



Level 4 Award in Managing Food Safety

“For The Journey”





HYGIENE SUE
Where learning comes to life

ABOUT HYGIENE SUE

Accredited Training Centre

Hygiene Sue is an accredited training centre and provider of Highfield food safety and teacher training qualifications, progressing from entry level to the highest level of professional achievement. It is recognised by employers and learning providers throughout the UK.

The Team

The team at Hygiene Sue comprises a friendly, confident and enthusiastic group of trainers who are determined to inspire and encourage learning. "Simply, you learn better when a subject matter is brought to life". The trainers bring lessons to life with case studies gained from industry knowledge and experience. With user-friendly learning books and presentation materials in many different languages, lessons are designed to be as inclusive as possible.

Policies and Procedures

Hygiene Sue fully supports the principles of equality and diversity, safeguarding young people and vulnerable adults and the right to a fair assessment. We are committed to satisfying these principles in all our activities and published material. A copy of our policies and procedures are available on the Hygiene Sue web site, www.hygienesue.co.uk

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Food Safety - Vocabulary

Food safety	The protection of consumer health and well being by protecting food from anything that can cause harm
Food Hygiene	The prevention of food poisoning and premature spoilage of the food. A combination of clean premises and good practices: - preventing contamination - preventing multiplication of bacteria - destruction of bacteria
Hazard	Anything that causes harm to consumers or Customers
Contamination	<i>The transference of any objectionable material into or onto food.</i> <i>There are three categories of contamination:</i> <i>Microbiological</i> <i>Physical</i> <i>Chemical</i>
Cross Contamination	The transfer of bacteria from contaminated foods (usually raw) to other foods. May be direct eg. raw meat touching cooked meat or indirect via a vehicle.
Food Poisoning	An acute disturbance of the intestinal tract, resulting in abdominal pain with or without diarrhoea and vomiting due to the consumption of contaminated food.
Preservation	The treatment of food to prevent or delay spoilage and inhibit the growth of pathogenic Organisms which would render the food unfit.
Cleaning	The application of energy to a surface to remove grease and dirt.
Disinfection	the reduction of micro-organisms to a safe level
Sterilisation	a process that destroys all micro-organisms
Food Pests	An animal, insect or bird that contaminates or destroys food
Hazard Analysis and Critical Control Point	HACCP -. A formal documented system that helps food businesses to comply with food safety regulations
Food Safety Management System	A documented food safety management system based on the principles of HACCP. For example 'Safer Food Better Business'



Introduction

Section A

1. Who is involved in Food Safety?
Costs of poor hygiene
Benefits of good hygiene
2. Food Poisoning
Definition
Causes
Incidence and seasonal variation
Main factors relating to outbreaks



Food Safety – Costs and Benefits of Food Hygiene

Introduction

The Level 4 Award in Managing Safety book “For the Journey” written by Sue Richardson, Managing Director of Hygiene Sue. Has been designed to help you understand the theory of Food Safety and accompany a Level 4 Food Safety course in Catering and Manufacturing.

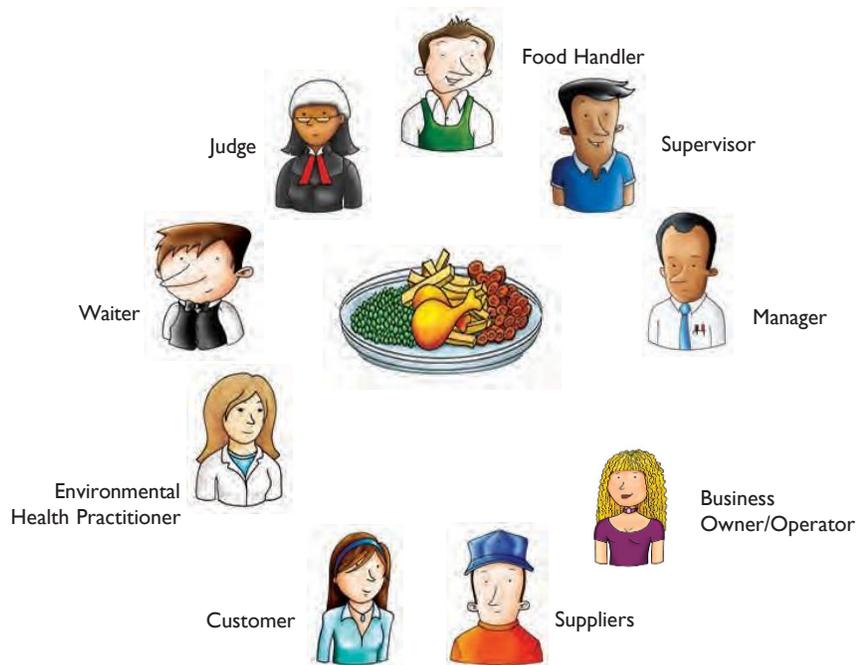
When you start to learn about food safety, it can be quiet overwhelming, so Hygiene Sue has created a symbol to high light important information, and to remind you of things you shouldn't forget.

Important Information



Who is involved in Food Safety?

Many people believe that when we talk about food safety we are only referring to the people who work directly with or handle fresh food, for example, chefs, butchers, bakers and greengrocers. However, food safety concerns everyone who is involved in growing, preparing, handling, selling and delivering food, from the farmer to the customer. This is known as “From Farm to Fork”.



Food handlers, Managers, Supervisors, Customers, Environmental Health Practitioners, Suppliers, Waiters and Government legislation.

Where do you fit in?



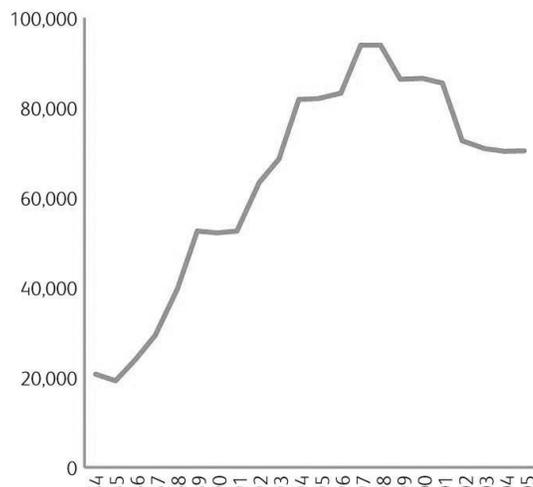
Food Safety – Costs and Benefits of Food Hygiene

Everyone who works with food has a responsibility to make sure that the food they prepare, cook, serve or sell is safe to eat. Keeping yourself, your workplace and equipment clean is an essential part of food safety. If you work in a clean area it will reduce the risk of producing harmful food and minimise the risk of infestation from food pests like flies and mice. An equally important part of food safety is the way in which food is handled and stored: poor practices in the handling and storage of food can lead to food poisoning outbreaks.

Learning about the principles of food safety will avoid food poisoning, wastage of food, loss of business and legal action against you or your workplace.

There are three ways to prevent food poisoning: **protecting** food against contamination, **preventing** multiplying of bacteria and **destroying** the bacteria on the food. However, to prevent food poisoning, it is vital to understand how food poisoning is caused and to recognise the symptoms.

Notified cases



The Benefits of Good Food Hygiene

- less chance of food poisoning
- compliance with food safety law
- customer satisfaction
- less food wastage
- good working conditions
- high staff morale
- low staff turnover
- thriving business, job security

Cost of Poor Food Hygiene

- Food
 - Food wastage
- People
 - Food poisoning
 - Customer complaints
 - Poor working conditions
- Company
 - Legal action eg. fines, closure, civil action
 - Bad reputation
 - Pest infestation





Food Poisoning - The Causes



Food Poisoning - Symptoms

The symptoms of food poisoning are unpleasant: **stomach cramps, vomiting, diarrhea, fever, and dehydration** and can last anything from 24 hours to several days. The **symptoms** can vary depending on what causes the food poisoning.

For most people the effects of food poisoning or food-borne illness are not serious, but for some people the illness can be life-threatening. This is often because their immune system is not working properly.

This group of people are known as the “**at risk group**” and they include:

- young children
- elderly people
- pregnant women
- people who are ill or recovering from an illness.

Incidence and Seasonal Variation. The incidence of food poisoning is currently around 70,000 cases a year. These it must be remembered, are the formally reported cases. The actual number of food poisonings is far higher. It is stated that you can multiply the reported figure by a factor of at least 100. Remember most food poisonings occur in the home.

Causes of Food Poisoning

- bacteria 70%)
- viruses (25%)
- poisonous plants and fish (4%)
- chemicals including metals (1%)



The most startling thing about the trend in food poisoning has been the increase over recent years. The following are considered to be relevant:

- Trend towards eating more rare/raw foods
- More buffets and barbeques
- Emerging pathogens
- More use of convenient foods & more imported foods
- Contamination during slaughter
- Food poisoning cases tend to peak during the summer barbeques, and at Christmas (poultry).



Food Poisoning - The Causes

Foods involved in Bacterial Poisoning

The following foods are known to have been involved in cases of bacterial food poisoning:

- Cooked meat & poultry
- Meat products e.g. gravy, stock
- Dairy products
- Egg dishes
- Fish and shellfish
- Cooked rice

These foods all have a high protein content. High protein foods which are intended for consumption without further cooking, are referred to as: **HIGH RISK FOODS**.

Main factors relating to outbreaks of food poisoning

- preparation too far in advance
- inadequate cooling
- inadequate reheating
- undercooked/eating rare food
- contaminated cooked food
- storage of high-risk foods at ambient temperature

Food Poisoning - An acute disturbance of the intestinal tract, resulting in abdominal pain with or without diarrhoea and vomiting due to the consumption of contaminated food

Tick the correct meaning (✓)



Food Safety - Protects the consumer's health and well-being by protecting food from anything that can cause harm.

True

False

Food Poisoning Symptoms - Tick the 5 symptoms of food poisoning;

- Fever Head cold
- Stomach cramps Blocked nose Vomiting
- Chest pains
- Diarrhea
- Dehydration



The Managers Role in Managing Food Safety

Section B

1. The manager's role in managing food safety
2. Standards and specifications
3. Food safety policies and manuals
4. Monitoring procedures and processes
5. Management inspections and audits
6. Investigation of an Alleged Outbreak of a Food-Borne Illness



Food Safety - The Manager's Role

Food safety is the practice of managing food in such a way that it is highly unlikely to cause harm to the health of anyone who consumes products that have been prepared, processed stored or sold by a food business

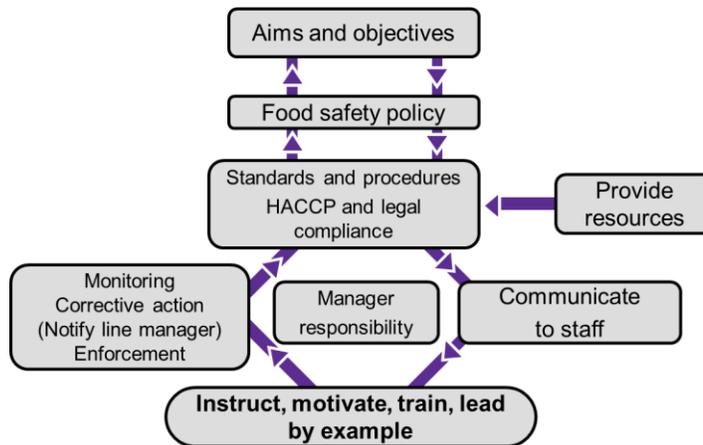
1. The manager's role in managing food safety



The production of safe food will be achieved if managers:

- Set the standards and objectives
- Provide the resources, systems etc to achieve the standards set
- Communicate standards to supervisors
- Ensure supervisors monitor staff monitoring functions
- Receive feedback from supervisors as to compliance with standards
- Train supervisors and staff
- Take corrective action, where necessary, to improve performance
- Set a good example
- Gain commitment from directors/senior managers and staff

Managing Food Safety





Food Safety - The Manager's Role

2. The need for standards and specifications

EU food safety legislation requires all businesses producing food to have a documented food safety management system in place. The Food Standards Agency has produced an easy to follow Food Safety Management System called '**Safer Food Better Business**', which is designed to help caterers comply with the new legislation.

Standards

- Agreed internal levels
- Need to check to ensure safety and quality of food
- Can be used to measure success
- Specifications or requirements are given to external companies eg. supplier

3. Use of food safety policies and manuals

Food Safety Policy

- Statement of intent
- Organisational responsibilities
- The forms of control and monitoring

Examples of food safety policies:

Personal hygiene
Fitness to work
Approved supplier
Control of physical contamination
Design of premises
The role of visitors and contractors
Use of glass, hard plastic and wood
Cleaning and disinfection
Temperature control
Maintenance
Food poisoning and outbreak control



The benefits of a Food Safety Policy include:

- Demonstrates commitment from senior management to provide the necessary resources to achieve high standards of food hygiene
- Supports the 'due diligence' defence
- Can be used as a way of communicating standards to staff



Food Safety - The Manager's Role

Food safety manual

- Policy
- Monitoring of suppliers and raw materials
- Procedures for suspected food poisonings, food complaints, product recall, visitors etc.

	Staff Training
	Personal Hygiene
	Design of Premises
	Food Storage
	Temperature Control
	Pest Control
	Cleaning

4. The need to monitor procedures and processes

Monitoring of the food operation is essential to:

- Confirm that the expected standards are being achieved
- Ensure the production of safe quality good
- Ensure compliance with legislation
- Identify problems
- Satisfy customers
- Satisfy enforcement officers
- Keep customer complaints to a minimum
- Establish when procedures require modification
- Encourage commitment and motivation of staff



5. Management inspections and audits

Adequacy audit

An examination of the documented food safety systems to establish whether they adequately set the standard required both legally and in terms of good practice.



Food Safety - The Manager's Role

Compliance audit

Carried out to establish the extent to which the documented system is implemented by the workforce.

Inspection

Visual check of the physical conditions

Suggested programme of management inspections/audits:

Frequency	Description
Daily	<ul style="list-style-type: none">- Checking by the supervisor that Assured Safe catering is being undertaken- Critical Control Points as identified by HACCP eg. temperature control checking
Weekly	Monitoring by the supervisor of the cleaning checklist and possible undertaking of an inspection to ensure that all equipment and structural finishes are clean and in working order
Monthly	Submission to the manager of the report that has been produced by both the food handlers and also the supervisors during the previous month for auditing purposes
6 monthly	Auditing of the premises by the manager or external consultant

6. Investigation of an Alleged Outbreak of a Food-Borne Illness

- Stop the outbreak
- Establish the cause
- Take action to prevent recurrence

The role of the Manager

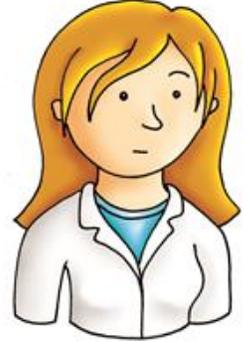
- Ensure no staff who are suffering symptoms will handle food
- Oversee disinfection of the premises
- Communicate importance of the situation to supervisors and staff
- Check temperatures
- Provide information to the EHO
- Implement remedial action as necessary



Food Safety - The Manager's Role

The role of the Environmental Health Officer

- Identify where the food was prepared/served
- Identify the food eaten which caused the illness and prevent further sales
- Identify the causative organism
- Trace carriers/cases as necessary
- Trace the source of the causative organism
- Determine the main faults that contributed to the outbreak
- Make recommendations to prevent recurrence





Legislation
Section C

1. Food Safety Legislation
2. Responsibilities of Food Business Operators
3. Offences and Penalties



Food Safety – Legislation

Everyone who works with food has a responsibility for protecting the health and well-being of consumers by safeguarding that food from anything that could cause harm. As a food safety manager you have a responsibility to ensure that staff comply with company policies and procedures to prepare, produce or sell food that is safe to eat.

1. Food safety Legislation

The three principle aims of food safety legislation are to:

- Protect food from ‘farm to fork’
- Prevent unfit food from entering the food supply chain
- Reduce the risk of food-borne illness

There are a large number of laws, regulations codes of practice and guidelines covering the production, processing, distribution, retailing, packaging and labelling of foods in the UK. The Food Safety and Hygiene (England) Regulations 2013 consolidated the food safety and food hygiene laws England, making guidance easier to find. (Note: food safety rules for Scotland and Wales remain together under the General Food Regulations 2004; and Northern Ireland has its own General Food Regulations (Northern Island) 2004; food hygiene rules for Scotland , Wales and Northern Island remain separate status instruments. In addition to this there are local bye-laws such as the prohibition of street trading in certain vicinities – which apply within local authorities geographical area and have to be approved by a government minister before they can take effect.

2. Responsibilities of Food Business Operators

A food business operator is the person responsible for ensuring that legal requirements are met and food safety procedures are implemented. To make sure food is safe to eat, all food business operators must put in place and implement and maintain permanent procedures based on HACCP principles.



This means setting up an appropriate food safety management system that identifies food safety hazards and puts in place procedures to control the risk of harm being caused. (We shall discuss HACCP later in more detail) As well as having to implement a food safety management system based on HACCP principles, a food business operator is also required by law to:

a. Register the business with the local authority

All food premises operating for 5 or more days in 5 consecutive weeks with minor exceptions must register with the Local Authority at least 28 days before food operations commence.

No charge is made for this and information is held on a central register.

It is an offence not to register.



Food Safety – Legislation

Exemptions include:

- Agricultural activities
- Sale from vending machines
- Certain uses of domestic premises
- Premises covered by specific regulations eg. slaughterhouses, dairies etc

- b. design, equip and operate the food premises in ways that prevent the risk of contamination
- c. Provide adequate toilets and handwashing facilities, protective clothing and changing facilities
- d. Cooperate with the enforcement authorities
- e. Maintain records of food safety control activities (for example temperature controls, cleaning and training.)

Food Hygiene Training

With respect to training, food business operators must ensure that; food handlers are supervised and instructed and/or trained in food hygiene matters commensurate with their work activity

Those responsible for the development and maintenance of the food safety management system have received adequate training in the application of HACCP.

3. Enforcement of Food Safety Legislation

Food safety legislation is enforced by local authorities through their enforcement officers; environmental health officers (EHOs) and trading standards officers.

EHO powers regarding premises

Power of entry

- To enter any premises at all reasonable hours

Enforcement officers may visit a food premises

- as part of a routine (planned) inspection
- if a complaint is made
- following the service of a legal notice



Breaching Food Safety Legislation

If during an inspection an EHO finds a breach of food safety legislation they can take various actions to try and resolve the problem



Food Safety – Legislation

Hygiene Improvement Notice

- Issued when poor conditions eg. damaged flooring
- Minimum period for work to be carried out is 14 days
- Appeal procedure available (Magistrates' Court)
- Enforcing authority will inspect works after completion and lift notice if appropriate

Hygiene Emergency Prohibition Notice & Order

- Served by EHO when there is an 'imminent risk to health'
- Application must be made to a 'Magistrates' court within three days for an Emergency Prohibition Order from the courts
- Compensation payable if court does not agree with EHO
- Notice holds until Enforcing Authority issues a certificate repealing Prohibition

Hygiene Prohibition Order

- If a proprietor of a food business is convicted of an offence and the court is satisfied that a risk of injury to health exists then they shall impose a prohibition order on either the operation or the proprietor
- The enforcement authority can lift the order on the operation
- The court can lift the order on a person

Emergency control order

- The minister can issue an emergency control order prohibiting the carrying out of commercial food operations involving imminent risk of injury to health

Offences and Penalties

Magistrates' Court

- Summary offences
- Maximum penalties £20,000 and/or 6 months imprisonment

Crown Court

- Indictable offences
- Unlimited fine and/or 2 years imprisonment
- Hears appeals from the Magistrates' Court. Judge and jury

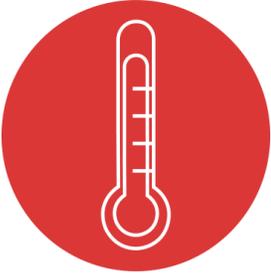
County court

- Deals with civil offences eg. claims for damages from persons who have suffered food poisoning

Prosecution

Those subject to prosecution include whoever is at fault

- Food handler
- Manager
- Director
- Corporate body



Time and Temperature
Section D

1. **Temperature control**
2. **Temperatures at a glance**



Food Safety – Time and Temperature

1. Temperature control

High risk foods:

- Chill holding requirements - 8°C or below
- Hot holding requirements - 63°C or above
- Cooling of cooked foods must be carried out as rapidly as possible

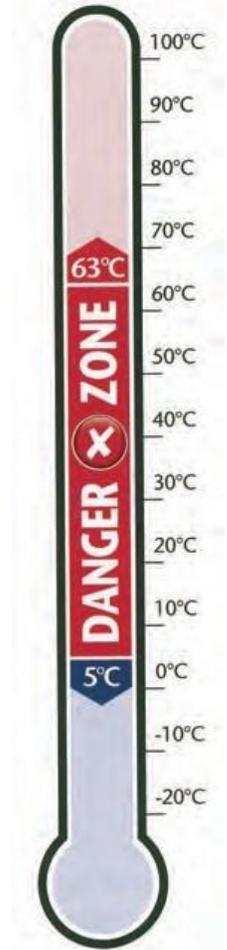
Exemptions:

- Where foods are placed on display or for service for a period not exceeding 4 hours
- For an unavoidable situation eg. transfer between vehicles, temporary breakdown of vehicles
- Scientific assessment shows that it is safe to hold foods outside of these temperatures for a specified length of time
- Where hot food was kept for less than two hours and had not previously been kept for service or display



Temperature and Time Controls

- **Cooking** - To kill bacteria heat to 70°C for a minimum of 2 minutes.
- **Hot Holding** - Keep hot foods at 63°C or above for up to 2 hours.
- **Re-Heating** - Re-heat foods to 75°C or above, but only once.
- **Chilling** - Cool foods to 8°C or below within 90 minutes.
- **Cold display** - Food can be displayed out of temperature control for up to 4 hours (buffet).
- **Refrigeration** - Chilled foods must be stored below 8°C. Best practice 5°C or below.
- **Freezer** - Frozen foods should be kept at -18°C or below. Bacteria now dormant.
- **Defrosting** - Defrost overnight at the bottom of the fridge. Once defrosted, do not refreeze.





Food Safety – Time and Temperature

2. Temperatures at a glance

TEMPERATURE	
8C	Legal upper limit for chill holding/refrigerator temperature
5C	Best practice (refrigerator temperature)
1C - 4C	Recommended (refrigerator temperature)
63C	Legal hot holding temperature (at/or above 63C, for 2 hours)
5C - 63C	DANGER ZONE
20 -50C	Optimum growth of bacteria
0C	Freezing point
-1 C/ +1C	Commercial chilling (butchers)
-18C to -23C/ -26C	Freezing
70C/two minutes	Minimum temperature/time for killing bacteria in meat (check core temperature)
75C	Reheating (once only)
90 minutes	Ideal length of time, for cooling hot food down to refrigerator temperature (blast chiller/dividing into smaller or thinner portions)
37C	Body temperature
72.2C/15 seconds	Pasteurization



100C	Boiling point
100C/30 minutes	(Commercial sterilization, steam under pressure, e.g. milk)
132C/1 second	(Ultra heat treatment (UHT))
121C/3 minutes	(Canning: in reality, time varies according to product, from less than a minute to e.g. 45 minutes for a large tin of ham)
45C – 50C	Hand washing
55C/60C – 65C	Dishwasher (washing cycle)/ 82C – 86C or 88C thermal disinfection (rinsing cycle)
82C <u>minimum</u>	Temperature of water used for thermal disinfection



Section E

Identification and Control of Hazards



Section E

Identification and Control of Hazards

1. Identification and control of hazards
2. Physical Contamination
3. Chemical Contamination
4. Allergenic contamination
5. Bacterial contamination
6. Natural Food Poisoning



Food Safety – Hazards and Controls

1. Identification and control of Hazards

There will always be food safety hazards, but they can be controlled if you understand how food becomes contaminated and how to prevent this from happening. The identification and control of hazards is fundamentally HACCP.

Hazards

A hazard is something that can cause harm – generally, in food hazards are classified as:

- Physical
- Chemical
- Biological
- Allergen



How contamination occurs

Contamination is the transference of any objectionable or harmful substance or material to food and can occur at any stage from 'farm to fork';

- A stone can be missed when vegetables are visually checked on a conveyor belt prior to packaging
- Carcasses of meat may be stored on the floor of delivery vehicle and pick up dirt
- A waterproof dressing can accidentally come off while handling food and end up in a finished product
- Disinfectant not properly rinsed off a work surface may taint the food
- The production line may be contaminated with dust containing nuts from another production line, therefore creating a potential product recall situation if there is an appropriate allergen declaration on finished product packaging.



2. Physical contamination

Physical contamination is anything that falls into or onto food. The contamination may come from variety of sources and can be introduced at any stage of food handling from 'farm to fork' – from growing, harvesting, slaughter, distribution, storage, processing, packaging, delivery, displaying, through to the point of purchase or consumption by the consumer.



Common physical contamination

Intrinsic

- Bones in meat, fruit stones, stalks
- Stones in vegetables, insects in salad



Food Safety – Hazards and controls

Extrinsic

- Glass
- Hair
- Pieces of equipment
- Packaging
- Insects

Detection of Contaminants



- **Visual detection – human**
Most premises rely upon human observation. This method is obviously fallible.
- **Visual detection – electronic/optical scanning**
Often used in bottling industries
- **Weight**
Accurate weighing of products can reveal the presence of heavier foreign objects.
- **X-ray scanning**
Food passed through scanning machine. Able to detect stainless steel, glass, stones, bones and plastic.
- **Metal detection**
Should be capable of removing either ferrous or non ferrous metals. Machines need to be checked and calibrated. Sensitivity should be appropriate for foods.

Removal of contaminants

- **Gravitational separation**
An example of this method which relies upon product weight is shooting peas across a gap.
- **Liquid filtering and powder granular straining**
An example of this method which relies on product size is the treatment of flour.
- **Optical and magnetic separation**
After having been identified, compressed air or a similar system is used to eject the contaminant.
- **Magnetic separation**
Contaminant lifted out.



Food Safety – Hazards and controls

3. Chemical Contamination

Chemicals and Metals

Symptoms can be:

- Acute – rapid onset within one hour including vomiting, diarrhoea or burning sensations
- Chronic – where a build-up in the body occurs over a period causing problems such as cancer or damage to the nervous system



Chemical contamination can occur by:

- Pesticides on fruit and vegetables
- Cleaning chemicals
- Weedkillers on crops
- Excessive additives eg. MSG
- Contamination from processing

Control measures:

- Limits set for chemical residues on crops
- Store and use cleaning agents correctly
- Ensure chemical containers/sprays are labelled to indicate contents
- Cover/move food during cleaning operations



Metals

Examples of metals that include:

Metal	Possible source
Antimony	Chipped enamel
Cadmium	Refrigerator shelving and fittings for cookers
Copper	Old copper utensils
Zinc	Used to galvanise metals
Lead	Pipes, lead crystal
Tin and iron	Cans
Mercury	Thermometers



Food Safety – Hazards and controls



4. Allergenic contamination

A food that is perfectly safe for one person to eat may be extremely hazardous to another. Some people experience allergic reactions to certain foods – reactions that can range from mild to life threatening. It is therefore, vitally important that all staff are fully aware of the foods that may be involved and what precautions need to be taken to ensure that contamination does not occur.



A food allergy is an identifiable immunological response to food or food additives. Some symptoms, such as vomiting and diarrhoea, are similar to food poisoning. Symptoms range from a mild flushing of the skin, or swelling of the throat and mouth, to collapse and unconsciousness. In an extreme attack an individual may suffer anaphylactic shock, which may be life threatening.

Any food can cause a food allergy. However, the 2014 EU legislation clearly identifies 14 major allergens. These are:

- Celery
- Crustaceans
- Fish
- Milk
- Molluscs
- Peanuts
- Soya
- Cereal's containing gluten
- Eggs
- Lupin
- Nuts
- Mustard
- Sesame seeds
- Sulphur dioxide and sulphur



Food Safety – Hazards and controls

5. Bacterial Contamination

With physical, chemical and allergenic contamination it is often quiet easy to identify how it occurred. This is generally not the case with microbiological contamination. Microbiological contamination may occur when:



Raw food touches high-risk food or when liquids from raw food drips onto a **High Risk** food - **direct contamination**. Bacteria are transferred from raw food to a high risk food by hands – **Cross contamination**. Cross contamination involves '**vehicles of contamination**' that enable bacteria to move from one surface to another.

Vehicles of contamination include:

- Hands
- Equipment, knives, chopping boards, mixing bowels
- Cloths
- Food or hand contact surfaces



Examples of food-contact surfaces:

Chopping boards
Knives
Worktops
Containers

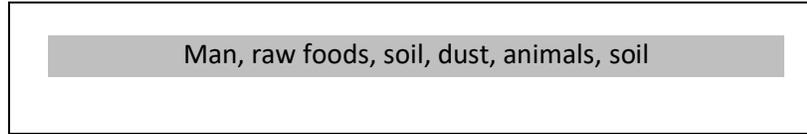
Examples of hand-contact surfaces:

Fridge door handles
Kitchen door handles
Oven door handles
Telephones
Taps
Bin lid



How contamination occurs

SOURCES



Hands, equipment, cloths

VEHICLES

Food or hand-contact surfaces



High Risk Foods





Food Safety – Hazards and controls



Entry of Bacteria into the Food Area and its Prevention

Source	Prevention
Humans	Changing from outdoor clothing Washing of hands prior to starting work Exclusion of known carriers
Food	Buying from good quality suppliers Checking quality and temperature of food upon delivery
Pets and Pests	Proofing of building Checking of incoming food Pest control contract
The Environment (including soil and dust)	Filtering intake of air Keeping windows shut Purchasing pre-cleaned vegetables
Water	Washing food in mains water only (potable)

Bacterial Contamination during Processing and its Prevention

Source	Prevention
Hands	Regular washing with bactericidal soap Frequent changing of gloves
Body and/or coughing	Good personal hygiene
Chopping boards	Separate boards, colour coded, easy to clean
Storage	Separation of raw and cooked foods
Air borne	Covering of food
Utensils	Separate. Correctly cleaned
Preparation surfaces	Suitable material. Cleaned and disinfected (use of sanitiser)
Pests	Pest control contract. Good environmental conditions.
Refuse area	Cleanliness. Washing of hands
Chef's cloth	Only to be used for hot items



Food Safety – Hazards and controls

The Major Methods of Preventing Bacterial Contamination

In order to prevent bacterial contamination the following should be given consideration:

- Remove sources of bacteria (prevent entry)
- Break routes of transmission of bacteria (change practices, disinfect)
- Protect food from contact with bacteria (cover food, store correctly)

6. Natural Food Poisoning

While bacteria are the main cause of food poisoning, illness can also be caused by poisonous plants and fish.



Poisonous Plants and Fungi

Plants sometimes naturally contain certain toxins:

- Some wild mushrooms
- Rhubarb leaves
- Deadly nightshade
- Incorrectly processed red kidney beans/haricot beans

Poisonous fish

Food poisoning can be caused by the consumption of certain fish:

- Scombrototoxin (tuna, mackerel and sardines) causing reddening rash to neck and face plus burning in the mouth
- Ciguatera (Caribbean reef-dwelling fish) causing malaise, respiratory paralysis
- Naturally poisonous fish eg. puffer (fugu) fish causing death (no known anti-toxin)
- Paralytic shellfish poisoning (P.S.P) causing numbness of mouth spreading through body. Can cause death from respiratory paralysis



Section F

HACCP- Hazard Analysis and Critical Control Point

1. The Principles of HACCP
2. The benefits of HACCP
3. Pre-requisites



Hazard Analysis Critical Control Point

Hazard Analysis Critical Control Point (HACCP)

What is HACCP?



Hazard analysis critical control point is a preventive approach to food safety management. It is designed to control significant food safety hazards, i.e. those hazards that are likely to cause an adverse health effect when products are consumed.

Under current European Union legislation food businesses are required to implement and maintain permanent procedures based on Codex HACCP principles. The Codex Alimentarius Commission (generally shortened to Codex) which was established in the 1960s by Food Agriculture Organisation and the World Health Organisation and has three principle aims:

1. To protect the health of consumers
2. To ensure fair practices in international food trade
3. To issue guidance and codes of practices, aimed at promoting the harmonisation of all food standards

The HACCP system originated in the 1960s as part of a collaboration between the US National Aeronautics and Space Administration (NASA) and Pillsbury Company aimed at providing safe food for astronauts on space missions. At this time food safety was generally measured by the number of complaints and incidents of food-borne illness and the quality of the finished food was often determined by end-testing



Benefits of HACCP

Apart from satisfying legal requirements there are several other reasons why a food business can benefit from a food safety Management system based on HACCP.

1. It promotes a food safety culture within the business that actively involves all members of staff. Staff are more likely to take ownership of the system.
2. Staff, as well as management, feel more confident that the business is running both effectively
3. Pro-active approach – remedial action can be taken during food processing
4. Cost-effective than inspection regimes
5. Inexpensive
6. All staff can be involved
7. Reduced wastage or re-processing
8. Helps to demonstrate 'due diligence'
9. Legally compliant
10. 360 approach

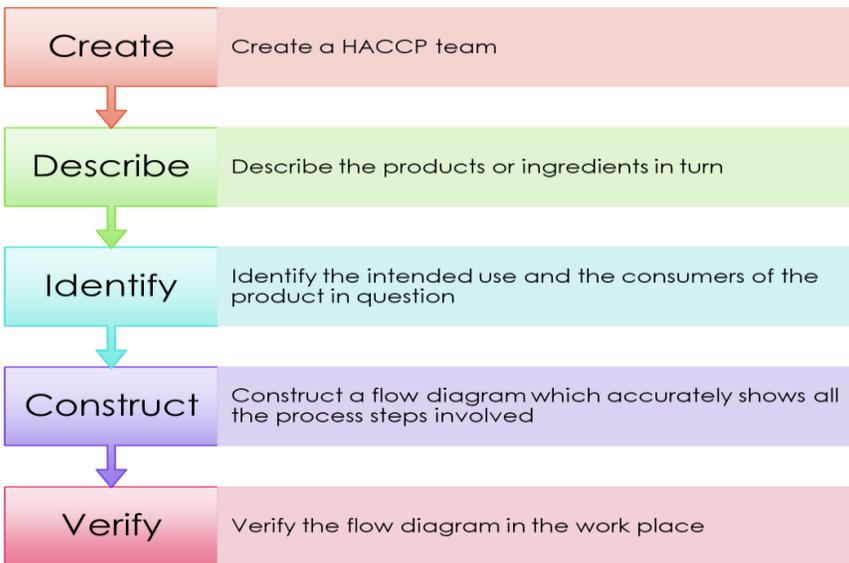


Hazard Analysis Critical Control Point

The main reasons HACCP systems fail are because:

- There is a lack of management commitment
- Insufficient resources are provided
- There is a lack of awareness and/or training
- Hygiene standards are poor
- All hazards may not have been identified
- The systems, as developed, may be too complicated

5 Principles of HACCP (Before you start)





Hazard Analysis Critical Control Point

Implementing HACCP

Food business operators shall put in place, implement and maintain a permanent procedure or procedures based on the HACCP principles. The HACCP principles consist of the following:

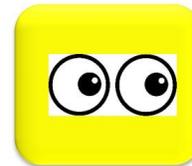
7 STEPS of HACCP

1. identifying any hazards that must be prevented, eliminated or reduced to an acceptable levels;
2. Identifying the critical control points at the step or steps at which control is essential to prevent or eliminate a hazard or to reduce it to acceptable levels;
3. Establishing critical limits at critical control points which separate acceptability from unacceptability for the prevention, elimination or reduction of identified hazards;
4. Establishing and implementing effective monitoring procedures at critical control points;
5. Establishing corrective actions when monitoring indicates that a clear critical control point is not under control;
6. Establishing procedures, which shall be carried out regularly, to verify that the measures outlined in subparagraphs (a) to (e) are working effectively; and
7. Establishing documents and records commensurate with the nature and size of the food business to demonstrate the effective application of the measures outlined in subparagraphs (a) to (f).

When any modification is made in the product, process, or any step, food business operators shall review the procedure necessary and make the changes to it.



Control



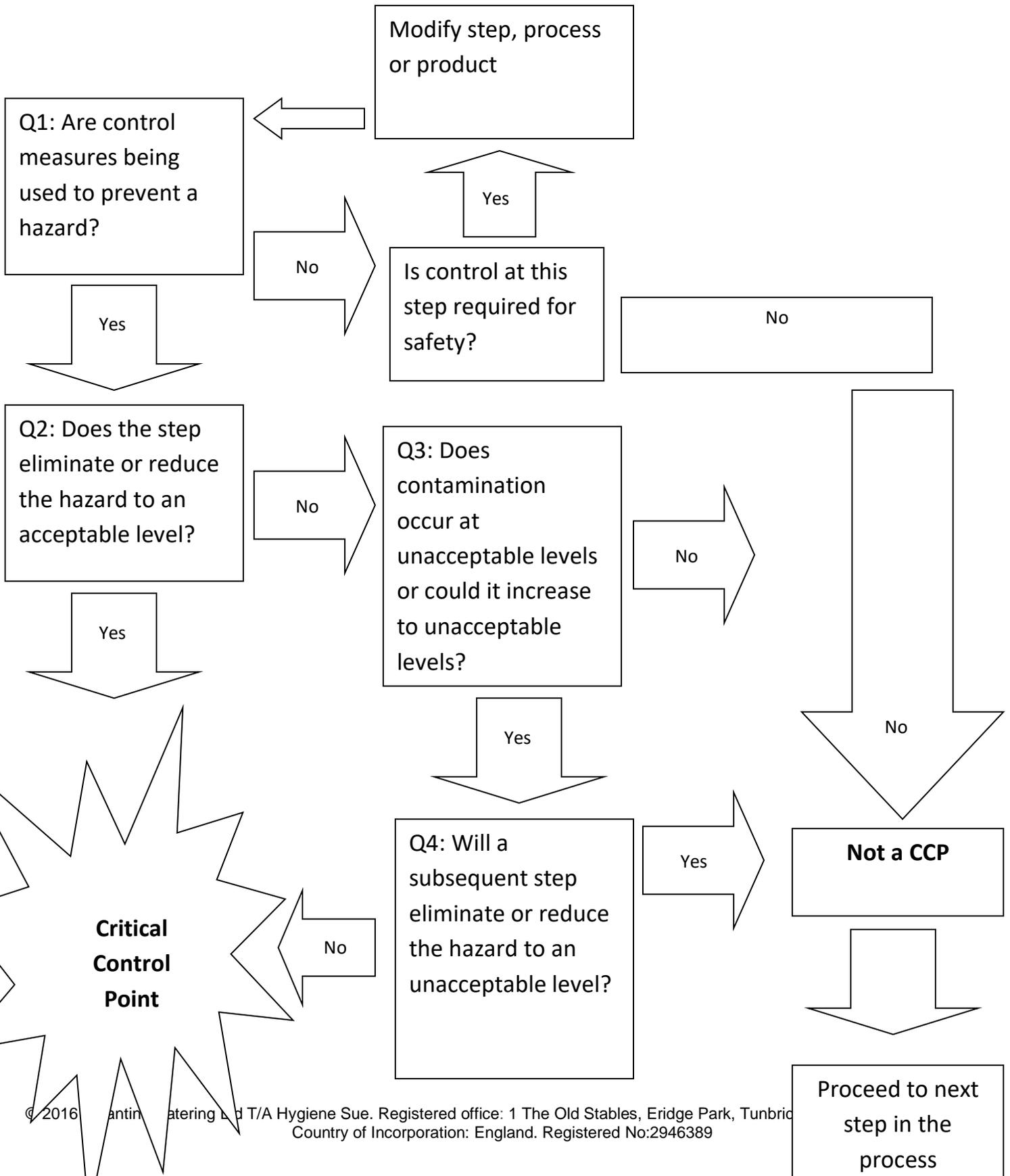
HACCP



Document



CCP Decision Tree





1. Pre-requisites for HACCP

HACCP is not a stand alone system. Procedures covering the general principles of hygiene need to be in place and operational before an effective HACCP system can be implemented.

Pre-requisite procedures:

2. Supplier specification
3. Design and structure of premises and equipment
4. Personal hygiene
5. Cleaning, disinfection and disposal of waste
6. Pest control
7. Allergen controls
8. Storage and stock control
9. Traceability and product recall
10. Staff Training
11. Customer Complaints
12. Visitors





Pre-requisites for HACCP

Design and structure of premises and equipment

Section G1

1. Site selection
2. Features of satisfactory design
3. Facilities for personnel, cleaning and disinfection and waste disposal
4. Food vehicles and outside catering
5. Principles of construction
6. Equipment of requirements
7. Construction requirements
8. Prioritising repairs and improvements



Design and Structure of Premises

1. Site Selection

The following items need to be considered when deciding upon a site:

Services

- Gas
- Electricity
- Wholesome water
- Waste disposal

Accessibility

- Supplies
- Market
- Road/rail

Environmental considerations

- Refuse sites
- Pest activity eg. river banks
- Dust/fume producing premises

Impact on neighbourhood

- Odours
- Noise

Consultation

When giving a site consideration, it may be necessary to consult with:

- Planning authority
- Service companies/authorities
- Architects
- County council

It will also be necessary to register with the local Environmental Health Department.

2. Features of satisfactory design

The following principles of design should be taken into account when planning for the premises:

- A **linear workflow** where raw food enters at one end and the finished product leaves the other without any backtracking
- Prevention of cross-contamination
- Adequate temperature control
- Facilities for cleaning and disinfecting equipment
- Cleaning and disinfecting equipment
- Denying pest access
- Well-drained yards and roads



Design and Structure of Premises

3. Facilities for personnel, cleaning and disinfection and waste disposal

Personnel Need

Legal requirement ('suitable and sufficient')

Benefits

- Encourages high standard of personal hygiene
- Staff motivation

Examples

- Sanitary conveniences
 - Clean, well-lit and in working order
 - Capable of effective sanitation
 - Vented to exterior
 - 6 changes of air per hour
 - Entrance via ventilated lobby
 - Self-closing doors
 - 'wash your hands' notice
 - Adequate number and signed
- Cloakrooms
 - Adequate
 - Clean and tidy
 - Lockers for outdoor clothing
- Washing facilities
 - Adequate
 - Suitable supply of hot and cold water
 - Liquid soap and drying facilities

Cleaning and disinfection – examples:

- Double sinks (utensils, crockery, cutlery, etc.)
- Single sinks (food)
- Hand wash basins
- Dishwashers
- Glasswashers

Waste disposal

- Refuse must not accumulate in food rooms
- Use polythene bags in stands
- Suitable, covered external storage facilities (proofed against pests)
- Effective trade collection
- Storage area suitably located
- Use of compactors where beneficial



Design and Structure of Premises

Food vehicles and outside catering

Maintaining standards of vehicles

- Easy to clean design
- Regular servicing and maintenance
- Subject to effective cleaning regimes specified within schedule
- Temperature controlled/temperature printouts

Maintaining standards of outside catering

- Carry out HACCP
- Provision of clean hot and cold water supplies
- Effective waste disposal
- Temporary facilities for staff
- Adequate protection from the environment
- Adequate temporary facilities for refrigerated storage

4. Equipment requirements

Principles

- Inert
- Smooth
- Easy to clean
- Minimum number of crevices
- Protect food from contamination

Also:

- Non-toxic
- Non-flaking
- Corrosion-resistant
- Durable and suitable

Stainless steel best meets these requirements.

Fixing and siting of equipment

- Facilities cleaning – wheeled units plus mobile flexible pipes and services
- Bases to ground or 25cm above
- Away from the wall
- Avoid congestion



Design and Structure of Premises

5. Construction requirements

Features

- Easy to clean
- No dirt/bacteria
- Less chance of cross-contamination
- No harbourage for pests
- Long lasting
- Must be clean, smooth, non-porous

Floors

- Absorbent, durable, no crevices
- Acid/grease resistant, coved to the walls
- Examples of suitable materials: epoxy resin, vinyl sheet (' Altro'), quarry

Walls

- Smooth
- Impervious
- Non-flaking
- Light coloured
- No cavities/false panelling
- Coved to the floor

Examples of suitable materials:

- Glazed tiles with water resistant grouting
- Resin bonded fibre glass
- Polypropylene sheet
- Stainless steel
- Rubberised paint on smooth plaster

Consideration should be given to protective angles or crash rails.

Ceiling

- Smooth
- Fire resistant
- Light coloured
- Well insulated

Suspended ceilings offer many advantages as there is access for pest control/maintenance and pipes are hidden.



Design and Structure of Premises

Examples of suitable materials:

- Polypropylene tiles
- Washable emulsion on plaster board
- Faced fibre board panels
- Stainless steel tiles

Doors

- Cleanable
- Tight fitting
- Self closing
- Hand/kick plates
- Avoid architraving
- Proofed at base against pest access

Windows

- Avoid right angle sills
- Cleanable surround
- Fly screens if openable
- North facing walls if possible
- Eliminate windowns at design stage

Ventilation criteria

Good ventilation is required:

- Remove heat
- Remove fumes/smells
- Extend working life of decorative finishes
- Better working environment
- Aim for 25°C
- 30 air changes per hour

Lighting criteria

Good lighting is required:

- See dirt
- See infestation

Work surfaces

Need to be easy to clean so that contamination can be kept at a minimum. The best surface is stainless steel. Other acceptable surfaces include marble and laminated surfaces (always subject to marking by knives).



Sinks

Two sinks should be provided for washing equipment. Their size is determined by the largest pot, which will have to be cleaned. A separate sink should be provided for the preparation of food. Stainless steel is the best surface and the provision of mobile units and supply facilities which can be disconnected thus making cleaning easier, are very advantage

6. Prioritising repairs and improvements: considerations

- Legal requirement
- Financial implications
- Food-contact surfaces
- Hand-contact surfaces
- Risk of cross contamination
- Risk of physical contamination
- Growth of bacteria



Pre-requisites for HACCP

Staff Training

Section G2

1. The needs and benefits of food hygiene training
2. The development and content of a training programme
3. The principles and methods of effective training
4. Training records
5. Training requirements



Staff Training



Staff Training

1. The needs and benefits of food hygiene training

Needs

- Legal requirement – The Food Safety (General Food Hygiene) Regulations
- Improved food safety

Benefits

To the company

- Reduced wastage
- Reduced supervision
- Increased safe production
- Fewer customer complaints
- Less risk of prosecution
- High staff morale – reduced turnover
- Improved attitude to hygiene
- Good company image

To the individual

- Increased confidence from knowledge gained
- Increased potential
- Job satisfaction
- Motivation
- Increased job security

To the customer

- Reduced risk of food poisoning
- Reduced risk of contamination or spoilage
- Good quality food
- Overall increase in customer satisfaction

Training is required to:

- Change attitudes
- Develop skills
- Increase knowledge



Staff Training

2. The development and content of a training programme

Identify the needs of each post

Determine the priorities

Arrange training

- Induction
- Ongoing
- Refresher
- On job/off job

3. The principles and methods of effective training

Preparing for training

- State aim
- State objectives
- Decide on content
- Order content
- Determine practical arrangements
- Considering training techniques and methods of testing
- Prepare materials
- Determine method of evaluation

The senses and learning

- To hear is to *forget*
- To hear and see is to *remember*
- To hear, see and do is to *understand and remember*

Techniques

- Brain storming
- Problem solving
- Buzz session
- Question and answer
- Lecture
- Incident process
- Discussion
- Demonstration
- Group work
- Case study
- Role playing



Staff Training

4. Training records

Required to:

- Help manage training programmes
- Aid 'due diligence'
- Show legal compliance to auditors and enforcing authorities

A typical training record:

Name	Start date	Induction	Level 1 Hygiene Awareness	Level 2	Level 3 Supervision	Level 4 Management	Refresher

5. Training requirements

“The proprietor of a food business shall ensure that food handlers engaged in the food business are supervised and instructed and/or trained in food hygiene matters commensurate with their work activity”

The Industry Guide to Good Hygiene Practice: Catering Legal

All staff on joining should be trained in the Essential Food Hygiene Information. Staff such as cleaners, porters, waiters and bar staff should receive Food Hygiene Awareness training ; a 2 hour course, 1 month after joining.

Handlers of open high-risk food must take the one day, Level 2 Food Safety Course - 3 months after joining.

Recommended

Supervisors should attend the Level 3 Award in Supervising Food Safety in Catering (3 days)

Managers should attend the Level 4 Award in Managing Food Safety in Catering (5 days)



Pre-requisites for HACCP

Personal Hygiene

Section G3

1. The importance of personal hygiene
2. Staff selection
3. Staff responsibilities
4. Hazards associated with standards of personal hygiene
5. Illness
6. Methods of monitoring standards of personal hygiene
7. Methods of ensuring high standards of personal hygiene



Personal Hygiene

Personal Hygiene

1. The importance of personal hygiene

The largest contaminator of food is the food handler via their hands. 15% of food handlers will have *Staphylococcus aureus* on their hands, in addition to any pathogenic bacteria that they have picked up from handling raw food.

2. Staff selection

In addition to normal staff selection procedures the following points must be covered:

- The inclusion of a question on the questionnaire asking if they have ever suffered from dermatitis or food poisoning symptoms in the last two months
- The applicant should be questioned concerning any recent foreign travel
- An assessment should be made regarding the personal hygiene of the applicant at the interview
- Proof should be obtained of any qualifications in food hygiene

3. Staff responsibilities

- Moral obligation
- Legal obligation
- Company standards
- Customer expectations

4. Hazards associated with standards of personal hygiene

Skin injuries and infections

Injuries can immediately pose a hazard due to loss of blood and consequent contamination of any food which is consumed. In the longer term infection (*Staphylococcus aureus*) could set in which may be passed on via food being handled.

All wounds legally have to be covered with a waterproof dressing. Ideally, the plaster should be coloured blue to assist in detection if it falls into the food. These can contain a metal strip which is detectable. Bandages etc. which are porous need to be covered by gloves or the equivalent.

Smoking

- Transfers bacteria from the mouth to the hands
- Encourages coughing
- Possible physical contamination
- Effects of passive smoking
- A food handler can be fined up to £5,000 for smoking in food room



Personal Hygiene

Jewellery

- Harbours dirt and bacteria
- Physical contamination
- Usually just a plain ring only is recommended although plain sleeper earrings are sometimes acceptable
- The wearing of watches should be prohibited

Nail varnish

- Nail varnish may become chipped and fall into food causing physical contamination

Eating

- Hand-to-mouth contact (Staphylococcus aureus)
- Tasting can be allowed using clean spoons

Hand washing

- Before commencing work
- After using the lavatory
- After handling raw food and before high-risk foods
- After touching face/hair/mouth/nose etc
- After touching rubbish
- After cleaning
- After taking a break

Wash hand basins with hot water, soap and a means of drying hands must be provided.

Protective clothing

Protective clothing is provided for food handlers to protect food from sources of contamination from the person.

Protective clothing must be:

- Clean
- Washable
- Light coloured
- Without pockets
- In good condition
- Able to cover all external clothing

Hair must be covered as it harbours bacteria and may cause physical contamination. Outdoor clothing must not be worn in food room. Lockers or cupboards must be provided. A food handler can be fined up to £5,000 for not wearing the protective clothing provided.



Personal Hygiene

7. Illness

Food handlers *must* report the following to their supervisors:

- Symptoms of food poisoning – diarrhoea, upset stomach, vomiting
- Contact with food borne diseases eg. typhoid, dysentery
- Contact with suspected cases of food poisoning

Food handlers *should* report the following to their supervisors:

- Heavy colds/sore throat
- Infected wounds

A food handler can be fined up to £5,000 for not reporting illness.

The manager should take appropriate action to ensure food safety is not compromised. This may include exclusion from food areas or providing appropriate dressings. The employer must notify the local Environmental Health Officer should a confirmed case of food poisoning/food-borne disease be identified among the staff.

8. Carriers

Healthy carriers

People who have not shown food poisoning symptoms, but excrete food poisoning organisms which may contaminate food. These people may have become infected due to the handling of raw meat or poultry. Confirmation of healthy carriers is only by medical screening, usually requiring a faecal or blood specimen.

Convalescent carriers

People who have recovered from illness, but continue to excrete food poisoning organisms which may contaminate food, eg. *Shigella* or *Salmonella*. This may continue for several months. Staff must be instructed that if they have suffered any illness involving vomiting and/or diarrhoea, this must always be reported to the management so that appropriate action can be taken to prevent the contamination of food. Medical tests should also be undertaken.



9. Methods of monitoring personal hygiene



Staff dress

- Visual inspection
- Monitoring of laundry bills and quality of returned goods
- Observation to ensure people do not go outside in protective clothing

Hand washing

- Monitoring of the amount of soap and paper towels used
- Observation
- Use of agar plates
- Temperature of hot at wash hand basin

Illness

- Use of medical after people have been away
- Noticing someone who is constantly going to the toilet
- Use of stool specimens



Pre-requisites for HACCP

Allergens

Section G4

1. Allergens
2. Anaphylaxis Shock
3. Food Intolerance



Allergens

Everyone who works in the food industry has a responsibility to ensure that food does not harm consumers. As someone who handles food, you must ensure that the food you prepare, serve or sell is safe to eat. Food allergens are a food safety hazard.

It is estimated that between 1-10% of adults and children have food hypersensitivity. However as many as 20% of the population experience some reactions to foods, which make them believe, they do have food hypersensitivity. 11-26 million members of the European population are estimated to suffer from food allergy. Food allergies affect 3-6% of children in the developed world.

For this reason, it is important for consumers to make informed choices about what to eat when eating out or what to buy when shopping for food.

Under the Food Information Regulations 2014:

- Food allergen labelling on pre-packed foods has improved
- Food business operators are required to provide correct information about allergens in any food served or sold.

Food Allergens – A Food Hazard

Any food can cause a food allergy, but there are 14 major allergens of which you need to be aware. These 14 major allergens can be found in many different forms in many different foods.

Food Allergy

A food allergy is the immune system in the body's rapid response to a specific food. The immune system detects proteins and responds as though the proteins are a threat. The body release antibodies to fight and neutralize the invading proteins. These antibodies trigger allergy cells (mast cells) to release chemicals into the blood stream. One of the chemicals released is histamine this acts on the skin, nose, throat lungs and gut causing the symptoms of an allergic reaction.

The same response will be triggered every time the proteins enter the body, whether through eating or in more severe cases being absorbed through the skin or inhalation by breathing in the allergen particles.

Symptoms

Food allergy symptoms vary but usually

- Skin – Rash, hives, redness and swelling round the mouth face or neck.
- Gastrointestinal system – Cramps, nausea, vomiting and diarrheah
- Respiratory system – runny, stuffy nose, itchy and watery eyes, wheezing, coughing and sneezing



Allergens

Anaphylaxis Shock

Anaphylaxis is a potentially life threatening and severe allergic reaction. Not everyone with an allergy will experience anaphylaxis.

Symptoms can include various symptoms in different parts of the body at the same time

- Rashes
- Severe swelling of tongue, lips and throat
- Difficulty breathing
- Loss of consciousness
- Rapid fall in blood pressure

Treatment

Adrenaline injectors (Epi pen) are often prescribed to individuals who suffer from severe allergic reactions and who may be at risk of anaphylactic shock. Someone who has been trained by a medical professional must only administer an adrenaline injector. When administered during anaphylaxis, the adrenaline can reduce the swelling around the airway helping the person to breathe. It also can help to stabilise blood pressure and stimulate the heart.

Anaphylaxis Shock

Anaphylaxis should always be treated as a medical emergency. If someone is displaying any or all of the symptoms of anaphylaxis

- *Call the emergency services on 999 immediately*
- *Explain that a customer is having a severe allergic reaction*
- *Do not move the customer*
- *Find out if the customer is carrying an epi pen (an adrenaline injector) If possible assist the patient in self administering the adrenaline.*
- *Send someone outside to direct the ambulance*
- *Stay with the customer until help arrives*



Allergens

Food Intolerance

Food intolerance is far more common than food allergy. Food intolerance is not triggered by food proteins nor is it an immune system response. It occurs when the body's gastrointestinal system (gut) is unable to digest certain foods. This is usually a delayed reaction set off by any of the following:

Food additives

A variety of natural and artificial additives are used in colouring, preserving and processing foods. Some people suffer symptoms triggered by sensitivity to food additives.

Natural chemicals in food

These can include caffeine in coffee, tea or chocolate, which can cause food intolerance.

Enzyme Defects

Humans contain enzymes to help break down specific foods. When these enzymes are defective, missing or in short supply, foods cannot be digested properly.

Histamine

A number of foods have naturally occurring histamine. Alcohol, pickled foods, processed meats and cheese. Other foods, if incorrectly stored, can produce high levels of histamine as part of the decomposition process. For example, fresh fish.

Toxic effects

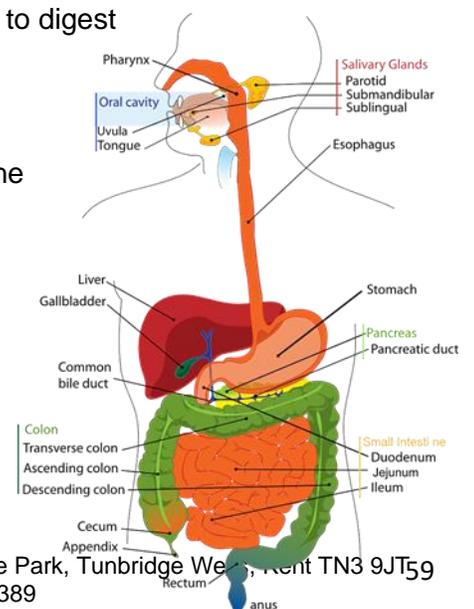
Undercooking kidney beans or green potatoes, as an example, can cause food poisoning, vomiting and diarrhoea.

Lactose Intolerance

Lactose intolerance is a common digestive problem where the body is unable to digest lactose, a sugar found naturally in dairy and milk products. The symptoms of lactose intolerance can usually develop within a few hours of consumption.

The body digests lactose into a substance called lactase. This breaks down the lactose into 2 sugars called Glucose and Galactose, which can easily be absorbed into the bloodstream.

People with lactose intolerance do not produce enough lactase





Section G5

Pre-requisites – Supplier Specification



Pre-requisites for HACCP

Section G5

Food Supplier Specification



Supplier Specification

Selecting the suppliers who can meet your consumers' demand for high-quality ingredients may bring some initial costs, but it will pay off over time through consistent high-grade materials. However, the process to find the ideal supplier is often not easy and requires discipline and hard work.

Identifying a Supplier

Before selection your supplier, it is important to gather the opinions of stakeholders and define the criteria for the selection process. The supplier selection team should work with potential suppliers to establish specifications. For example, they should explain how the supplier's material would be used in your products and within the manufacturing process. Keep in mind that the ultimate goal is a win-win situation for the supplier and manufacture; therefore open and transparent communication is extremely important.



Delivery Commitments

Supplier Selection Process

In food manufacturing operations, raw materials are generally purchased from approved suppliers against agreed specifications that detail minimum acceptable standards. Raw material specifications usually include the following information:

- Name and address of supplier
- Description of the raw material and, if appropriate what it is used for
- Chemical name or ingredient list
- Agreed microbiological standards and tolerances
- Any specific tolerance limits – for example pH, salt, permitted additives
- Agreed analytical data – for example fat content, calories, pesticide residues
- Allergen status, if appropriate
- Storage conditions
- Shelf Life
- Safe handling procedures and instructions for use
- Labelling requirements
- Batch identification details





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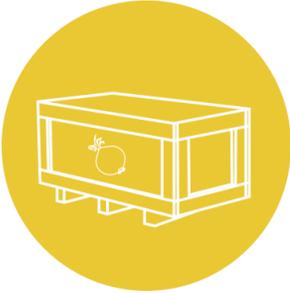
For high -risk raw materials, where suppliers are generally audited before being accepted, processing information and details of the HACCP plan are normally required as part of the specification.

Certificates of analysis may be provided for individual batches of a raw material to confirm that any specific criteria against agreed in the specification have been met – for example microbiological standards such as total viable count, absence of specific pathogens or analytical data such as fat content or the absence of specific additives.



Section G6

Pre-requisites – Food Storage



Pre-requisites for HACCP

Food Storage and Stock Control

Section G6

1. The Principles and Importance of Satisfactory Storage
2. Stock Rotation and Date Labelling
3. Damaged/unfit stock
4. Dry goods storage
5. Refrigeration
6. Storage and thawing of food
7. Chilling of food



Food Storage

1. The Principles and Importance of Satisfactory Storage

The Reasons for Food Storage

Storage is necessary due to:

- Fluctuations in supply and demand
- Convenience
- Advantages of bulk purchase

Importance of Good Storage

Satisfactory storage:

- Achieves minimum deterioration
- Prevents pest infestation
- Maintains quality, value, appearance and taste
- Reduces the risk of contamination or taint

Causes of food spoilage

- Spoilage bacteria
- Moulds and yeasts
- Enzymes (down to -6°C)

The Effects of Spoilage

- Appearance
- Smell
- Texture
- Taste

Indicators of spoilage

- Meat/poultry – slime, discolouration, sour odours and flavours, white spots
- Fish – ‘off’ odour, discolouration, slime
- Vegetables – soft rot, foul odour, discolouration, black spots
- Pasteurised milk – ‘off odours’ and flavours, bitty cream



Food Storage

2. Stock Rotation and Date Labelling

Stock Rotation

Stock rotation is used to ensure that the food that is used is good quality and safe to eat.

Control of Stock Rotation

- 'FIFO' – first in, first out
- 'use by' dates – safety issues
- 'best before' dates – quality issue
- Colour-coding ('day dots')
- Internal date labelling

Damaged Stock

Examination of Stock

Routinely stock should be examined, organoleptically tested (used of the senses) and checked for their 'use by' dates.

Dealing with Damaged Stock

Any food which is out of date or of poor quality shall be separated, identified with a notice, destroyed or returned to the supplier.



3. Dry Goods Storage

- Cool (< 20°C)
- Well ventilated
- Clean and easy to clean
- Shelves can be solid
- Absence of pests
- Opened packets of food transferred to sealed, pest-proof containers
- Adequate light
- Lowest shelf on rack raised off floor
- Products labelled





Food Storage

4. Refrigeration

Operating Temperatures

Each product has an optimum temperature. The following generalisation can be used as a guide:

Food	Recommended temperature
Raw meat	-1 to +1°C
Cooked food	1 to 3°C
Dairy products	3 to 5°C
Low risk whole vegetables	5 to 8°C
Displayed foodstuffs	1 to 3°C

Refrigerator Types

Refrigerator types include:

- Walk in chillers
- Holding cabinets
- Blast chiller
- Chilled display
- L deck display chillers

Units may be convection or fan-assisted.

Hygienic Use of Refrigerators

- No hot food
- No cross contamination
- Covering of foods
- Solid lids to containers
- No open cans
- Disinfect door handles

Efficient Use of Refrigerators

- 1-4°C
- Position away from heat
- Keep door shut
- Easy to clean, good condition
- Gauges/thermometers
- Regular defrosting and servicing
- Stock rotation



Food Storage

5. Storage and Thawing of Frozen Foods

Operating temperatures

The operating temperature for a commercial freezer should be below -18°C.

Hygienic use of freezers

- Clean and easy to clean
- No refreezing of thawed food
- Wrapping of foods to prevent freezer-burn
- Labelling of foods

Efficient use of freezers

- < 18°C
- Fan-assisted
- Large enough
- Not over-stacked
- Position away from heat
- Gauges/thermometers
- Regular defrosting

Prolonged storage effects

- Rancidity (breakdown of fats)
- Slime (non-blanching vegetables)
- Protein deterioration (eg. toughening of fish)
- Freezer burn (dehydration at the surface)

Therefore, shelf-lives vary according to food-type.

6. Thawing of frozen food

- Away from high-risk foods in a catch tray
- In appropriate place
- Allow sufficient time for food to thaw completely (chicken 12 hours, turkey 2-3 days)
- Discard thawed liquid carefully
- Treat all surfaces as contaminated





Food Storage

7. Chilling of food

Methods of chilling

- Blast chiller
- Ice bath
- Fans
- Running cold water
- Cool in cool part of kitchen for no longer than 1.5 hours, then transfer to refrigerated storage

Speed of chilling

Container

- Depth – keep shallow
- Material – stainless steel
- Perforated
- Presence/absence of lid
- Pre-chilled

Food

- Density
- Depth
- Moisture content

Benefits of blast chilling

Blast chilling helps to preserve:

- Safety
- Appearance
- Texture
- Flavour
- Nutritional value



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Section G7

Pre-requisites – Traceability and Labelling

Pre-requisites for HACCP

Traceability, Product recall and Labelling

Section G7



Traceability and Labeling

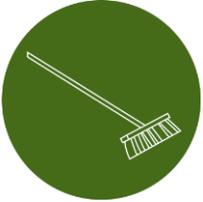


Traceability and Product Recall

Effective methods of product tracing are essential to enable rapid removal from sale and recall, should food safety problems be identified with a product. It is also important within a Food Safety Management system to be able to trace batches of ingredients, work in progress or finished products so that in the event of a failure at a critical point, ingredients or products that need to be rejected can be identified and isolated.

Identification and traceability procedures need to be maintained and relevant information recorded at all stages of production - from the purchase and receipt of raw materials, storage, batch assembly, processing and packaging, through to storage and distribution of the finished products.

To assist in the event of a product recall, the Food (lot Marking) Regulations 1996 requires that all pre-packed foods be identified with a Batch or Lot number. The size of a batch and the choice of number are both generally decided by the manufacture – the only requirement being that the lot number is easily visible, clearly legible and indelible.



Pre-requisites for HACCP

Cleaning, Disinfection and the Disposal of Waste Section G8

1. Needs and benefits of cleaning
2. Glossary of cleaning
3. Energies used in cleaning
4. Glossary of chemicals
5. Cleaning procedures
6. Cleaning in place (CIP)
7. Cleaning schedules
8. The manager's role



Cleaning and Disinfection

1. Cleaning

Need for cleaning

Thorough cleaning is needed in order to:

- Reduce likelihood of food poisoning
- To meet legal obligations

Benefits

- Reduce bacterial levels
- Pleasant, safe, attractive working environment
- Remove potential food sources for pests
- Reduce risk of physical contamination
- Customer satisfaction

2. Glossary of cleaning

Cleaning – the application of energy to a surface to remove grease and dirt.

Disinfection – the reduction of micro-organisms to a safe level

Sterilisation – a process that destroys all micro-organisms

3. Glossary of chemicals

Bactericide – destroys bacteria

Detergent – removes grease and dirt and aids the action of disinfectants

A detergent has the following characteristics:

Surfactancy

Reduces the surface tension between water and any surface (including dirt), therefore giving increased contact with the detergent.

Dispersion

Decreased surface tension allows the detergent to break large masses of dirt into smaller particles

Suspension

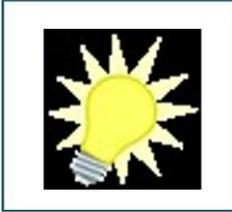
Once broken into particles a thin film of detergent holds the particles in suspension and stops them from re-joining. Water plays an important part in detergency to carry out the chemical to the site, to agitate the soil, to dissolve any soluble soil and to remove the suspension produced by detergency.

Detergent efficiency can be increased by:

- Abrasive cleaning
- Foam cleaning
- Power spray washing



Cleaning and Disinfection



Disinfectant

Reduces micro-organisms to a safe level

BS5283 “the destruction of micro-organisms, but not usually bacterial spores, it may not kill all micro-organisms but reduces them to a level which is neither harmful to health nor the quality of perishable foods.”

Methods:

- Heat
- Steam
- Chemicals

Where to disinfect:

- Food contact surfaces
- Hand contact surfaces
- Food handlers’ hands
- Cleaning equipment

Chemical disinfection

Disinfectant chemicals portray a wide range of qualities. Consideration of the required application must be made in deciding the best available chemical.

The choice of disinfectant depends on many factors including:

- Amount of soiling
- Water hardness
- Contact-time available
- Type of micro-organisms that need to be destroyed
- Type, imperviousness and smoothness of surface to be disinfected
- Possibility of taint
- Temperature of application
- Toxicity and effect on personnel

Sanitiser – used for cleaning and disinfecting

Steriliser – destroys all living organisms



Cleaning and Disinfection

4. Cleaning Procedures

Cleaning of surfaces

The following are the traditional six stages of cleaning:

- Pre-clean
- Main clean with detergent
- Disinfect
- Final rinse
- Air dry

Nowadays this process is shortened due to the use of sanitisers.

5. Cleaning in Place (C.I.P)

Definition

Application of non-foaming detergents and disinfectants to food process equipment in its assembled state. Use of heat and type of chemical is dependent on equipment, type and level of soil concerned.

Process

A normal process involves:

- Cold water pre-rinse
- Detergent
- Cold water rinse
- Disinfectant
- Cold water rinse

Problems

- Equipment design
- Measurement of efficiency
- Chemical contamination



6. Cleaning schedules

Benefits

Cleaning schedules help to communicate standards to ensure that cleaning is carried out and managed effectively. They co-ordinate all cleaning activities and act as a major communication link detailing requirements and staff duties.

Contents

- What is to be cleaned
- Who is to clean it
- When it is to be cleaned
- How it is to be cleaned
- Chemicals, materials and equipment to be used
- Precautions to be taken
- A system to indicate compliance, eg. signatures

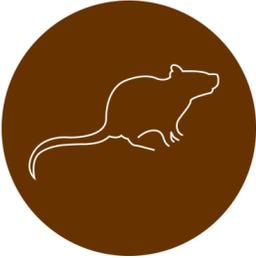
7. The manager's role

- Ensure sufficient resources are allocated
- Ensure staff are trained
- Ensure cleaning tasks are carried out effectively
- Financial control
- Compliance with cleaning schedules
- Appointment of cleaning contractors



Section G9

Pre-requisites – Pest Control



Pre-requisites for HACCP

**Pest Control
Section G9**

1. Definition of 'Pest' and the Importance of Pest Control
2. Methods of Pest Control
3. Rodents
4. Birds
5. Flying Insects
6. Cockroaches
7. Ants
8. Stored Product Insects
9. Management of Pest Control



Pest Control

It is essential to check regularly for any signs of pests infestation, even if a pest controller is employed to monitor the premises. An infestation can get out of hand in only a matter of days. Which could occur between scheduled visits from a pest control company. Staff must be aware of the common signs of pest infestation and know how to report them to a supervisor or manager immediately.



1. Food Pests

Definition

“An animal, insect or bird that contaminates or destroys food”

Apart from the fact that their presences contravenes food hygiene laws, pests must be controlled because they can:

- contaminate food or food surfaces with harmful bacteria and so spread disease
- physically contaminate food with their droppings, hair and body parts
- cause damage to stock for example by gnawing
- cause damage to the structure of food premises and equipment
- cause food wastage
- cause customer complaints and loss of business
- lead to fines prosecutions and even closure of the premises of the business



2. Management of Pest Control

When choosing a pest controller a manager should consider the following points:

- does the pest controller have the ability to provide a complete service
- are they a Member of the British Pest Control Association
- do they have the ability to provide clear reports
- can the pest controller advise on suitable proofing measures.
- the methods and chemicals used are food safety approved
- do they have the ability to undertake complete survey
- coverage of pests relevant for your business
- ability to provide regular, frequent visits ,emergency response available
- experience in food industry with references
- adequate insurance
- trained staff , suitable and necessary equipment.





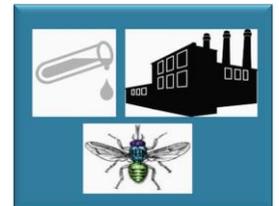
Pest Control

Supervision of the Contractor

- The manager must ensure the contractor provides the service at regular intervals throughout the year as specified in the contract.
- Any remedial works identified by the pest control operative should be noted, implemented and documented.
- Once a report of a pest is forwarded to the pest control contractor the manager should oversee the treatment and liaise with the contractor until the infestation is eradicated.

3. Integrated Pest Management

Rather than tackling pest problems as and when they occur, food business should work closely with a pest control controller to *prevent infestation*. An *Integrated Pest Management* system focuses on preventative measures rather than simply the use of physical and chemical pest control measures when an infestation occurs. Pests may be controlled by a variety of methods:



- Environmental
- Physical
- Chemical



Environmental control

Environmental methods are usually used to prevent pest infestation, whilst physical and chemical methods are usually used to control existing infestations. Environmental control aims to prevent infestation by removing the features that attract pests to food premises, namely food, moisture, warmth and shelter by:

Preventing access(pest-proofing)



- installing window and door screens/curtains (these must be easy to remove and cleaned when necessary)
- fitting plastic brush strips to the bottoms of doors
- fixing metal kick plates at the bottom of the door so they cannot be gnawed
- fitting wire guards over ventilation pipes and soil stacks
- avoiding cavities in internal walls
- keeping doors/windows closed when not in use
- keeping the drainage systems in good repair (pests particularly rats =, live in the sewers and will escape if the drainage system is in disrepair)



Pest Control



Physical control

Physical pest control involves trapping and/or killing pests, making the environment unsuitable for them. Examples include:

- traps
- sticky boards
- cages
- tracking powder
- thick inert gels
- bird spikes
- sprung wire systems (birds)
- hormone traps (insects)
- electric fly killers (EFK)



Traps are often used when there is a particular risk of food contamination when using chemical methods. Traps may be laid with or without bait and must be examined daily. The advantage of trapping is that the pest's body can be removed quickly and easily disposed of.

A tracking powder such as flour or talcum powder is used to detect rodents by tail swipes and foot prints. An EFK unit is the most efficient way of killing flies in the kitchen. Catch trays should be emptied regularly. A large number of dead insects would indicate that there is easy access to the premises and this should be investigated and remedied as soon as possible.

EFK

The unit should be positioned away from food surfaces, equipment, draughts windows and fluorescent lights, so that the dead bodies will not fall or blow into the food



Pest Control



Chemical control

Chemical pest control include:

- rodenticides
- insecticides
- pesticides
- fumigation
- drugs to sedate pests before removal

Rodenticides, are often mixed with bait, such as cereal, fruit, fish or meat. The reaction to the chemical is either acute – and the animal dies after one feed – or chronic – so that the animal has to eat the bait for sometime.

Fumigation may be necessary if stored products are found.

Specific hazards from pests

Rodents

There are many different species of rat in the world, but the one that causes most problems in the UK is the brown rat.

Rats are agile and can jump, climb up brickwork, get into cavity walls and swim up u-bends. They are more likely to be active at night as they are quite timid creatures. They can squeeze through tiny gaps no larger than an adult's thumb.

Rats are omnivorous, which means they feed on both animals and plant stuffs. They need to have a supply of water, whereas mice can obtain all the moisture they need from their food.

The most common mouse to cause problems in the UK is the house mouse. Mice can reproduce very quickly and one pair can result in thousands within a year.

Mice are inquisitive creatures and can sometimes be spotted during the day. They are far less timid than rats. Mice can climb almost anything and only need very small holes of about 6mm in diameter, the diameter of a pencil or pen, to gain access to premises.

Evaluating the effectiveness of pest control

Absence of pests/signs of pests - pest control book (use traps to monitor)

EFK tray empty

Evidence of proofing/maintenance

Visual check – food storage



Pest Control

Like rats, mice are also omnivorous and as mentioned above they do not need a supply of water as they get all the moisture they need from food.

Rats and mice must be controlled because of:

- The spread of disease, caused by:
 - Food poisoning bacteria, such as salmonella carried on and/or in the bodies of rodents
 - Contamination by rodent urine and droppings, which can lead to Weil's disease in the case of rats, and other illnesses
 - Parasites, including the cysts of *Trichinella Spiralis*, a worm that lives in rats' intestines which particularly affects raw pork and may survive when the meat is not thoroughly cooked
 - Rat bites
- The possibility of wasting food, as a result of infestation of food and packaging materials., leading to loss of production, recall of contaminated food, repackaging and the destruction of large quantities of food.
- Damage to structures (leading to collapse or subsidence) and water installations, such as underground pipes and electricity cables (leading to flood or fires) caused when rodents gnaw in order to wear down their incisor teeth.
- Likely financial loss, caused by any or all of the above
- Legal requirements

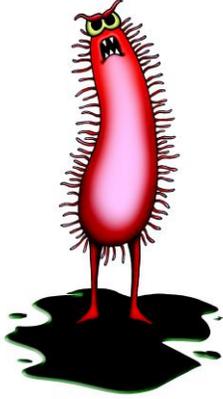
Birds

The wildlife and Countryside act 1981 protect all wild birds, their eggs and nests except for certain species defined as pests – including feral and wood pigeons, house sparrows, starlings, some gulls, jackdaws, magpies and rooks.

The main bird pests are pigeons and sparrows, which can cause a problem in any food premises but especially in processing plants, warehouses and markets.

Bird infestations must be controlled to prevent:

- The transmission of food poisoning microorganisms such as salmonella
- The contamination of food or equipment by droppings, feathers and nesting materials, which carry insects and mites
- Blocked gutters, which may result in flooding and expensive repair and maintenance
- The defacement of buildings- bird droppings contain an acid that attacks stone and paint
- The build-up of droppings, which can result in offensive smells
- Roosting on fire escapes and similar structures, causing a safety hazard
- Non-compliance with legal requirements.



Bacteriology

Section H1

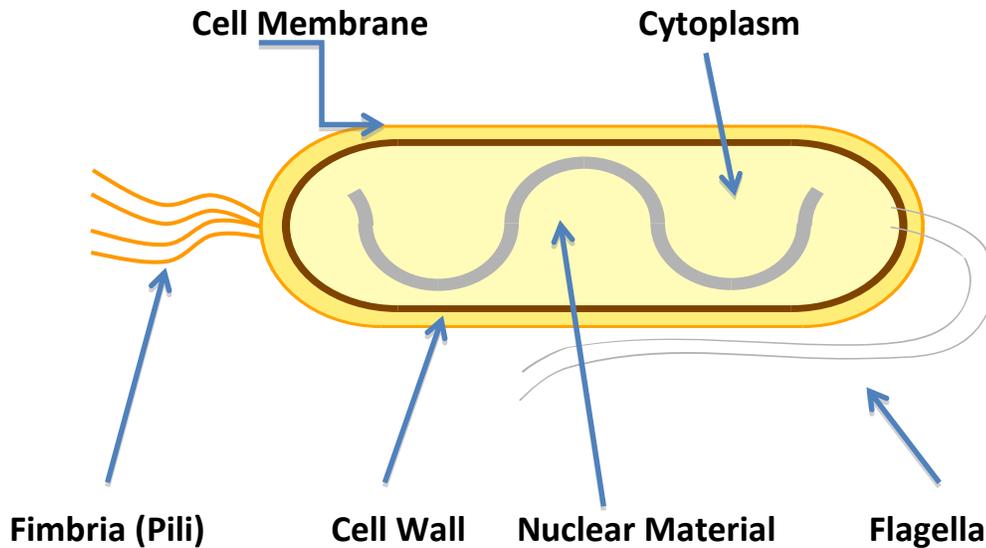
1. The Structure of Bacteria
2. Facts about Bacteria
3. Factors influencing Bacterial Growth
 - Nutrients
 - Temperature
 - Moisture
 - Atmosphere
 - ph
 - Competition
4. Bacterial Growth Rates



Bacteriology

Bacteriology

1. The Structure of Bacteria



2. Facts about Bacteria

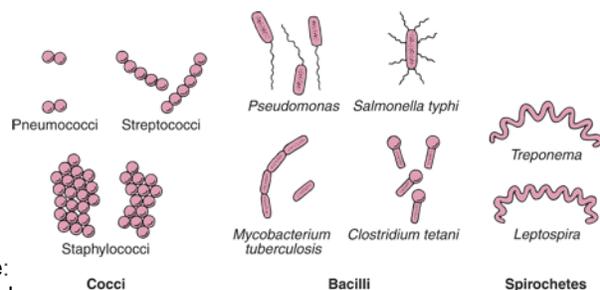
Bacteria:

- are microscopic, measuring between 1-3 μm (micrometer, 1 μm = 1/1,000,000m)
- are found everywhere
- are mostly harmless with some being essential
- can be beneficial eg. in the manufacture of cheese and yoghurt
- can in some cases cause food spoilage
- can in a few cases cause illness (pathogenic)
- can increase in large numbers in food due to poor food hygiene

3. Bacterial Characteristics

Bacteria can be distinguished by the following:

- Bacterial shape
- Spore formation
- Toxin production





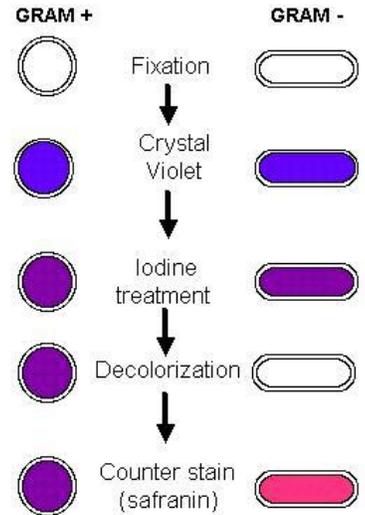
Bacteriology

Identification of Bacteria

Gram staining (relies on differences in the composition of the cell wall)

Bacteria in solution	
Fix to slide (heat)	
Add stain (crystal violet and iodine)	
Rinse with alcohol	
Blue/purple	Pink
Gram +ve	Gram -ve
Acid sensitive	Acid tolerant
eg. Staphylococcus aureus (upper body)	eg. Salmonella (lower body)

<http://www.meddean.luc.edu/lumen/DeptWebs/microbio/>



4. Factors influencing Bacterial Growth

Nutrients

Pathogenic bacteria require the presence of nutrients found in certain foods. Foods that are particularly vulnerable to bacterial growth:

- Meat & poultry
- Meat products
- Shellfish and dish
- Eggs and egg dishes
- Milk and dairy products
- Rice

These are foods that contain carbon, sugar, vitamins, fats and amino acids. Foods that are high in the nutrients bacteria require and will receive no further treatment for example, cooking, are known as **high risk foods**.



Bacteriology

Temperature requirements of bacteria

Pathogenic bacteria are generally said to grow between 5-63°C. This range is referred to as the “Danger Zone”. It is normally stated that bacteria grow best at a temperature of 37°C. However we find that each bacterium has a different optimum growth in temperature.

Bacteria	Range	Optimum temperature
Psychrophiles Include bacteria which cause food spoilage in refrigerators	-8°C to 25°C	10°C
Psychrotrophs Includes CL Botulinum, Listeria Monocytogenes	-5°C to 40°C	25°C
Mesophiles Includes common pathogens that cause food poisoning	10°C to 56°C	35°C
Thermophiles Important in canning – some are very heat resistant and if not destroyed will cause Spoilage in canned foods	35°C to 80°C	50°C

Moisture

Moisture available for microbial growth is measure in a_w (water activity).

The range of a_w goes from 0 to 1.00 is pure water.

Bacteria generally prefer water activity above 0.95 and grow best about a_w 0.99 (see diagram below). Moulds and yeast can grow at a_w 0.62

Examples of the a_w of foods:

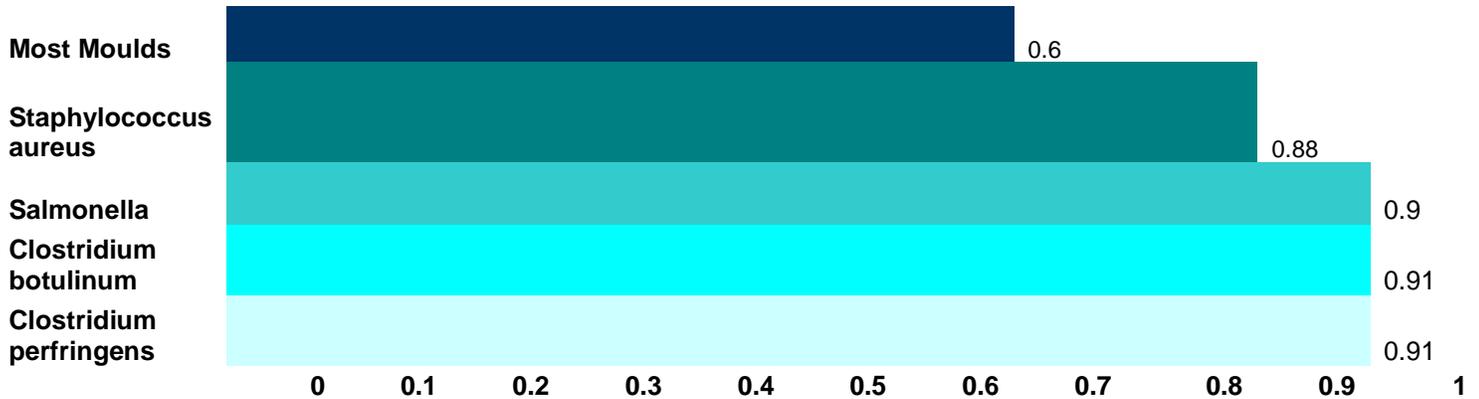
Jam	0.75
Fresh meat	0.95 – 0.99
Cured meat	0.87 – 0.95
Hard cheese	0.90
Dried pasta	0.2



Bacteriology

Water Activity Limits for Microbial Growth

A table showing water activity required for growth of different tables of bacteria



Atmosphere

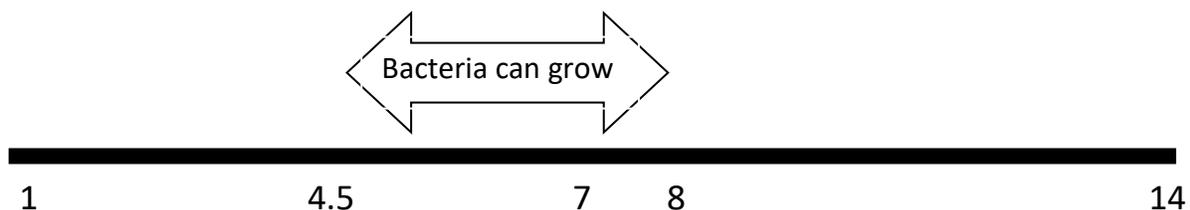
The composition of the air (the atmosphere) affects bacterial growth. Different bacteria have different oxygen requirements. Dependent on their needs they are called:

- Aerobic need oxygen
- Anaerobic do not need oxygen
- Facultative can survive with or without free oxygen

pH

pH is the measurement of a substance's acidity or alkalinity. The range goes from 0 – 14. Low levels of pH are highly acidic and high levels of alkaline. Pathogenic bacteria prefer a neutral pH of 7. Bacteria can grow at pH levels down to 4.5 and up to 8. (see diagram below). Moulds and yeasts can grow at pH levels down to 2. Most foods have a pH between 4 and 7.

pH Limits for Microbial Growth



A simple diagram illustrating pH limits for microbial growth

By reducing the pH we can reduce bacterial growth eg. by pickling food.



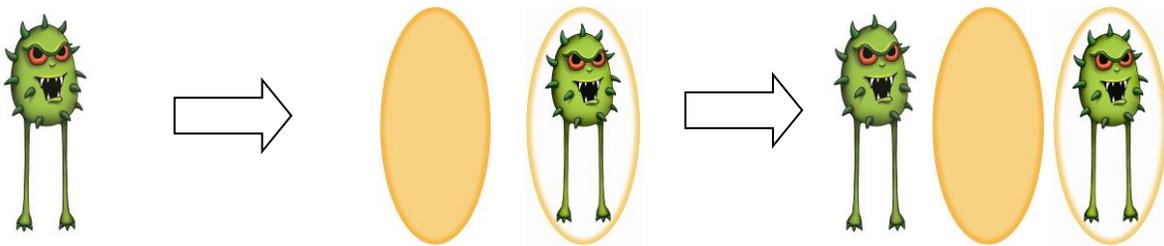
Bacteriology

Spore formation

Bacillus and Clostridium are both able to form spores during 'adverse conditions'. This enables the bacterial to survive unfavourable conditions. When favourable conditions return the spore germinates and a new vegetative cell is formed, which once again is capable of reproduction (see diagram below). Spores are resistant to a lack of moisture (desiccation), disinfectants and heat (100°C plus).

Spore formation is not a method of reproduction, rather survival.

Spore Formation – Adverse Conditions



Toxins

Toxins are poisonous substances that can be produced by living organisms such as bacteria.

There are two types of toxin:

Enterotoxins – affect the intestinal system

Exotoxins - formed during the multiplication of bacteria.

The toxin leaves the bacterial cell and is found on the food.

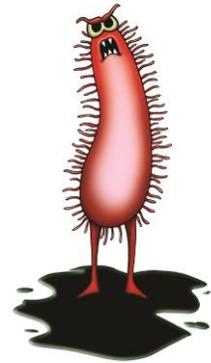
- produced during multiplication of bacterial in food
- when food eaten, exotoxin causes rapid illness
- severe vomiting 1 to 7 hours after consumption

Endotoxins - found in the bacterial cell and are only released on death of the cell when it forms a spore:

- released from cell on death or during spore formation
- mainly produced in the intestine
- illness occurs some time after ingestion as bacterial cells break down
- diarrhoea 12 – 18 hours after consumption

Neurotoxins – affect the nervous system

- paralysis, heart attacks, death onset period 12 – 36 hours
- produced during multiplication of bacterial in food
- when food eaten, exotoxin causes rapid illness



or



Bacteriology

Bacterial Sampling and Monitoring of Equipment

Bacterial Sampling

Method

- Sampling plan may be required
- Sample taken using sterile tools and placed into sterile container
- Food placed into insulated container for transportation
- Sample taken to recognised UKAS accredited laboratory for analysis
- Food may be analysed organoleptically (using the senses)

Benefits

- Can be used to determine the acceptability of a batch of food, either raw materials or finished goods
- Confirms good practice throughout the production of food
- Used by enforcement officers to support observations regarding hygiene practices

Disadvantages

- Expensive
- Bacteria are distributed unevenly through food, therefore a number of samples should be taken
- Destruction of food required
- Time, usually 48 hours before results available
- Organoleptic testing does not detect pathogens

Monitoring of Equipment

Bacterial Monitoring of Equipment

- Swab taken of pre-determined area
- Swab placed into medim and incubated to allow bacteria to grow
- Test kits available to give comparative results in terms of cleanliness of equipment
- Useful for staff training and to determine the effectiveness of cleaning and disinfection operations

Mycotoxins

- a. Toxins produced during mould growth, for example, *Aspergillus ustus*
- b. Food poisoning is rare but chronic food borne illnesses can cause concern
- c. Other foods that can be affected include cereals, apple juice, herbs, spices, milk and milk powder





Bacteriology

Food Safety - Food Poisoning

Bacillus cereus	Spore Exotoxin Endotoxin Facultative/Anaerobic	Cereals, soil, dust	1-6 hours
Clostridium botulinum	Spore Toxin – Exotoxin Neurotoxin Attacks the nervous system Anaerobic	Soil, untreated water, meat & fish	12- 36 hours
Clostridium perfringens	Spore Endotoxin Anaerobic Associated with cooked joints of meat & stews. Joints should not exceed 2.25Kg	Human and animal guts, soil, dust and insects	8- 12 hours
Salmonella	2500 types e.g Salmonella enteritidis and Salmonella typhimurim Facultative/Anaerobic	Poultry “raw egg products”, meat, dairy products,	12-36 hours
Staphylococcus aureus	Toxin Exotoxin Anaerobic	Human body, nose, throat and mouth	1- 7 hours



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Bacteriology

Food Safety – Food Borne Disease



Campylobacter jejuni	It is the most common food-borne illness in the UK Aerobic	Animal, sewage, poultry, untreated water	1-3 days
Esherichia coli O157	Toxin Endotoxin Verocytotxin (extremely virulent toxin) Anaerobic	Human and animal guts, sewage, untreated water	3-4 days
Hepatitis A (Viruses)	Viral liver infection	Sewage, Shellfish, untreated water, people	20-50 days
Listeria monocytogenes	Lowest growth rate of any pathogenic bacteria 30C Facultative	People, sewage, untreated water Soft cheese. It can cause severe illness in vulnerable group.	1- 90 days
Norovirus Viral gastroenteritis (Viruses)	Spreads in the environment	People, sewage, untreated water	1-2 days



Section H2

Viruses and Parasites

1. Parasites
2. Viruses



Parasites and Viruses

1. Parasites

Definition: “A plant or animal that lives on or in another plant or animal (the ‘host’)” eg. Cryptosporidium species which causes a gastrointestinal infection.

Cryptosporidium is a microscopic single celled parasite somewhat smaller than a red blood cell, which, if swallowed, can cause gastroenteritis. It is not a bacterium or a virus, but belongs to a group of micro-organisms known as protozoa. It infects humans, animals such as cattle and sheep, and sometimes dogs, cats, rodents, birds etc. Most of the infections in man and livestock are with just one species, *Cryptosporidium parvum*.

Cryptosporidium can grow only in a living host and does not multiply in the environment. The parasite develops mainly in the cells lining the gut where it goes through a complex life cycle. The last stage of this cycle is the production of oocysts, the infective stage. These are passed out of the body in the stools and can survive (but not multiply) in the environment, especially in cool moist conditions. Oocysts contain motile (free moving) banana-shaped bodies known as sporozoites. When oocysts are swallowed, the sporozoites are released and attach to the cells lining the gut and start the life cycle over again.

The infection may be passed either directly from an animal or from person to person. It may also be passed indirectly through the environment, especially in water, unpasteurised milk, offal and occasionally undercooked meat such as sausages.

In recent years there has been increasing recognition of outbreaks of cryptosporidiosis arising from contamination of water supplies. Although resistant to many chemical disinfectants, including chlorine used to treat water, properly functioning water treatment systems are usually able to deal with the small numbers of oocysts which are present from time to time in water sources such as rivers. However, water treatment may occasionally fall below the required level of efficiency following particularly heavy rain or agricultural contamination. In this event, the public may be advised by the water company or health officials to boil their tap water. Most infections are silent. Infected individuals may occasionally complain of mild abdominal cramps. They may report seeing moving tapeworm segments in the faeces or on clothing. Rarely, large portions of the worm may become separated and pass out through the anus, causing severe psychological distress.



Parasites and Viruses

2. Viruses

Viruses are extremely small living organisms (3/100 the size of bacteria), visible only through an electronic microscope, they multiply in the living cells of a host such as humans. They cannot reproduce themselves independently. The following two viral groups are known to be significantly associated with food-borne illness:

Hepatitis A (HAV)

- Caused by the Hepatitis A virus
- Source: people, un treated water and sewage
- Incubation period of 15 to 50 days
- Symptoms include fever, nausea, vomiting, abdominal pain, liver disease and jaundice. (lasting up to several months)
- Mainly caused by faecal-oral route
- Often associated with shellfish (from sewage) and raw vegetables (irrigation with contaminated water)

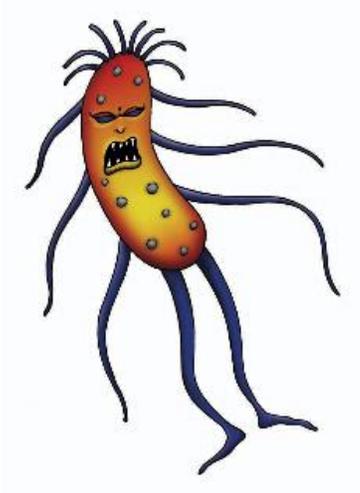
Norovirus Norwalk/Norwalk-like Viruses: small round structured virus

- Named after an outbreak in Norwalk USA in 1968
- Also known as the winter vomiting disease
- Source: human intestine
- Symptoms include nausea, vomiting, diarrhoea, abdominal pains and fever (lasting up to 3 days)
- Cause of illness/likely foods



Section H3

Food Safety – Food Poisoning



Section H3

Food-Borne Illness: Food Poisoning

1. Food poisoning: key facts
2. Bacillus cereus
3. Clostridium botulinum
4. Clostridium perfringens
5. Salmonella species
6. Staphylococcus aureus



Food Safety – Food Poisoning

1. Food poisoning: key facts

- Bacteria multiply on the food and some produce toxins on the food
- High infected dose required
- Short onset and duration of symptoms
- Time before the contaminated food is eaten is critical
- Most food poisoning symptoms affect the gastro-intestinal system and typical symptoms are abdominal pain, diarrhoea and vomiting
- Fever, malaise and general weakness may be among other symptoms suffered

2. Bacillus cereus

Organism	<i>Bacillus cereus</i> Spore-former
Shape	Rod Shaped
Gram	Gram-positive
Oxygen	Facultative / Aerobic
Toxin	Exotoxin, occasionally endotoxin
Temperature	Optimum 30-37oC
Symptoms	Vomiting, nausea, abdominal pain, occasionally diarrhoea
Sources	Rice, cereals, dust and soil
Food types	Rice dishes, vanilla slices (cornflour)
Onset	1 – 6 hours (6 – 24 hrs for endotoxin)
Duration	12 – 24 hours

Main causes of Bacillus cereus Food Poisoning	Control measures
<ul style="list-style-type: none">• Poor cooling of cooked rice• Inadequate storage• Excessive shelf-life• Serving cold/inadequate reheating	<ul style="list-style-type: none">• Thorough cooking and rapid cooling of food• Adequate temperature control for storage• Correct reheating• Prevention of cross-contamination



Food Safety – Food Poisoning

3. Clostridium botulinum

Organism	Clostridium botulinum spore-former
Shape	Rod
Gram	Gram-positive
Oxygen	Anaerobic
Toxin	Neurotoxin (form of exotoxin)
Temperature	Optimum 20 – 30 oC
Symptoms	Paralysis, double vision, death
Sources	Soil, meat, fish
Food types	Canned or vacuum-packed foods such as salmon, smoked fish or meat
Onset	12 – 36 hours
Duration	Death within 8 days unless anti-toxin given

Main causes of Clostridium botulinum Food Poisoning	Control measures
<ul style="list-style-type: none">• Inadequate sterilisation of cans• Contamination of cans post processing• Poor storage of pasteurised, vacuum-packs	<ul style="list-style-type: none">• High standards of hygiene during canning, bottling and vacuum-packing• Discard blown cans• Strict controls over smoking and handling of smoked fish• Adequate sterilisation and temperature control• Correct chilled storage of pasteurised products



Food Safety – Food Poisoning

4. Clostridium perfringens

Organism	<i>Clostridium perfringens</i> spore-former
Shape	Rod shape
Gram	Gram - positive
Temperature	43oC
Oxygen	Anaerobic
Toxin	Endotoxin
Symptoms	Diarrhoea, abdominal cramps
Sources	Human/animal intestines, soil and dust
Food types	Raw meat, raw vegetables, stews, curries, rolled meat joints
Onset	8 – 12 hours
Duration	1 – 2 days

Main causes of Clostridium Perfringens Food Poisoning	Control measures
<ul style="list-style-type: none">• Long, slow, low-temperature cooking of meat and vegetable dishes• Poor cooling• Inadequate cooking/reheating• Incorrect storage• Serving cold	<ul style="list-style-type: none">• Thorough cooking of rolled joints• Cool hot foods rapidly• Separation of raw and cooked foods• Removal of dirt from vegetables• Correct reheating



Food Safety – Food Poisoning

5. Salmonella species

Organism	<i>Salmonella sp (nearly 3,000 known sero-types)</i>
Shape	Rod
Gram	Gram- Negative
Oxygen	Facultative / Anaerobic
Toxin	-
Temperature	35- 40 oC
Symptoms	Vomiting, diarrhoea, abdominal cramps, fever
Sources	Animal intestines, birds, pests, human carriers, water and sewage
Food types	Poultry (50%), raw meat, eggs, untreated milk
Incubation period	12 – 36 hours
Duration	1 – 7 days
Carrier	May be carried in human intestines (1% of sufferers are still carriers a year later)

Main Causes of Salmonella Food Poisoning	Control measures
<ul style="list-style-type: none">• Service of raw eggs• Undercooked chicken eg. barbeques• Cross-contamination from raw poultry to high-risk foods• Poor storage/cooling temperatures• Carriers preparing food	<ul style="list-style-type: none">• Hygienic husbandry for poultry• Hygienic slaughtering• Separation of raw and high-risk foods and work areas• Effective cooking• Adequate temperature control – cooling and storage• Thorough cleaning and disinfection• Effective personal hygiene• Effective pest control

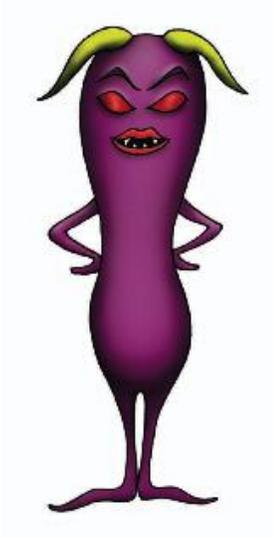


Food Safety – Food Poisoning

6. Staphylococcus aureus

Organism	Staphylococcus aureus (salt-tolerant)
Shape	Round
Gram	Gram Positive
Oxygen	Anaerobe
Toxin	Exotoxin (Heat Stable)
Temperature	37°C
Symptoms	Projectile vomiting, abdominal cramps
Sources	Humans – nose (40%), skin (15%), hands, hair, infected wounds, infected cows' udders
Food types	Raw milk and unpasteurised cream, cold meats and canapés
Incubation period	1– 7 hours
Duration	24 hours

Main causes of Staphylococcus aureus Food Poisoning	Control Measures
<ul style="list-style-type: none">• Poor personal hygiene – coughing, septic wounds, poor hand washing• Poor temperature control over contaminated high-risk food• Consumption of raw milk/cheese	<ul style="list-style-type: none">• Good personal hygiene• Food hygiene training• Adequate temperature control during storage• Pasteurisation of milk and cheese



Section H4

Food Borne Disease

1. Food-borne infection: key facts
2. Campylobacter jejuni
3. E. coli O157
4. Listeria monocytogenes
5. Bacillary dysentery
6. Typhoid and Paratyphoid



Food Safety – Food Borne Disease

1. Food-borne disease: Key Facts

Low infective dose

Bacteria only carried by food and multiplication takes place in the body

Time before the food is eaten is not a significant factor in onset of symptoms

Long incubation and long duration possible

2. Campylobacter jejuni

Organism	Campylobacter jejuni
Shape	Spiral Rods
Gram	Gram – negative
Oxygen	Aerobic
Toxin	-
Temperature	43oC
Symptoms	Abdominal pain, diarrhoea (may be bloody), fever, headache, nausea
Sources	Wild animals, pets, raw poultry (50%) and meat (pigs 95% infected), untreated water
Food types	Undercooked foods (chicken); cross-contamination from raw chicken, untreated water, raw milk, contact with infected pets
Onset	1 – 3 days
Duration	2 – 7 days

Main causes of <i>Campylobacter jejuni</i>	Control Measures
<ul style="list-style-type: none"> • Under cooked chicken • Cross contamination 	<ul style="list-style-type: none"> • Separation/segregation to avoid contamination • Not washing poultry • Refrigerated storage • Good personal hygiene • Cleaning and disinfection



Food Safety – Food Borne Disease

3. E. coli O157

Organism	Escherischia coli O157
Shape	Rod
Gram	Gram – Negative
Oxygen	Anaerobic
Toxin	-
Temperature	35 – 40oC
Symptoms	Vomiting, abdominal pain, diarrhoea (may be bloody), fever. Renal failure in up to 30%of cases
Sources	Human and animal intestines Raw meat and sewage
Food types	Beef burgers, minced beef, cooked meat, raw milk
Onset	7 – 14 days
Duration	1 to 8 days or longer if kidneys are infected

Control Measures

Farm

High standards of hygiene
Cleaning of cows udders
Safe disposal of sewage

Slaughterhouse

Cleaning of cattle prior to slaughter
Eliminate spillage from intestines during slaughter
Hygiene of slaughter men and equipment

Retail/Catering

Analysis of food safety hazards
Training of staff
Prevention of cross contamination
Temperature control during storage
Thorough cooking

Institutions

Personal hygiene in primary schools, nurseries, and old people’s homes



Food Safety – Food Borne Disease

4. *Listeria monocytogenes*

Organism	<i>Listeria monocytogenes</i> Psychotrophophic, salt tolerant
Shape	Rods
Gram	-
Oxygen	
Toxin	-
Temperature	Lowest growth rate of any pathogenic bacteria. 30C
Symptoms	Fever, septicaemia, possibly meningitis, abortion
Incubation period	1 – 70 days, normally 3 – 21 days
Sources	Soil, sewage, water
Transmission	Ingestion of contaminated food, usually after prolonged or inadequate refrigeration. Decaying vegetables. Transferred from contaminated surfaces onto soft cheese, ice cream, cooked meats
Onset	1 – 90 days
Duration	1 – 7 days
Control	Good personal hygiene, good temperature control over high risk foods especially pate and soft cheeses

Control Measures

Good personal hygiene
Good temperature control over high risk foods especially pate and soft cheese
Staff training



Food Safety – Food Borne Disease

5. Bacillary Dysentery

Organism	Normally <i>Shigella sonnei</i> but occasionally <i>S. flexneri</i>
Incubation period	1 – 7 days (normally 4 days)
Symptoms	Bloody diarrhoea, fever, stomach cramps, vomiting
Source	Intestines of infected people
Incidence	1,382 cases in 2005
Transmission	Faecal/oral route

Control Measures

Personal hygiene, particularly in primary schools; excluding food handlers who are carriers

6. Typhoid and Paratyphoid

Typhoid

Organism	<i>Salmonella</i> Typhi
Incubation period	3 – 56 days (usually between 1 and 3 weeks)
Symptoms	Fever, profuse diarrhoea or constipation, rose spots
Incidence	231 cases in 2005
Source	Mainly caught abroad/contaminated sewage and carriers
Transmission	Faecal/oral route or contaminated drinking water
Carrier status	Yes
Control	Wholesome water supply, sanitary disposal of sewage, control shellfish suppliers, high standards of personal hygiene, heat treatment of milk; supervision of young children

Paratyphoid

Organism	<i>Salmonella</i> Paratyphi
Incubation period	1 – 3 weeks (fever) 1 – 10 weeks (gastro enteritis)
Symptoms	As for typhoid but generally less severe
Incidence	229 cases in 2005
Source, transmission and control	As for typhoid



Section I

Preservation

1. Definition of preservation
2. Low temperature
3. High temperatures
4. Cook-Chill and Cook-Freezing Systems
5. Sous-Vide
6. Canning and Bottling
7. Dehydration
8. Addition of Chemicals
9. Vacuum Packing and Modified Atmospheres
10. Smoking
11. Irradiation





Food Safety – Preservation

1. Definition of preservation

'The treatment of food to prevent or delay spoilage and inhibit the growth of pathogenic organisms which would render the food unfit.'

2. Low temperatures

Refrigeration Principle used:

- Chilling of foods slows the rate of growth of bacteria, but does not stop it
- Spoilage bacteria and *Listeria monocytogenes* can grow down to 1°C
- Some moulds do multiply at low temperatures
- Enzymes can still be active

Freezing Principle used:

- Inhibition of enzyme activity in the micro-organism below -6°C
- Reduction of a_w
- Bacteria become dormant
- Most spores and toxins unaffected
- Some reduction in the number of bacteria
-

Benefits of rapid freezing:

Smaller ice crystals resulting in reduction in 'drip' on thawing plus better quality.

Commercial freezing:

- Fluidised bed freezing eg. peas
- Air blast freezing eg. ready-meals
- Plate freezing eg. fish fillets
- Cryogenic freezing eg. prawns

3. High Temperatures

Pasteurisation

Heat treatment at a relatively low temperature for a short time
eg. 70°C for 2 minutes, milk 72°C for 15 seconds.

- Pathogens destroyed
- Large number of spoilage bacteria destroyed
- Toxins and spores unaffected



Food Safety – Preservation

Rapid cooling and refrigerated storage essential.

Characteristics of pasteurisation:

- Food is safe for a short shelf-life
- Minimum change in flavour
- Minimum change in nutritional value

Examples of pasteurised foods:

- Milk
- Ice cream
- Liquid egg
- Canned ham

Sterilisation

'Commercial sterility' – the application of heat which renders food free from micro-organisms (probability of 1 in 10^{12} of a spore surviving).

Usually achieved by the application of steam under pressure to achieve temperatures in excess of 100°C.

- Destroys all pathogens and spoilage bacteria
- Prolonged shelf-life
- Flavour is affected
- Nutritional value is affected including loss of vitamins

Ultra Heat Treatment

Process designed to give foods a long shelf-life without substantially changing flavour eg. milk heated to 132 °C for 1 second.

4. Cook-Chill and Cook-Freeze Systems

Description of Systems

Cook-Chill

Full cooking of food followed by rapid chilling. Storage and distribution is at 0-3°C followed by regeneration close to the point of consumption. Used within 5 days.

Cook-Freeze

Full cooking, fast freezing for storage and distribution at -18°C or below. Regenerate close to the point of consumption.



Food Safety – Preservation

Management of Cook-Chill Process

HACCP is recommended. Critical control points include:

- Quality and temperatures incoming raw materials
- Centre temperature on cooking
- Time period to portion
- Time period to chill
- Temperature/time for cook/freeze process
- Storage temperature
- Stock rotation
- Distribution temperature
- Core temperature on reheating

5. Sous-Vide

Advantages of Sous-Vide

- Extended shelf-life
- Better flavour retention
- Better retention of nutritional value
- Less shrinkage
- Improved packaging/transportation

Disadvantages of sous-vide

- Significant capital and operation costs
- Limited number of products suitable
- Potential for growth of anaerobic bacteria

6. Canning and Bottling

The process:

- Food sealed in the can, then subjected to high temperatures (usually 121°C for at least 3 minutes at the centre of the food)
- Referred to as the 'botulinum cook' as the process is designed to destroy the heat-resistant spores of *Clostridium botulinum*
- Other combinations of times and temperatures may be used. Flow Diagram is shown in 2E.

Factors affecting heat resistance of micro-organisms

- pH
- chemicals
- a_w
- humidity
- fats, sugars, proteins
- time/temperature



Food Safety – Preservation

The amount of heat processing required depends on:

- pH
- weight/density of product
- product size
- level of preservative
- pre-process contamination

Problems associated with canning

- Inadequate heat processing
- Defects in can construction
- Post process contamination
- Pre-process spoilage

Detectable changes

- Can distortion (eg. flipper, hard swell, spinger due to production of gas)
- Leaking seams
- Denting
- Flat sour (no gas, acid produced by bacteria)
- Sulphiding (sulphide produced by bacteria causes black/purple stain)

7. Dehydration

Principle

- Lowering of a_w will stop bacterial growth

Disadvantages

- Rancidity of a problem for fatty foods
- Alteration of nutritional value, flavour and texture
- Spore-forming bacteria survive

Minimising chemical changes

- Keep moisture content as low as possible
- Ensure air-tight packaging
- Blanch fruits and vegetables prior to dehydration to eliminate enzyme activity
- Use preservatives eg. sulphur dioxide
- Store dried foods at low levels of relative humidity

Methods

- Sun drying eg. tomatoes, figs
- Tunnel drying eg. fruits and vegetables
- Fluidised bed drying eg. pulses
- Roller drying eg. potato
- Accelerated freeze drying eg. fruit, coffee
- Spray drying eg. milk powder



Food Safety – Preservation

8. Addition of chemicals

Salt and sugar

- Reduction of a_w process of osmosis
- Some bacteria can reproduce in salty environments (halophiles) eg. Staphylococci
- Concentration of sugar must be six times that of salt to achieve the same effect
- Can be rubbed on the surface of the food, added as a solution or added directly
- Examples – salt: curing, brining. Sugar: jam, candied fruits, condensed milk, some cakes

Preservatives

- Nitrates and nitrites – curing meat, prevents germination of bacterial spores
- Sodium benzoate – inhibits yeasts and moulds in high-acid foods
- Sulphur dioxide – used in wine, beer and fruit juice, inhibits bacteria, moulds and enzyme activity in dehydrated foods

Acid

Principle

- The lowering of pH below 4.5 will prevent bacterial growth

Problems

- Moulds and yeasts can often grown at a pH below 3.0
- pH must be carefully controlled to ensure no growth of anaerobic bacteria

9. Vacuum packaging and modified atmosphere Packaging

Principle

- The removal of oxygen and/or replacement with another gas eg. nitrogen or carbon dioxide prevents aerobic bacteria from multiplying and reduces oxidative rancidity

Problems

- Produce must be refrigerated to prevent growth of anaerobic bacteria
- Packaging integrity must be maintained

10. Smoking

Principle – inhibition of microbial activity by:

- Chemical bactericidal effect (phenols, alcohols)
- Dehydration
- Alteration of pH

Methods

- Cold smoking (below 30°C)
- Hot smoking

Problems

- The process does not destroy spores, therefore storage conditions are important



Food Safety – Preservation

11. Irradiation

Principle

- Food exposed to a Gamma radiation source which destroys bacteria, moulds, yeasts, parasites and insects

Problems

- Spores and toxins not affected
- Reduction in nutritional value (vitamins may be destroyed)
- Enzymes unaffected
- Customer satisfaction
- No method of detecting that food has been irradiated
- The Food (Control of Irradiation) Regulations 1990 authorised irradiation of foods in licensed facilities
- The Food Labelling (Amendment)(Irradiated Food) Regulations 1990 requires irradiated food to be labelled



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Notes