of your building clean and well maintained. By keeping the surrounding area clean, as dry as possible and the weeds and rubbish controlled, rodent and insect infestations are minimised.

Protecting food from rats, mice and insects needs constant attention. They all multiply quickly and spoil far more food than they eat, because they are carriers of pathogenic bacteria. They harbour bacteria in their mouths, intestinal tracts and carry them on their feet and bodies, eventually putting them on food, equipment and surfaces.

#### Types of pests that contaminate food:

- Flies
- Ants
- Rats and mice
- Birds
- Cock roaches
- Weevils
- Cereal mites
- Domestic animals such as cats and dogs



### **Basic Pest Control Measures:**

The best way to prevent pest infestations is to keep them out, however since insects and pests have many ways of getting into food premises, the task is endless.

- Check your building for entry points and the outside for breeding grounds.
- Always check incoming goods for possible contamination, refuse any contaminated food.
- Store all food in the proper manner, sealed, labelled containers etc.
- Keep all food storage and food preparation areas clean and sanitised.
- Keep a constant vigil for signs of insect or rodent presence.
- If you discover a infestation seek professional help immediately.

### **4) Waste Management Procedures**

Every food premise produces waste. Waste is stored temporarily prior to its disposal. Much of the waste created is food scraps which are a source of food for bacteria, insects and rodents. Food scraps rot quickly and can cause strong odours.

Packaging can also harbour bacteria, rodents and insects. Waste must therefore be removed from the food environment regularly and promptly. The following are guidelines recommended for controlling waste.

#### **Wet Rubbish**

Should be removed from premises daily and the container washed and sanitised thoroughly. The container should then be left upside down to air dry.



If wet rubbish cannot be removed on a daily basis it should kept at a temperature below 4°C.

All containers that might be used for storing wet rubbish, such as a pig bucket, should have tight fitting lids and again must be thoroughly washed and sanitised after being emptied.

A paved yard area must be provided where this type of operation can take place safely.

#### **Dry Rubbish**

Should be stored in suitable containers fitted with lids.

Do not use any raw material packaging, e.g. cardboard cartons, for the storage of any food products.

Dispose of all raw material packaging immediately upon opening.

#### **Yard Areas**

Should be kept clean and tidy. Ensure that areas designated to the storage of waste are controlled and included in the cleaning schedules.



# Controlling Bacterial and Fungal Growth in Food

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## Methods used to kill or control the growth of bacteria and fungi in food:

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### Purchasing Food

To reduce the level of contamination on raw material entering your premises;

- Purchase from reputable food producers/suppliers
  - Set specifications for the food you buy, (quality, size, delivery times)
  - Ensure food is transported and delivered under the correct conditions
  - Assume all raw food contain harmful bacteria
  - Arrange to inspect the premises of your suppliers on a regular basis
  - Organise testing programmes for bacteria with suppliers for agreed product to test levels of contamination
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### Food Delivery and Receipt



This is an important stage of bacteria reduction. Only by maintaining a constant vigil can we attempt to control or limit the amount of bacteria that enters our food processing areas.

- Have somebody available to receive and check food products as they arrive
- Check temperatures of chilled and frozen products, rejecting food above maximum allowable limits
- Where possible, remove food from outer packaging and bags
- Check individual packages and reject goods which may be contaminated
- Separate fresh and frozen, raw and cooked foods, especially meats

- Reject damaged goods, look for swollen, dented cans, split packages and dirty or cracked eggs
  - Always ensure that goods are stored in the appropriate areas as soon as possible
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### Storage

Once food has been checked for the right quantity, quality and that it meets the required specifications, it must be transferred to the correct storage area as quickly as possible in order to prevent possible rapid growth of bacteria.

- Store at correct temperatures (coolrooms between 1°C and 4°C, freezers at -18°C)
  - Allow for stock rotation. Date code food/ingredients to assist in older stock being used first.
  - Store all foods above ground level to avoid contamination and allow for effective cleaning
  - Store all cooked foods above raw foods, allowing for separation of different foods types and to prevent any dripping from raw to cooked
  - All foods require covering including frozen foods
  - Store foods well away from any source of chemicals
  - Keep storage areas free from dirt, dust and pests and include these areas in all cleaning programmes
  - Do not over load freezers and refrigerators
  - Always allow adequate air circulation in cool food and dry goods area to prevent a build up of moisture
-

## Preparation

**A high standard of personal hygiene** should be observed. Avoid unnecessary human contact with the food by using tongs, forks or disposable gloves as a barrier between the food and the food handler.

**Clean and sanitise as you go** rather than leaving for the end of the day, as bacteria grow continually on food particles at room temperature and can be transferred onto other food being prepared (cross contamination).

**Do not use the same equipment or surfaces (e.g. knives and cutting boards) for both raw produce and cooked produce** or even for different food items, as cross contamination will occur. Work quickly at room temperature, returning perishable ingredients to the refrigerator immediately after they have been used. If you are unsure of the quality of the food remember – if in doubt, throw it out.

**Store raw and cooked product in separate areas**, or cooked at the top and raw at the bottom. When storing food it should always be **covered, labelled and dated**.

### Other important points:

- Don't allow pets access to the food processing area.
- Don't put tasting utensils back into the food.
- Don't smoke around food.
- Be very conscious of body habits around food items.
- Do not sit on food preparation surfaces.
- Wash your hands often.
- If using disposable gloves change them often and use with care as they are only as good as you are.
- Don't wipe your hands on tea towels, wiping cloths or aprons. Instead wash them in the designated hand basin and dry with a disposable towel or air dryer.

### **Note:**

High risk foods must be prepared quickly, and either cooked and served immediately or refrigerated until cooked or served.

The risk of cross contamination while food is being prepared is high, so all care must be taken. Prepare food as quickly and as close to the serving time as possible. Raw food can easily contaminate cooked food.

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## Cooking

Cooking foods to required temperatures will destroy bacteria. Do not judge if food is done by look or touch, or by the temperature of the oven. The internal temperature of food being cooked must be checked in the thickest part of the food.

- The internal temperature of high risk foods including rolled roasts, minced meats, poultry and hard boiled eggs must reach at least 75°C during cooking. Cook mince, sausages, whole chickens or stuffed meats right through to the centre. You should not be able to see any pink meat and the juices should be clear.
- Cook steak, chops, solid joints of meat and whole cuts of red meat to your preference as food poisoning bacteria are mostly on the surface and will have been destroyed. Cook fish until it flakes easily with a fork.
- Soft cooked eggs, e.g. scrambled or poached and any products that contain soft cooked eggs such as Hollandaise sauce, will not have been cooked enough to kill all harmful bacteria present. To prevent further growth of bacteria in these foods they must be held above 60°C and served within the hour.
- Stir large quantities of food frequently during cooking to distribute heat evenly, ensuring all food is cooked thoroughly.
- Check internal temperatures using a hand held probe thermometer, which has been sanitised between each use, to determine the internal temperature of a sample from each batch of food cooked. Record the results.

## Cooling

Food prepared in advance which is not cooled properly causes more food poisoning than anything else. This is caused by either inadequate cooking and/or cross contamination, followed by time temperature abuse. After cooking, if food is re-contaminated with harmful bacteria, they will multiply rapidly if the food is not cooled quickly.

- Cool food as quickly as possible.
- A deep bucket of hot food will still be warm in the centre after 24 hours. Place food in shallow containers no more than 10 cm deep. Put containers into iced water or ice and stir frequently before placing in the refrigerator.



- Do not over crowd the refrigerator, as it will not be able to maintain the maximum temperature of 4°C it needs to remain safe for the other food in it.
- Check the temperature of cooling food with a temperature probe to see that it has reached the required temperature drop.

## Reheating

Bacterial growth can occur during reheating so care must be taken to reheat as quickly as possible to avoid this happening.

- Reheat food as quickly as possible to at least 75°C.
- Thoroughly reheat food *before* transferring it to a warmer or hot service counter. This equipment is designed for holding food at a temperature, not heating it, therefore should not be used to do so.
- Check internal temperatures with a temperature probe.
- Test a sample from each batch of food cooked and record the results.

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## Holding Food for Service or Sale

Never allow prepared food to sit around in the danger zone. Hold perishable foods in either a refrigerated cabinet at 4°C or below, or in a hot cabinet which keeps food above 60°C. Refrigerator temperatures will soon rise above 4°C if the doors are opened often. If the doors of a pie warmer are left open or lids are not kept on food containers, food temperatures will soon drop below 60°C. Adjust your settings to accommodate for this.

- Check and record both equipment and food temperatures regularly
  - Have hot holding equipment repaired or replaced if it is unable to maintain food at the correct temperature
  - Discard any food which has been held for more than 2 hours within the danger zone (between 5°C and 60°C)
  - Foods made of a combination of raw and cooked ingredients should be held in a refrigerator for no more than 24 hours
  - Supervise to ensure that correct procedures to avoid cross contamination are followed
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## **Selling or Service**

Cold perishable foods should be displayed in a refrigerated cabinet at 4°C or less.

If you do not have a refrigerated cabinet, only display small quantities of food at a time. Replace when necessary from your kitchen refrigerator or prepare another batch.

- Use a temperature probe to check that hot food remains above 60°C
- Only display the amount of food you expect to serve or sell within two hours. To avoid wasting food, use past sales as a guide
- Cover all food
- Display food in:
  - an enclosed display cabinet
  - in a container with the lid on it
  - under a sneeze guard
  - wrapped in a plastic film

This will prevent customers or staff from touching, breathing, sneezing or coughing over the food. Do not display food in open windows, or covered with cloths as they are likely to cause cross contamination

- Avoid self service if possible. When customers serve themselves they may touch your food. If you use self service, do not let customers handle the food offered for sale with their fingers. Provide plenty of clean serving utensils and encourage customers to use them. Change the utensils often
  - Never handle food with unwashed hands. Money, the telephone, order pads and the like, can be very dirty. If you are handling these, make sure you always wash your hands thoroughly before handling any food or equipment which will touch food
  - Clean and sanitise all serving equipment and surfaces on a regular basis
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## **Left Over and/or Unsold Food**

All high risk foods if not eaten or sold within 24 hours must be thrown out. Foods such as soup and products containing fish, poultry, meat, eggs and cream if not served or sold by the end of the day must be thrown out.

Only non-perishable and semi-perishable foods such as plain cakes, biscuits, fruit and cheese are safe to re-use.

- Cover and date all left over or unsold food before storage
  - Minimise left over or unsold high risk foods by using previous sales figures as a guide to predict how much to prepare
  - Check the refrigerator daily for leftovers and remove all those which should be thrown out
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# Developing a Food Safety Programme including HACCP



## The BIG question is always:

*“What’s in it for me? Why spend time and money developing a food safety programme for things that I am already doing. Isn’t my food safe now?”*

Sure, it might be most of the time but can you guarantee that everything you produce has that bubble of safety over it. If you haven’t got checks and balances organised properly you can’t say that your food is *always* safe.

## “How do I develop my Food Safety Programme?”

You are the best person to plan your food safety programme. You know your business better than anyone. You can choose to develop a programme from a code of practice or from scratch, however some expert technical advice may be required to help you identify hazards and the necessary controls.

Internationally, it is recognised that the ideal tool to give assurance of food safety is the **Hazard Analysis Critical Control Point (HACCP) system**.

## What is HACCP?

HACCP (pronounced Hassip) is a food safety system that requires you to identify hazards and control them at each step of production. These critical control points include:

- Purchase
- Delivery
- Storage
- Preparation
- Cooking
- Reheating
- Serving
- Selling



The system also requires answers to key questions about the safety of the food related to:

- The type of business
- The food safety hazards associated with the business
- The cause of those hazards
- How to control or remove those hazards
- How to show that hazards have been controlled or removed
- What to do if things go wrong
- Systematically identify the hazards involved in the preparation of food at the premises or in any vehicles
- Identify how those hazards will be monitored
- Identify the means by which those hazards will be controlled, and provide for the systematic supervisions of those controls
- Identify the food preparation tasks or categories of tasks that will be carried out and identify, in relation to each task or category:
  - The skills required to perform the task
  - The persons or categories of persons who will perform the task
  - The training and instruction necessary before the task can be performed and any ongoing



training and instruction that may be required

- Identify regular maintenance tasks that must be carried out in relation to the premises or vehicle concerned and in relation to any equipment used in the premises or vehicle
- Provide for compliance with the programme to be audited, on a regular basis, by an approved auditor
- Provide for the recall of unsafe food
- Set out appropriate record-keeping requirements

Once you have the answers to these key questions, applied the key controls that have been identified, and kept these controls in place, you have a food safety programme.

### **Meeting the Legislative Requirements in a Food Business**

Food Safety legislation requires a food business to look at food handling processes to ensure all hazards are identified, managed and controlled and to document, follow and review their food safety program. A HACCP system gives the food business the means to meet these legislative requirements.

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#### **The 7 principles of the HACCP system:**

- 1. Identify hazards, assess risk and list controls.**
- 2. Determine critical control points.**
- 3. Establish critical limits.**
- 4. Establish monitoring systems for control points.**
- 5. Establish corrective actions.**
- 6. Establish verification procedures.**
- 7. Establish record keeping.**

#### **Identifying and Controlling the Potential Hazards**

It is important to be able to identify the possible biological, chemical and physical hazards that can occur at every stage of every process within the food business, from delivery, processing, manufacture, storage and distribution, until the point where it is sold to the customer and eaten. As much as possible you should also

consider how the customer may handle your product.

The control methods will vary hugely depending on the nature of the hazard identified.

If the control is deemed to be critical to the safe production of food, a measurement or checking mechanism will be required.

This could be; an observation, recording a temperature or measuring a timeframe.

For example suggested controls at the point of delivery could include all or some of the following: temperature check of product being received, physical examination for damaged packaging and expiry dates and the delivery area being kept clean and tidy (rodent free).

### **Principal 1 :**

#### **The Main Hazards to Food**

**This involves identifying the possible biological, chemical and physical hazards that occur at all stages of the food business from production to service.**

As we have discussed earlier in this paper they are;

#### **Micro-biological hazards such as**

Bacteria and viruses that are capable of causing illness and that grows or may be carried on food. Well known examples are Campylobacter etc.

#### **Chemical hazards**

Examples include excessive or toxic amounts of heavy metals, chemicals, pesticides, herbicides, insecticides etc. Some hazards may be naturally present such as Solanine in green potatoes.

#### **Physical Hazards**

Objects that get into food or are already present in food may cause illness, injury or distress to the person eating it. Examples may include; pieces of glass, hair, insects and such like.

Once the hazards are identified, the next step is to work out the likelihood of them happening and then deciding on appropriate preventative measures for their control.

## **Principal 2 :**

**Control points need to be identified – they are the places in the chain where it is possible to control or remove hazards.**

**Critical control points need to be determined – they are where the hazard must be controlled.**

### **Control Points**

There are two types of control points;

- a) points in the food processing chain where it is possible to control or remove hazards
- b) points in the processing chain where it is *essential* to control a hazard, usually because there is no later step at which to establish control – these are known as Critical Control Points

Once all the possible hazards are identified, decide exactly where in the process the control points are, then decide which of the control points are *critical*. This means identifying whether it is the essential step at which to control an identified hazard. Bear in mind that different types of hazard may have critical control points at different steps in the process.

## **Principal 3 :**

### **Establish Critical Limits**

**Decide at what point the control of a hazard moves from being acceptable to unacceptable.**

After each control point is identified, decide how to check whether it is under control during processing. This may be by observation or by measurement, such as time and temperature.

## **Principal 4 :**

### **Establish a Monitoring System**

**Work out what, how often and how results from monitoring will be recorded.**

To be sure that the critical limits are always effective, it is important to set up a system to monitor and record control at the critical control point.

The monitoring system must ensure any loss of control at the critical control point can be discovered in time to take corrective

action before the product is rejected. Information obtained from monitoring must be assessed by someone who has the knowledge and authority to carry out corrective actions when needed.

Quick on the line chemical and physical measurements and observations are better than microbiological tests that take time to analyse. Usually simple time and temperature records are sufficient. Often all that is needed is a system to record observations. All records and documents must be signed by the person doing the monitoring and by a responsible reviewer of the business.

## **Principal 5 :**

### **Establish Corrective Action**

**Decide what corrective action needs to be taken when monitoring shows a particular critical control point is out of control.**

You may need to think about reprocessing or dumping the affected product.

Take corrective action to bring the process back under control before the problem leads to a safety hazard. Document all corrective actions in your HACCP records.

## **Principal 6 :**

### **Establish Verification Procedures**

**Once the HACCP system is established, set up procedures to check that the system works.**

Examples of verification include:

- Reviewing the HACCP system and its records to ensure that controls are effective
- Reviewing corrective action reports to ensure that the corrective actions are effective
- Occasional testing to demonstrate that control has been maintained

## **Principal 7 :**

### **Establish Records and Documentation**

**Decide how records will be kept and where.**

The level of documentation required will depend upon the needs and the complexity of the food business. In a small business a simple log-book or diary may be all that is

needed. If your business is bigger or more complex, more detailed or formal documentation will be necessary.

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### **Other things to consider when developing your food safety programme:**

It is important that you consider all the possible hazards to food safety in your business. The following headings may help you with this:

#### **The raw material**

Prevent the introduction of hazards during the production, handling and supply of raw materials. This includes ingredients, packaging, water and anything that may come into contact with the product.

Where possible, your suppliers should have a food safety programme to demonstrate their control.

Set specifications for all material supplied.

Consider:

- Characteristics of raw materials and products
- Hygienic production of raw materials
- Processing, handling, storage and transport
- Cleanliness of surroundings, equipment and staff
- Receiving

#### **The buildings**

To control hazards properly, ensure your premises are designed and built to be hygienic, that they are in a suitable place and have the necessary facilities. Control the entry of insects, birds and rodents.

Consider:

- Location of premises
- Entry points of pests
- The design and layout of rooms and equipment
- Food control and monitoring devices such as probes

#### **Controlling the operation**

To reduce the risk of unsafe food, take preventative measures to protect the safety of food at suitable stages of operation.

Consider:

- Control of hazards
- Recipes
- Temperature control
- Packaging

#### **The premises and equipment, cleaning and maintenance**

Set up systems to establish control over such things as the safe effective cleaning and sanitisation of all surfaces and fittings.

Give special regard to contact surfaces, equipment and utensils.

Consider:

- Maintenance and replacement
- Cleaning methods and procedures for external areas
- Cleaning programmes for all internal surfaces; walls, floor, ceiling etc.
- Pest control systems

#### **Training the staff**

Training is critical to any food safety system. Poor staff training in food hygiene is a real threat to the safety of the food. Staff must understand how and why a food safety programme is essential to the operation.

Consider:

- The level of staff awareness
- Supervision of existing staff
- Induction of new staff
- Basic personal hygiene
- Protective clothing
- Refresher training

#### **Transportation and storage of food**

Unless proper control measures are taken during transportation and storage, food may not reach its destination in a fit state. Establish controls over hazards.

Consider:

Transportation and storage that;

1. Does not contaminate food
2. Is easily cleaned
3. Allows food to be separated
4. Maintains critical temperature