

Resource Code CSE2-RF

This information is provided to assist with Safe Food Handling on your program. It has been based on a food handling resource in Victoria, Australia. You may need to modify the information provided here to comply with regulations in your jurisdiction, or to take account of your context.

1.INTRODUCTION TO FOOD HYGIENE

Everyone who works with food is responsible for ensuring that consumers are protected from contaminated food and the risk of food poisoning, which causes extreme discomfort, absence from work or school and, in some cases, death.

People get sick from food poisoning because the food they've eaten has contained bacteria, viruses or chemicals. It can take from an hour to a few days to develop food poisoning, depending on the cause, and the best way of preventing food poisoning is to use safe food handling practices.

Bacteria are the biggest problem, because they are so common, and are found in soil, on animals, people and even clothes. In the kitchen, bacteria often come from vegetables and raw meat. Sometimes these bacteria can move from raw ingredients to cooked food, in a process called cross contamination.

The way that these germs can move includes:

- From hands to food.
- From cutting boards, knives and other utensils on to food.
- From one food to another, especially from raw to cooked.

Once bacteria are in a food, they can increase their numbers quickly. They just need the right conditions. This means a temperature of between 5 °C and 60 °C, (sometimes called the danger zone), time and water.

There are six keys to breaking this chain of food poisoning:

- 1. Someone who is responsible for every aspect of food preparation and sales.
- 2. Each person handling or preparing the food must know, about and practise safe food handling.
- 3. Making sure that everything (utensils) used in preparing the food is clean and germ free.
- 4. Correct and safe food preparation.
- 5. Correct and safe food storage.
- 6. Displaying food safely.

FOOD HYGIENE INVOLVES

- preventing the spread of infection by people who handle food.
- ensuring that food preparation areas, equipment and surfaces are clean.

AIMS OF FOOD HYGIENE

- Protect food from risks of contamination.
- Prevent bacteria from multiplying to levels resulting in ill-health.
- Destroy bacteria in food through adequate cooking or processing.

THE BENEFITS OF FOOD HYGIENE

- Return of business through satisfied customers.
- Good reputation.
- Compliance with the law.
- High quality food and increased shelf life of food.
- Good working environment for staff, boosting staff morale and job satisfaction.

THE COST OF POOR HYGIENE

- Food poisoning outbreaks and sometimes death.
- Customer complaints.
- Wastage of goods due to spoilage.
- Pest infection.
- Suspension of trading by local health authorities.

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- Fines and cost of legal action by food poisoning sufferers.
- Loss of reputation through word of mouth or media exposure.

APPROACH TO THE PROBLEM

- Preventing food being contaminated.
- Killing bacteria.
- Preventing bacteria growth and multiplication.

SOURCES OF CONTAMINATION

- People (hands, mouth, nose, anus, skin).
- Clothes.

• Utensils - (dirty utensils, especially those used for raw then cooked foods without adequate cleaning and sanitising in between, tea towels).

- Raw foods (especially red meat, chicken, seafood, vegetables, water).
- Flies and pests.
- Garbage.

PREVENTION

If we are to adopt the main principles of food hygiene we must adhere to the following practices.

- Develop and maintain high standards of personal hygiene.
- Avoid cross-contamination of foods.
- Establish and maintain correct storage conditions.
- Clean and sanitise all utensils and equipment used in the handling and preparation of food.
- Control pests.

2.PERSONAL HYGIENE

WHY FOOD HYGIENE?

Food hygiene is concerned with every aspect of food production. The main aim is to promote health. This is the responsibility of everyone in the food industry, from managers to cleaners. All must take great care when it comes to handling and preparing food to prevent unnecessary waste of food, due to spoilage or contamination by moulds, bacteria, physical damage or vermin.

Most people think that food hygiene is simply common sense, they try to do the right thing and they certainly do not set out to poison anyone. However, when you work in the food industry you must consider a number of important issues to do with your approach to personal hygiene and kitchen hygiene.

WHERE DOES GOOD HYGIENE BEGIN?

PERSONAL HYGIENE

One of the keys to safe food is good personal hygiene of the people who prepare and serve it. The bacteria that can cause food poisoning can easily transfer from the hands and clothes of the people who handle it to food, so it is important that everyone who handles food has high levels of personal hygiene.

As well as hands, clothes and other body parts, hair and jewellery can contain and spread bacteria to food. Important, too is the health of the people handling food. People with illnesses and those with wounds like cuts and scratches can spread illness through food without knowing it. Good hygiene begins with the attitudes and knowledge of all food service workers. It starts with personal hygiene and caring for yourself. The outward signs are a healthy body and attention to grooming.

PERSONAL HYGIENE AND CONSCIOUS BODY HABITS

As a food service worker you are responsible for:

1. Practising personal cleanliness:

- having a bath or shower daily.
- wearing clean undergarments daily.
- using a deodorant but avoid the use of overpowering perfumes.
- washing hair regularly.

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- shaving at least daily, for males without beards.
- beards, if worn, should also be washed daily and kept trim.
- cleaning teeth frequently to ensure oral hygiene and fresh breath.
- keeping fingernails clean, neat and well trimmed. Nail polish should not be worn when preparing food.

2. Preparing yourself systematically for work:

• brush hair and secure it off the face and in such a way that hair will not contact food or surfaces used for preparing food.

- wear clothing which will not cause contamination of foods.
- do not smoke in food preparation or serving areas.

• wash hands and fingernails thoroughly before commencing work. This is vital because hands are the major contact between the food handler and food.

- wear a clean apron.
- wear limited jewellery, plain band type rings and plain sleeper style earrings.

PERSONAL HYGIENE AND UNCONSCIOUS BODY HABITS

Following these fundamental rules for good personal hygiene ensures basic standards. However, a food handler also needs to be aware of unconscious body habits and must avoid actions such as scratching or rubbing the head, nose or other body parts, stroking hair/beards, picking pimples, licking fingers when tasting food and the like. Ordinarily, these unconscious body habits do not create problems, but when handling foods for the public, it is not only unprofessional behaviour but is potentially dangerous.

THE FOOD HANDLER AS A SOURCE OF HARMFUL BACTERIA

All this focus on the cleanliness of the food handler is because the human body provides a rich environment for microorganisms to live in. Micro-organisms (eg. bacteria) are to be found in and on the body. Most of these bacteria are harmless. Many even have an important role to play in maintaining health. (eg. gut bacteria manufacturing Vitamin K).

However some are harmful and can cause food poisoning. Apparently healthy people may be carrying pathogenic bacteria without showing any signs of illness.

Everyone has to assume that they may be carrying food poisoning bacteria and so take precautions against spreading the disease. It is estimated that 50% of the population carry Staphylococcus Aureus in their mouths/noses. Staph Aureus may also be present in infected cuts and pimples. This food poisoning bacteria may be spread to food by a food handler coughing or sneezing over food, tasting food using fingers or working with an infected cut.

Salmonella and Clostridium perfringens can be present in the intestine of seemingly healthy people. Inadequate washing of hands after going to the toilet may result in faecal material being transferred to the food.

If healthy people are carrying bacteria, then people suffering from nose, throat or chest infections, intestinal upset or skin infections will be shedding bacteria at an even greater rate. If you are sick you should not handle food. Report any abnormal health conditions. Keep cuts or burns covered with a clean waterproof dressing.

HAND-WASHING

Always wash your hands before handling food. Washing hands is not just a quick wetting under the tap. Adequate washing of hands involves these steps:

- Using the hand basin, wet hands with hot water.
- Apply soap. Lather and thoroughly rub over hands, wrists and fingers. A nail brush is useful.
- Continue washing action for sixty seconds.
- Rinse under warm, running water.
- Dry using disposable paper towel.

Wash your hands again:

- after visiting the toilet.
- after handling raw food.
- after using a tissue, coughing or sneezing.
- after handling garbage.
- after changing a nappy.
- after handling pets or other animals.
- after smoking or touching your hair or other body parts.

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3.BASIC MICROBIOLOGY

MICRO-ORGANISMS

A micro-organism is any living organism so small that, on its own, it is invisible. Individual micro-organisms can only be seen with the aid of a microscope. The micro-organisms of most concern in food service are:

- Viruses.
- Bacteria.
- Yeasts.
- Moulds.

Micro-organisms can be found everywhere in our environment - they are on us, in the air, soil and water. The effects of micro-organisms can be desirable or undesirable.

BENEFICIAL MICRO-ORGANISMS

These micro-organisms can play a crucial role in:

- the breakdown of dead plant and animal matter.
- the production of certain foods such as microbial action in yoghurt, cheese, bread, wine.
- the production of some antibiotics eg penicillin.

SPOILAGE MICRO-ORGANISMS

These micro-organisms alter the appearance, texture, flavour and odour of food, making the food undesirable to eat. Consumption of spoiled food such as sour milk, does not result in illness or disease.

PATHOGENS

Less than 1% of all micro-organisms are harmful and produce disease. These are referred to as pathogens eg. viruses, food poisoning bacteria.

VIRUSES

Viruses are the smallest of all micro-organisms. Viruses do not have their own cellular structure, and to become active must enter a living cell. Once a virus enters a host cell, it redirects the activities of that cell towards reproducing itself. Viruses are always pathogenic but are host specific ie. animal cells are only susceptible to animal viruses. Most viral diseases affecting people are transmitted by contact eg measles, mumps, H.I.V., colds and influenza. However, a few viral infections are transmitted by contaminated food or water. Both Hepatitis A and viral gastro-enteritis are food borne. Healthy humans produce antibodies, as a defence in response to invading viruses. Once exposed to a virus, either through an attack of the disease or artificially through vaccination, immunity is conferred.

BACTERIA

Bacteria are single cell organisms and their name gives a clue to their shape. Bacteria are important for the ageing of meat and in producing foods such as cheese, yoghurt, sour cream, sauerkraut, pickled cucumbers, salami, peperoni and vinegar. Sometimes bacteria spoil food. Slime and 'off' smells indicate their action. Other bacteria can cause food poisoning eg. Salmonella. Regardless of their shape, bacteria have the same internal structure and reproduce in the same way. It reproduces by the one cell dividing into two parts. This is called binary fission. Under ideal conditions binary fission can be completed in 15-20 minutes. This means that a single bacteria can multiply to large numbers in a relatively short time. Under ideal conditions, bacterial population can grow from one thousand to over four million in under four hours. Between one and two million bacteria form a serious food poisoning threat.

Under adverse conditions, growth slows down, and many bacteria die. Bacillus and Clostridium have a special way of coping with adverse conditions. They form spores which is a protective means of survival. They go into a dormant state until conditions become favourable again. They are not killed by freezing or boiling while in this 'protective' state. **YEASTS**

Yeasts are single celled organisms, larger than bacteria. Yeasts reproduce by a process called budding. A small growth appears on the 'mother' cell. As this bulge grows, the mother cell progressively cuts off the new 'daughter' cell. The daughter cell is about half the size of the original cell. It will increase in size until it is ready to 'bud' or reproduce. Yeasts breakdown sugars to produce carbon dioxide and alcohol. This reaction is utilised in the production of alcoholic beverages and bread.

MOULDS

Moulds are usually multicellular but each cell is capable of growing independently. Moulds are often quite visible. They appear in various forms such as powdery blue-green-white patches on lemons, white fluffy patches on tomato paste or blackened areas along the rubber lining on refrigerator doors. Moulds consist of fine thread-like strands called hyphae. The hyphae grow in a mass either across the surface or down through the medium.

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UNDESIRABLE EFFECTS OF MOULDS

Many foods such as pumpkin, citrus fruits, zucchini and bread are susceptible to mould spoilage. Some moulds are pathogenic and can cause infections of the skin eg tinea and ringworm. A few moulds produce dangerous toxins. These are of concern in the bulk storage of peanuts and grains. It produces a toxin called aflatoxin. Long term consumption of aflatoxin causes liver cancer.

DESIRABLE APPLICATION OF MOULDS

Moulds are responsible for the particular flavours and textures of the blue vein cheeses and the surface ripened cheeses, brie and camembert. A highly prized sweet dessert wine is made with grapes affected by a particular mould.

Moulds and yeasts are the microscopic members of the fungi group. Larger fungi, mushrooms and truffles are also used extensively as foods.

Environmentally, moulds are important because of their ability to change complex organic materials into simple substances eg the rotting and decay of dead matter.

Medically, moulds are significant for their antibiotic properties eg. Penicillium mould producing Penicillin.

4.FACTORS AFFECTING MICROBIAL GROWTH

Micro-organisms form an invisible world around us. They are in the air, on us, on food, equipment and food preparation surfaces. It would be difficult to find an environment free of micro-organisms.

In some situations microbial growth will be encouraged eg. in the making of yoghurt or bread. At other times their presence will be actively discouraged eg. taking precautions to prevent food poisoning. Either way, to understand how to control micro-organisms, the food worker needs to have some basic knowledge of the conditions required for microbial growth.

There are six factors required for the growth of micro-organisms:

- 1. Suitable food.
- 2. Suitable water.
- 3. Suitable temperature.
- 4. Suitable oxygen levels.
- 5. Suitable pH.
- 6. Time.

SUITABLE FOOD

Micro-organisms exhibit a wide variation of nutrient requirements. Some can be sustained on inorganic material. However, the bacteria responsible for food poisoning thrive well in the foods we like to eat, especially those high in protein, high in moisture and not very acidic.

SUITABLE WATER

- Micro-organisms need liquid water for growth and multiplication.
- Dried foods will not support microbial growth providing they are kept dry, and tend to be spoiled by yeasts and moulds.
- The majority of microbes will not grow in high sugar foods.
- Freezing makes water unavailable to micro-organisms.
- Food is not the only aspect of a kitchen environment that may supply moisture for microbial growth. Soiled, wet tea-towels, dish cloths, and mops, as well as improperly dried items of small equipment provide suitable breeding grounds for micro-organisms.

SUITABLE TEMPERATURE

Micro-organisms vary in their temperature requirements. Some thrive at low temperatures eg. Listeria Monocytogenes, while others can live at higher temperatures. Pasteurisation will destroy pathogenic bacteria, but not spoilage bacteria in milk.

Bacterial spores can survive boiling. Each micro-organism has an optimum temperature for growth. Below a minimum temperature growth is halted, although the microbe does not necessarily die. Above a maximum temperature the microbe

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is likely to be destroyed. Bacteria that cause food poisoning grow well at the temperature between 4° C and 60° C.

This is called the **TEMPERATURE DANGER ZONE.** The temperatures in a commercial kitchen fall within the Temperature Danger Zone. Food should not be kept long in the Temperature Danger Zone.

- Cold foods are to be kept below 4 °C.
- Hot foods are to be kept above 60 ℃. This refers to the internal or core temperature of the food.

SUITABLE OXYGEN LEVELS

- Most microbes are aerobes i.e. need oxygen for respiration.
- Anaerobes do not use oxygen, and will not grow in the presence of it.
- A small group of bacteria are capable of growing in either aerobic or anaerobic conditions and are called facultative.
- All moulds are aerobic, which explains why they grow on the surface of foods.
- Yeasts are facultative.

SUITABLE PH

- Bacteria prefer neutral or slightly acidic environments.
- Moulds and yeasts tolerate quite acidic environments.

SUITABLE TIME

Given optimal conditions micro-organisms can reproduce rapidly. Bacteria are the fastest growing microbes. Growth relates to increase in numbers, not size. Micro-organisms need time to multiply enough to cause food poisoning or serious spoilage of food.

5.FOOD SPOILAGE

Food spoilage may be due to three separate but inter-related factors:

PHYSICAL SPOILAGE

- Damage to the protective surface layer of a food item eg. cracked egg shell, dented cans, insect or rodent damage to packages. This increases the chance of chemical and/or microbial spoilage.
- Moisture loss eg. wilted leafy vegetables, freezer burn on incorrectly packaged frozen goods, staling of bread.
- Moisture gain eg. staling of biscuits.
- Aroma loss eg. ground coffee.
- Odour absorption eg. fruit salad prepared on board used previously for crushing garlic.
- Presence of undesirable objects eg. stone in a packet of lentils, fish hook in canned fish.

CHEMICAL SPOILAGE

- Chemical contamination eg. cleaning substances improperly removed from surfaces or equipment.
- Enzyme action eg. browning or ripening of fruit
- Rancidity of fats and oils.

MICROBIAL SPOILAGE

The action of bacteria, yeasts and moulds is the major cause of food spoilage. When present in large numbers their activity is easy to detect. The appearance of the food is altered. There might be colour changes, visible whiskery growth, surface slime, softening of texture, off odours and off flavours.

How do these microbes get on to food? Contamination occurs through contact with soil, air, water, equipment, packaging materials and food handlers. To keep the microbial population small, care must be given to personal hygiene, the cleanliness of the premises and equipment and proper storage conditions and times. Otherwise microbial growth is encouraged and foods spoil faster.

BACTERIA

Bacteria spoil food rapidly. Foods that support bacterial growth include meats, fish, poultry, milk and many vegetables. Often the food becomes slimy and develops an unpleasant odour. Bacteria require high levels of moisture, thus do not spoil dry foods. To minimise bacterial growth keep food surfaces as dry as possible when storing. Foods that are acidic are less susceptible to bacterial spoilage. Also store foods out of the temperature danger zone. Ensure that cold foods are kept cold, and hot foods are kept hot.

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YEASTS

Yeasts spoil foods that are acidic and high in sugar, such as jams, fruit, juices, syrups and alcoholic beverages. The product may develop a beery smell and show signs of gas bubbles. Yeasts grow well in warm, moist environments. Low temperatures inhibit their growth, while heating above 60 °C will destroy them.

MOULDS

Moulds are aerobic so they first appear as whiskery patches on the surface of the foods. Their mycelium will however spread down into the food. Moulds are slow growing and favour moist, slightly acidic foods, such as fruits, some vegetables and bread. Mould affected food has a musty odour. Cold, dry conditions inhibit mould growth.

FOOD PRESERVATION

To minimise or prevent food spoilage the growth of micro-organisms must be inhibited. This can be achieved by altering one or more of the conditions necessary for microbial growth. Food preservation techniques are based on this principle.

DEHYDRATION

Controlled condition: water.

Heat is applied to evaporate the moisture.

Bacteria can survive the drying process. Care must be taken with some rehydrated products. Once water is added, powdered milk must be treated as fresh milk.

- Sun drying tomatoes, sultanas.
- Air drying in heated chambers apples, bananas.
- Spray drying used for liquids milk, eggs, instant coffee.
- Roller drying used for tomato paste, instant mashed potato and breakfast cereals.
- Tunnel drying used for vegetables.
- Freeze drying meat, instant coffee, instant meals.

SALTING

Controlled condition: water.

In low concentration, salt binds with the moisture in the food thus making the water unavailable to microbes. At higher concentration salt will dehydrate the microbial cells.

- Brines olives.
- Cures salt in combination with potassium nitrate and potassium nitrite eg. corned beef, bacon.

THE ADDITION OF SUGAR

Controlled condition: water.

• Sugar acts in the same way as salt -syrups, jams, glace fruits, candied fruits, crystallized fruits.

PASTEURISATION

Controlled condition: temperature.

In this process heating destroys pathogens, but does not destroy spoilage organisms or bacterial spores.

UHT - ULTRA HIGH TEMPERATURE

Controlled condition: temperature.

Product is heated to 132 °C for two seconds, then cooled to below 4 °C. The item is sterilised. All micro-organisms, both spoilage and pathogenic are destroyed.

Examples include long life milk, fruit juices specially packed. Refrigeration is not required until opening.

CANNING

Controlled condition: temperature.

In this process, heat is used to destroy Clostridium Botulinium spores. The times and temperatures used in canning may vary depending on the acidity of the food.

In the standard method, food is cooked in the can. For larger cans the food may be heat treated first, then canned.

FREEZING

Controlled condition: temperature and water.

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At -18 °C the growth rate of micro-organisms is severely reduced. The low temperature inhibits growth and water in the frozen state is not available for microbial growth.

<u>Note.</u> Micro-organisms are not necessarily destroyed by freezing. Some may survive and can become active once the food is thawed.

VACUUM PACKAGING

Controlled condition: oxygen. Oxygen is withdrawn. A special plastic packaging is used. Anaerobic micro-organisms survive.

Examples include vacuum packaged meats, fish, cheese. These foods must be held at refrigeration temperatures. Items such as coffee beans can be stored at room temperature.

CONTROLLED ATMOSPHERE

Controlled condition: oxygen and temperature. Oxygen levels are reduced and carbon dioxide levels are increased. Temperatures are kept low.

Examples include pears and apples which can be stored for many months under controlled atmospheric conditions. Further ripening is suspended, thus deterioration is slowed too.

PICKLING

Controlled condition: pH. Vinegar is most often used to change the pH of foods.

Examples include pickled vegetables.

SMOKING

Smoke contains anti-microbial substances formaldehyde and cresol. Nowadays, smoking is most often used for flavour, not primarily for preservation.

CHEMICAL PRESERVATIVES

These are anti-microbial substances. Certain additives are used to control the growth of undesirable bacteria, yeasts and moulds.

Examples.

- propionic acid used as a mould inhibitor in bread.
- sulphur dioxide effective against bacteria, yeasts and moulds and used in dried fruits and peeled potatoes.
- nitrates and nitrites used to cure meats to control Clostridium botulinium.

Controlling one or more conditions required for the growth of micro-organisms slows the rate of food spoilage.

6. FOOD POISONING

Foods that are spoiled look, smell and taste 'off'. These are detectable signs to warn the consumer not to eat them. Eating spoiled foods however is unlikely to cause illness. On the other hand, foods that are contaminated with harmful micro-organisms or toxins look, smell and taste okay. Toxins in foods can be from a number of sources. Some foods are naturally poisonous or are subject to natural contaminants.

Examples:

- Poisonous mushrooms.
- 'green' potatoes poison 'solanine'.
- Comfrey contains a poisonous alkaloid.
- Rhubarb leaves high levels of oxalic acid.
- Apricot kernels contain cyanide.
- Apple seeds contain cyanide.
- Peanuts may be contaminated with high levels of Aspergillus flavus mould.

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CHEMICAL FOOD POISONING

Harmful chemicals may end up in the food supply as a result of agricultural practices or industrial pollution. Pesticides/herbicides are widely used in the control of undesirable plants and insects. The surface of fruits and vegetables may have spray residues. It is good practice to wash fruit and vegetables before use. Sometimes cleaning chemicals can accidentally contaminate food eg. sodium hypochlorite inadequately rinsed from drink containers. Always store chemicals away from food. Make sure chemicals are correctly labelled. Always follow manufacturer's instructions for use.

BACTERIAL FOOD POISONING

The term food poisoning is used to describe the illness that results from the consumption of food containing pathogenic bacteria.

Symptoms of food poisoning vary but usually involve vomiting, diarrhoea and abdominal pain.

The bacteria responsible for food poisoning may be derived from:

- Contaminated raw ingredients.
- Infected food handlers.
- Pests contaminating raw or processed foods.
- The equipment, surfaces and utensils in the food preparation area.

The growth of these bacteria can be accelerated by:

- Preparing food too far in advance.
- Inadequate cooking.
- Inadequate reheating.
- Improper thawing.
- Improper hot holding of cooked foods.

Most food poisoning is the result of unhygienic practices. The causes of food poisoning are sometimes summarised as the Food Poisoning Chain. There are six links.

source of bacteria

bacteria transferred to food

food, pH, moisture, oxygen conditions time and

temperature

contaminated food is eaten

food poisoning

Breaking any link in the chain will prevent food poisoning.

source of bacteria

no transfer

making conditions of food, moisture, pH & oxygen unsuitable for bacterial growth

time & temperature

food is safe to eat no food poisoning

Food service workers should organise their work so that the links in the food poisoning chain are broken. They should be especially careful when handling potentially hazardous foods. These foods are high in protein and moisture and will

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readily support bacterial growth eg. meats, poultry, fish, milk and eggs. The most important types of food illnesses are caused by the following:

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These bacteria cause infection	Illness is due to toxins produced by the bacteria

Salmonella Listeria monocytogens Clostridium botulinum Vibrio parahaemolyticus

Staphylococcus Aureus Campylobacter jejuni Bacillus Cere

SALMONELLA

Incubation time:8-48 hours. Symptoms: Diarrhoea, vomiting, abdominal pain, fever. Lasts: 1-7 days.

ENVIRONMENTAL AND FOOD SOURCE

- Present in the intestines of animals.
- Spread by flies, cockroaches, mice and rats.
- Meats, poultry and eggs contaminated with excreta during processing.
- Shellfish and fish from sewerage polluted waters.
- Vegetables grown using animal manure.
- Transferred from raw foods to cooked foods by hands, equipment and surfaces in the kitchen.
- food handlers can be carriers of Salmonella.

CONTROLS

- Thorough cooking of foods. Temperatures above 65 °C will destroy Salmonella.
- Wash hands and equipment between handling raw and cooked foods.
- Wash vegetables, especially those to be eaten raw.
- Enforce strict personal hygiene.
- Avoid cross contamination after cooking by keeping raw and cooked meat apart.

CLOSTRIDIUM PERFRINGENS

It is anaerobic and forms spores.

ILLNESS

Incubation time:8-20 hours. Symptoms: Diarrhoea and abdominal pain. Vomiting is rare. Lasts: 12-48 hours.

Occurs particularly in situations of large scale catering.

ENVIRONMENTAL AND FOOD SOURCES

- Present in the intestines of animals, commonly found on meat and poultry.
- Spores occur widely in soil, dust, air and water.
- Vegetables contaminated with animal manure, soil or dust may harbour spores.

• Large quantity meat dishes that involve long slow cooking and roasts that are cooked ahead, then reheated. Spores may survive the cooking process. If cooling is slow and not under refrigeration, spores may germinate and Clostridium Perfringens bacteria grow to dangerous numbers.

CONTROLS

- Keep soil carrying vegetables out of preparation area.
- Avoid partial cooking of foods, then reheating.
- Cool cooked meat dishes quickly (within 1½hours) and refrigerate.
- If foods must be reheated, do it quickly and thoroughly.
- Enforce strict personal hygiene.

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LISTERIA MONOCYTOGENES

The organism responsible for listeriosis has caused several major food-borne outbreaks affecting particular at-risk groups in the community. The bacteria can be found in a variety of ready-to-eat foods such as deli-meat, cooked diced chicken, smoked mussels, smoked fish, pre-prepared salads and soft serve ice-cream. It has also been found in unpasteurised milk, soft cheese, coleslaw and pate.

WHO IS AT RISK FROM LISTERIA INFECTION?

Listeria infection can affect people differently. Healthy people may develop few or no symptoms. However, for some people, the infection can be serious enough to require hospitilisation and be a threat to life.

People who are at particular risk of infection include:

- Pregnant women and their unborn babies.
- Newborn babies.
- The elderly.

• Anyone whose immune system has been weakened by disease or illness eg cancer, leukemia, diabetes, liver or kidney disease.

• Anyone on prednisone or cortisone as this can also suppress the immune system.

SYMPTOMS

Healthy people may not be affected at all. In persons at risk, symptoms may include fever, headache, tiredness, aches and pains. These symptoms may progress to more serious forms of the illness, such as meningitis and septicaemia. Less common symptoms are diarrhoea, nausea and abdominal cramps.

In pregnant women the illness may vary from a mild form to resulting in miscarriage, still birth, premature birth or a very ill baby.

How common is Listeria Infection?

It is relatively uncommon but the fatality rate among at-risk people is very high. Between 8-24 cases are reported each year.

Can Listeria infection be treated?

Yes, with antibiotics if treatment is started early.

How can you avoid Listeria Infections?

As Listeria bacteria are commonly found in the environment, they are impossible to eradicate. Some exposure to the bacteria is unavoidable; most people are, however, at low risk of Listeria infection.

HIGH RISK FOODS

- Ready to eat seafood such as smoked fish and smoked mussels.
- Pre-mixed raw vegetable salads, such as coleslaw.

• Pre-cooked meat products which are eaten without further cooking or heating, such as pate, sliced deli-meat, and cooked diced chicken.

- Any unpasteurised milk or foods made from unpasteurised milk.
- Soft serve ice-cream.
- Soft cheeses such as brie, camembert, ricotta.

SAFE FOODS

- All freshly cooked foods.
- Hard cheeses, cheese spreads, processed cheeses.
- Milk, freshly pasteurised and UHT.
- Yoghurt.
- Tinned and pickled foods.

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BACILLUS CEREUS

Bacillus organisms are aerobic and spore forming. In the vegetative state they produce toxins. Infective dose is large; 100 million bacteria.

Illness1-12 hours.Incubation time:1-12 hours.Symptoms:Vomiting, some diarrhoea and abdominal pain.Lasts:6-24 hours.

ENVIRONMENTAL AND FOOD SOURCES

- Found in soil, dust and water.
- Frequently present in rice, cornflour, dried peas and beans.
- Mostly associated with spore germination in cooked foods incorrectly stored and reheated.

CONTROLS

- Hold food out of the temperature danger zone.
- Discard water used for soaking dried peas and beans.
- Refrigerate leftovers quickly.
- Thoroughly reheat leftovers.

SATHYLOCOCCUS AUREUS

Staphyle is from the Greek, meaning 'bunch of grapes'. Under the microscope this bacteria looks like a bunch of grapes. Staphylococcus is a facultative micro-organism and able to survive without oxygen. It does not form spores, but does release heat resistant toxin. The bacteria themselves are easily destroyed by heating. The toxin, however may survive boiling temperatures for thirty minutes. Staphylococcus is tolerant of salt.

Approximately 50% of the human population permanently or intermittently carry Staphylococcus Aureus in the nose, throat and on the skin. It is the micro-organism which infects pimples, cuts and burns.

IllnessIncubation time: 2-6 hours.Symptoms:Acute vomiting, abdominal cramps and sometimes diarrhoea.Lasts:2-24 hours.

ENVIRONMENTAL AND FOOD SOURCES

- Food handled with contaminated hands.
- Food handler coughing or sneezing over food.
- Ham, cold meats, sausages.
- Bakery items eg. cream filled cakes, trifles, custards.
- Salads eg. pasta, potato.
- Unpasteurised milk from cows with infected udders.

CONTROLS

Enforce strict personal hygiene. Food handlers with colds should not work with food. Use gloves, tongs, spoons to minimise contacting food with bare hands when mixing, slicing, serving. Store food items under refrigeration. guard against cross contamination.

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CLOSTRIDIUM BOTULINIUM

The word 'Botulinium' is a Latin derivative of sausage.

Through the ages, sausages have need associated with the most deadly form of bacterial food poisoning.

A 0.2mg dose of the toxin produced by the bacteria is thought to be lethal to an adult. Fortunately, botulism is rare and an anti-toxin is available. Clostridium botulinium is anaerobic and forms spores.

 Illness

 Incubation time:
 12-36 hours

 Symptoms.
 Toxins act on the central nervous system. Vision and speech are impaired. Respiratory muscles are paralysed. In the worst cases breathing stops

ENVIRONMENTAL AND FOOD SOURCES

- Found in soil, sea water.
- Low acid canned foods that have been inadequately heat processed eg. beetroot, corn, beans, mushrooms, fish.
- Vacuum packed fish eaten raw.

CONTROLS

- Do not use defective 'blown' canned foods.
- Ensure sufficient time/temperature combinations in cookery.
- Add acid (vinegar, lemon juice, wine) to low acid foods bottled on the premises.

CASE STUDY

In a local community house the Council provides a lunchtime meal service for the elderly people. On most days, custard is served with the dessert. As it is easy to prepare, the new kitchen assistant is given this task. She starts work at 8.00am and on this particular morning decides to prepare the custard first. At 8.30am she leaves the custard to cool and begins other preparation. Suddenly she wonders if she added the sugar. She tastes the custard with a spoon and thinks it is sweet enough, but checks again just in case, using the same spoon without washing it. Satisfied that the sugar has been added the custard is left on the bench in the kitchen for the rest of the morning. At 12.15pm the custard is gently warmed and then served at 12.30pm with apple crumble.

By afternoon tea time several people have started to vomit and have severe abdominal pain. That evening all the people who had eaten custard are ill.

7.FOOD HYGIENE AND FOOD STORAGE

Food hygiene is about protecting food from contamination and minimising microbial growth. The many ways that food may be exposed to cross contamination are shown below.



CROSS CONTAMINATION OF FOOD

Food hygiene is important at each stage of the catering cycle; that is throughout:

- Purchasing.
- Transport and delivery.
- Receiving.
- Storage.
- Preparation.

Foods should only be purchased from reputable suppliers who follow all the appropriate rules and regulations to ensure that food is wholesome and clean. The transport of food should comply with government regulations.

Delivery times should be arranged so that a responsible person can be on hand to receive incoming items. Deliveries such as bread and milk should not be left outside the premises. Items should be checked to ensure that they:

- Meet specifications and are of appropriate quality and quantity.
- Are not spoiled or damaged.
- Are at correct temperatures and that frozen foods are still frozen.

CLASSIFICATION OF FOODS FOR STORAGE

These groups are based on the stability of foods in terms of expected storage or shelf life. This is relative since all foods are perishable if incorrectly stored. Storing under appropriate conditions will maximise shelf life.

NON PERISHABLE

- Low moisture and low fat eg. flour, sugar, pasta, rice, cocoa, dried peas and beans.
- Most canned and bottled goods.
- May be stored at room temperature (18 °C) for relatively long periods.

SEMI-PERISHABLE

- Items still low in moisture, but containing more fat.
- Keep quite well for 1-3 months at room temperature (18°C) eg. snack foods, potato crisps, pretzels, deep frying compound, biscuits.
- Keeping qualities of some items may be improved if held under refrigeration temperatures eg. eggs, nuts, butter, margarine, firm cheeses.

PERISHABLE

- The quality of these goods deteriorates rapidly at room temperature.
- Shelf life of between 2-10 days eg. meats, poultry, fish, shellfish, milk, cream, fresh and soft cheese, breads, fruits, most vegetables, cooked foods, products made with eggs or stock.
- A sub-group within the perishable category is the potentially hazardous foods.

POTENTIALLY HAZARDOUS FOODS

These require special temperatures

- Fresh meat. 1-3℃
- Poultry 0℃
- Fish, shellfish. 0 ℃ on crushed ice
- Small goods 2-8℃
- Dairy products 4-8°c

STORAGE OF FOOD

When storing food, the aim is to protect food from contamination and to minimise microbial growth. Appropriate storage conditions help to maximise quality and minimise wastage due to deterioration and spoilage.

There are certain conditions common to dry stores, cool-rooms and freezers critical to the minimisation of food spoilage and the prevention of food poisoning.

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CLEANLINESS

- Regular cleaning of floors and shelving.
- Spillages cleaned immediately.
- Containers clean, with lids if necessary.

SEGREGATION OF DIFFERENT TYPES OF FOOD

- Stored at appropriate temperatures.
- Keep items covered if appropriate.
- Orderly arrangement of items.
- Cleaning materials to be kept away from food.

PURCHASE APPROPRIATE AMOUNTS

- Over stocking means that items are kept longer in storage.
- Quality deteriorates, wastage may occur.

ROTATION OF STOCK - FIRST IN, FIRST OUT

- Regular inspections for damaged, deteriorating items.
- Store only for the appropriate time.

DRY STORES

- Cool and protected from sunlight.
- Well ventilated, dry, free from dampness and humidity.
- Enough shelving for stacking goods.
- Orderly arrangements, so frequently used items are accessible.
- Items should be stored off the floor.
- Heavy items should be stored on lower shelves.
- Large bins used for bulk items like flour and sugar.
- Suitable containers with tight fitting lids used for opened packages such as custard powder and salt.
- Containers should be clearly labelled.
- Good lighting to enable easy inspection and cleaning.
- Dry goods should be monitored for signs of insect infestation or the presence of rodents.
- Dispose of any rusted, dented, leaking or bulging cans.

REFRIGERATOR / COOL-ROOM STORAGE

- Do not overload refrigerator or cool-room.
- Keep separate sections for different foods. In particular meats, poultry, fish, milk, fruits and vegetables should be segregated. Raw and ready to eat products should be kept well apart. Ready to eat products should always be stored above raw items

• Place food items on trays or in containers. Do not place food directly on shelves. Do not stack food containers/trays on top of other foods.

- Cover or wrap foods to prevent contamination, spread of odours, and dehydration. Note: large pieces of meat
- are best left uncovered. This allows the surface to dry out, slowing down bacterial growth.
- Keep refrigerator/cool-room door closed when not in use.

FREEZER STORAGE

- Promptly store frozen foods.
- Food should be packaged or wrapped to protect items from freezer burn and to prevent spillages.
- Items should be labelled and dated.
- First in, first out.
- Only freeze good quality food.
- Do not re-freeze thawed products.
- Minimise opening of freezer to conserve cold air.

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8.FOOD HANDLING

The risk of contamination is particularly high whenever food is being prepared for cooking or processed in some other way in readiness for consumption.

It is important for the food handler to be aware of the critical points when microbial growth is favoured. Appropriate preventative measures can then be followed.

PREPARATION OF FOOD

Care should be taken at all times to ensure that:

- Food handlers have excellent personal hygiene and that unconscious body habits are strictly monitored.
- Tasting food is done in a hygienic manner. Tasting spoons should be used and thoroughly washed between samples. Never use fingers for tasting.

• Unnecessary human contact with food is avoided. Tongs, scoops, spoons, disposable gloves should be used whenever possible.

- Raw and cooked foods should be kept separate.
- Hands, utensils and equipment are thoroughly cleaned between tasks to minimise the risk of contamination.
- Foods, especially those that are potentially hazardous, do not stay at kitchen temperatures for longer than is necessary.
- Fruit and raw vegetables to be used raw are thoroughly washed.
- Food of doubtful quality is thrown out.

THE COOKING PROCESS

• If foods are cooked at the correct temperature for the correct time, most bacteria can be destroyed. Thorough cooking of meat means achieving an internal temperature of 74 ℃-88 ℃. This can be measured using a special meat thermometer.

MEAT THERMOMETER

• Bacterial spores can survive the cooking process. Dishes that require long, slow cooking eg meat/veg, casserole style dishes. may provide a suitable medium for spore germination if not cooked properly.

• Boned, rolled roasts, gravies, and items made from mince meat are likely to carry higher levels of bacteria and need thorough cooking.

• Stuffed poultry cooks more slowly. Cook the stuffing separately to ensure the thorough cooking of chicken, turkey and duck.

REHEATING OF FOODS

Ideally food quantities are managed so that leftovers are kept to a minimum and reheating is not required.

For those situations when reheating is necessary then:

- Heat the food quickly to minimise the time in the temperature danger zone.
- Heat the food to the right temperature (75 °C) for at least ten minutes in order to destroy bacteria.
- Stirring the food makes reheating faster.
- It is easiest and quickest to reheat in small batches.
- Remember, heating does not destroy the toxin produced by Staphylococcus aureus.

HOT HOLDING OF FOODS

Often in food service situations foods are kept hot for service. It is necessary for the food to be kept at 60 °C or above, out of the temperature danger zone.

The following points should be remembered:

• Maintain the internal temperature of food at or above 60 °C. Check the core temperature of the food using a probe thermometer.

- In a deep container the food at the top may become cool. Ensure that all the food is kept at a safe temperature.
- To retain heat and moisture in food, keep lids on where possible.

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COOLING FOODS BEFORE REFRIGERATION

To cool food the temperature should be reduced as quickly as possible. It is not advisable to place hot food in the refrigerator/cool-room straight away as this may raise the refrigerator/cool-room temperature and cause condensation on other foodstuffs.

Food should be cooled to $4 \,^{\circ}$ C within 90 minutes of cooking.

To cool cooked food quickly:

- Transfer food cooked in bulk to smaller, shallow containers.
- Stand container in ice-bath. Stir frequently.
- Elevate base of container to allow air circulation.

Once cooled, cover and refrigerate.

REFRIGERATED DISPLAY

There are various types of refrigeration equipment used for display purposes.

The major hygiene concerns are:

- Ensuring the equipment is operating at the right temperature.
- Ensuring the equipment is clean.
- Avoiding cross contamination of foods.

THAWING

Remember! Freezing does not kill bacteria, it only stops their growth while food is in the frozen state. As soon as the water in the food begins to return to the liquid state, bacteria become active. Food is even more vulnerable as the temperature begins to rise.

Acceptable methods of thawing:

- 1. In a refrigerator/cool-room.
 - Place the food on a tray to catch the drips.
 - Position food for thawing on shelves below any cooked food or ready to eat products.
 - This method is slow and thus requires some planning ahead.
- 2. Using a microwave.
 - Suitable for small items or single portions.
 - Use 'defrost' setting and turn food frequently so that it does not begin to cook.
- 3. As part of the cooking process eg. frozen vegetables, some convenience products.
- 4. Under clean, cold running water.
 - Food should remain in original undamaged wrapper.
 - Place on wire rack.
 - Do not place directly in sink.
 - Never leave food to thaw in a sink of warm water.

Foods should not be thawed at kitchen temperatures. Once defrosted the item should be used quickly. Do not refreeze.

DISPLAY AND SERVING FOOD

The major risks are contamination by the public.

Ideally where customers are able to serve themselves, the food on display is protected by a 'sneeze-guard'.

- Ensure there are plenty of serving utensils.
- Provide butter, jams and spreads in portion control packs.
- Supervise the self serve area.
- Do not refill near-empty dishes with fresh ingredients.
- Cutlery, crockery and glassware must be handled in a hygienic manner.

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9. PEST CONTROL

WHAT IS A PEST?

A pest is an undesirable organism at a given place and time. Pests may be plant or animal. In a commercial kitchen the pests of most concern are flies, cockroaches, stored product pests, rats and mice.

Pests are undesirable because they:

- Have the potential to spread disease.
- Cause considerable spoilage of foodstuffs.
- Damage fittings and structures which can lead to electrical fires.
- Are a nuisance and contribute to staff unrest and loss of customers.

SIGNS OF INFESTATION BY RATS OR MICE

- Damaged food materials, packages and containers. Rats and mice do not actually eat large quantities of food, but they do carry pathogenic bacteria (Salmonella and Hepatitis A) on their bodies and urinate and defecate where they eat, contaminating food.
- Gnawed holes in woodwork and fittings. Rats teeth grow continually so they need to gnaw on hard materials to keep the teeth filed down.
- Droppings, urine stains and foot marks in spilled food.
- Characteristic odour.
- Greasy, shiny marks along the edges of a room. Rodents have poor eyesight and tend to follow regular routes close to walls.

RODENT CONTROL

- Deny access to premises.
- Store foods off the floor, in containers with tight fitting lids.
- Clean any spillages immediately.
- Store rubbish in bins with tight fitting lids. Empty regularly.
- Keep premises and kitchen area clean and free from rubbish.

FLIES

The flies mainly attracted to food premises are the Housefly and Blowfly.

- Flies carry pathogenic bacteria (Salmonella) on their legs and bodies. However, it is their method of feeding that is most responsible for spreading disease.
- Flies do not take in solids. They regurgitate a fluid to liquefy food which is then taken up through the proboscis.
- The fluid contains previous meals which may have been decomposing rubbish, animal manure or other filth.

FLY CONTROL

- Deny entry. Have tight fitting screens on windows and doors.
- Always cover food. Clean up any spillages.
- Store rubbish in bins with tight fitting lids. Empty regularly.
- Keep premises/kitchen area clean. Rubbish provides breeding areas for flies.
- Have empty bottles removed regularly. These may attract vinegar flies.
- Install electronic insect killing devices. These are fitted with catcher trays which must be cleaned regularly.
- Use insecticide impregnated strips.
- Do not spray insecticide near uncovered food, utensils or where it is likely to leave residue on preparation benches.

COCKROACHES

The German Cockroach is the most serious pest in kitchens and food handling areas. They are common beneath cupboards and drains. They are indiscriminate in their feeding habits, feeding on garbage and sewerage and then crawling on food. They carry many pathogenic bacteria which can cause dysentery, food poisoning and gastroenteritis.

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COCKROACH CONTROL

- Deny access to premises.
- Dispose of any empty boxes and cartons as these may bring cockroaches into the food area.
- Store foods off the floor, in containers with tight fitting lids.
- Clean any spillages immediately.
- Store rubbish in bins with tight fitting lids. Empty regularly.
- Keep premises and kitchen area clean and free from rubbish.
- Dirty crockery, cutlery and utensils should be washed as soon as possible and not left to accumulate.

• If cockroaches persist despite good housekeeping measures, a professional pest control company should be called in.

STORED PRODUCT PESTS

These pests are not a threat to health but they are troublesome and cause considerable damage to food supplies with constant wastage and financial loss eg. Grain Weevil, Flour Weevil, Indian Meal Moth.

SIGNS OF INFESTATION

- Holes in packages.
- Presence of webbing binding food particles together.
- Presence of eggs and/or grubs.
- Presence of adult weevils.

With pest control, prevention is better than cure. Make the environment uninviting to pests, keep premises well maintained and in a state of good repair. Do not allow rubbish, used cartons or boxes to accumulate. Deny shelter in which pests can live and breed. Store foods in containers with tight fitting lids. Rotate stock. Carry out regular and thorough cleaning of all areas where food is received, stored and prepared.

10. CLEANING AND SANITISING

Keeping the kitchen or food preparation area clean is one of the best ways to avoid food contamination. Clean means clean and sanitised surfaces, no dirt, no left over food, and no mice, rats or insects.

You can make sure the kitchen is really clean by conducting regular cleaning and maintaining a tidy kitchen. While something may look clean, it may not necessarily be sanitised, or safe to use.

In the food industry, two levels of cleanliness must apply:

- Physical level.
- Microscopic level.

PHYSICAL LEVEL

Physical cleanliness refers to the appearance of the items that are free from visible dust, dirt, grease and food residues. To achieve this we use detergents.

Detergents are chemical agents designed to lift food, dirt and grease. They also help to wash off micro-organisms but do not kill them.

MICROSCOPIC LEVEL

Microscopic cleanliness involves reducing micro-organisms to a level which does not spread disease. To achieve this we use sanitisers.

<u>Sanitisers</u> are agents designed to kill or control the growth of micro-organisms. Sanitisers can come in the form of heat or chemical.

Heat over 75 °C can kill micro-organisms. The higher the temperature, the shorter the contact required. Hot water from most taps runs at 50 °C - 55 °C and is not suitable for use as a sanitiser. In some premises, however, hot water is available at 80 °C-85 °C, making it suitable for sanitising equipment, but unsuitable for hand-washing. The important factor is the temperature of the item being sanitised.

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Where chemical sanitisers are used, the following factors or conditions must be right if the sanitisers are to be effective:

- Concentration.
- Temperature.
- Time.
- pH
- Method of application.
- Condition of surfaces.

DETERGENT/SANITISER

Euco proof Quaternary ammonium based. Germicidal disinfectant, detergent, deodorant. Hospital strength, general cleaning for floors, walls, toilets.

Spray 'n' Wipe Used for cleaning/sanitising in kitchen and dining room.

DETERGENT

Suprex Alkybenzene sulphonic acid amine neutralised 30%. Dishwashing detergent.

Liquid Tang	Detergent used in automatic dishwasher.
Rinse Aid	Used in automatic dishwasher.
SANITISERS Sodium hypochlorite.	1 cup/9 litres water. Used for dish mops, dish brushes, floor mops. eg. Bleach, White King. 3 cups/9 litres water used for blood spills and other body fluids.
Methylated spirits.	70% meths. 30% water. Sprayed on bench-tops and tables and allowed to air dry.

Germex Anti-bacterial hand-wash used in kitchen and toilet blocks.

11. TRAINING TASKS

1. Consider this situation:

The kitchen hand forgets to refrigerate a large container of cooked rice. It is left overnight in the warm kitchen ($25 \,^{\circ}$ C). If there was an initial contamination of 1,000 Bacillus cereus bacteria, how big would the population be after 10 hours.

Remember, that under optimum conditions bacteria can complete binary fission (ie. splitting in two) within fifteen minutes.

1-2 million is danger level for food poisoning.

2. With reference to cross-contamination between raw and cooked foods. Look closely at the way foods are kept in your refrigerator at home, camp or at the local deli.

- Are raw/cooked foods stored separately?
- Are raw/cooked foods displayed separately?
- Are separate utensils used for raw/cooked items?

3. Observe the cycle of delivery to storage. Identify and list the risk points in this cycle ie. the points at which food could be in danger of contamination if the correct procedures are not followed.

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12. ASSESSMENT SHEET

1	The proper hand-washing technique is to apply soap to dry hands.	True/False
2.	Healthy, clean workers do not carry food poisoning bacteria on their bodies.	True/False
3	Smoking in the immediate food handling area can be permitted if the ashes are disposed of properly.	True/False
4.	A healthy person can carry pathogenic bacteria without any symptoms of illness.	True/False
5.	Practising good personal hygiene is only necessary where the preparation area can be seen by the public.	True/False
6.	Rinsing hands under hot running water will remove bacteria.	True/False
7.	Pathogenic bacteria will be destroyed at freezing temperatures.	True/False
8	Heating to above boiling point is necessary to destroy bacterial spores.	True/False
9.	The temperature danger zone is between 40 $^\circ\!\mathrm{C}$ and 60 $^\circ\!\mathrm{C}$.	True/False
10.	Dangerous levels of contamination by pathogenic bacteria or toxins can always be detected by the taste of food.	True/False
11.	Poor food hygiene may cause a few cases of diarrhoea, but will not lead to serious illness.	True/False
12. before	Cooked food should be cooled overnight at room temperature refrigerating.	True/False
13. cookinę	Some food poisoning bacteria found in raw foods can survive g then grow if the food is stored in the temperature danger zone.	True/False
14.	In general, sanitising should be carried out before cleaning.	True/False

Viruses reproduce by: 15.

- (a) Budding
- (b) Spores
- (c) Binary fission(d) Parasitic invasion of a host cell

16. Bacteria reproduce by:

- (a) Budding
- (b) Spores
- (c) Binary fission
- (d) Parasitic invasion of a host cell

17. Moulds reproduce by:

- (a) Budding
- (b) Spores
- (c) Binary fission(d) Parasitic invasion of a host cell

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- 18. The smallest of all micro-organisms are:
- (a) Bacteria
- (b) Yeast
- (c) Fungi
- (d) Viruses
- 19. The temperature danger zone is between:
- (a) 60 100 ℃
- (b) 4 60 ℃
- (c) 0 4 ℃ (d) 20 - 40 ℃

20. At 4 °C or less, most bacteria will:

- (a) Form spores
- (b) Stop multiplying
- (c) Be destroyed
- (d) Turn into moulds

21. The absolute maximum length of time that prepared foods may be held in the temperature zone is:

- (a) Overnight
- (b) 4 hours
- (c) 1 hour
- (d) 1 day

22. A very hazardous method of thawing frozen food is:

- (a) Storage in a cool-room or refrigerator
- (b) Storage overnight at room temperature
- (c) Using a microwave
- (d) Under cold running water
- 23. Foods not likely to support bacterial growth are:
- (a) Fresh meat and poultry
- (b) Fish and seafood
- (c) Dried pasta, noodles or bread
- (d) Milk and cream

24. A hot food required for service the next day should:

(a) Be placed in the refrigerator immediately after cooking

(b) Be left in the kitchen to cool for 6 hours

- (c) Cooled rapidly then refrigerated and reheated to above60 °C
- (d) Cooled rapidly, refrigerated, added to hot gravy the next day

25. Allowing prepared foods to become contaminated with a drip from thawing raw meat or poultry in the cool-room:

- (a) Is of no concern because food poisoning bacteria cannot grow in the cool-room
- (b) Is of no concern because the meat or poultry will be cooked later when needed
- (c) Is very hazardous
- (d) None of the above
- 26. When re-heating cooked foods or cooking stuffed meats or poultry, the internal temperature should be at least:
- (a) 100 ℃
- (b) 37℃
- (c) 75℃
- (d) 50 ℃

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27. When refrigerating stews or meat and gravy dishes, shallow pans should be used because:

- (a) They fit in a refrigerator more easily
- (b) They allow the product to cool rapidly
- (c) You can check the amount of meat in the product
- (d) The product is easier to sell
- 28. An acceptable method of thawing is:
- (a) On a tray on a kitchen bench
- (b) On a tray in the cool room
- (c) Overnight in the sink
- (d) In a sink of warm water
- 29. Semi perishable foods include:
- (a) Eggs, nuts, butter and biscuits
- (b) Fresh cheese, fruits and stock
- (c) Flour, sugar, pasta and rice
- (d) Canned and bottled goods

30. The type of food poisoning most likely to be caused by an uncovered infected cut is due to:

- (a) Bacillus Cereus
- (b) Salmonella
- (c) Clostridium Perfringens
- (d) Staphylococcus Aureus

31. Food poisoning organisms are most likely to grow in foods held between:

- (a) 0 and 10 ℃
- (b) 10 and 30℃.
- (c) 5 and 55℃.
- (d) 65 and 75 °C.

32. Frozen poultry should be carefully thawed and cooked to an internal temperature of 70 ℃ to prevent food poisoning due to:

- (a) Escherichia
- (b) Salmonella
- (c) Clostridium Botulinum
- (d) Bacillus Cereus

33. The main source of Staphylococcal contamination is:

- (a) Fresh air
- (b) Salami
- (c) The food handler
- (d) Flies and cockroaches

34. Which of the following grows in refrigerated temperatures:

- (a) Listeria monocytogenes
- (b) Clostridium perfringens
- (c) Salmonella
- (d) Clostridium botulinum
- 35. Pests that cause a hazard to health are:
- (a) Ants and weevils
- (b) Cockroaches and flies
- (c) Vinegar flies and butterflies
- (d) Aphids and moths

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- 36. A detergent:
- (a) Kills bacteria
- (b) Kills mould
- (c) Helps remove visible soil
- (d) Kills viruses
- 37. A sanitiser:
- (a) Helps remove visible soil
- (b) Helps reduce microbial load
- (c) Makes cleaning easier
- (d) Leaves a pleasant after-smell

38. The most germ-free crockery will be obtained by:

- (a) Drying with a clean cloth
- (b) Drying with a disposable towel
- (c) Air drying after rinsing at $80 \,^{\circ}$ C
- (d) Air drying after hand rinsing

39. Some viruses can survive adverse conditions outside the host and can cause food-borne infections, for example:

- (a) Flu and German Measles
- (b) Vibrio parahaemolyticus and Campylobactea jejuni
- (c) Tinea and ringworm
- (d) Hepatitis A and Gastro-enteritis
- 40. Aflatoxins are poisonous substances produced by:
- (a) Artificial flavourings and colourings
- (b) Moulds that grow on oranges and Camembert
- (c) Moulds that grow on peanuts
- (d) Food poisoning bacteria

THE W.H.O. GOLDEN RULES FOR SAFE FOOD PREPARATION

- 1. Choose foods processed for safety.
- 2. Cook food thoroughly.
- 3. Eat cooked foods immediately.
- 4. Store cooked foods carefully.
- 5. Reheat cooked foods thoroughly.
- 6. Avoid contact between raw and cooked foods.
- 7. Wash hands repeatedly.
- 8. Keep all kitchen surfaces meticulously clean.
- 9. Protect foods from insects, rodents and other animals.
- 10. Use pure water.

13. ESSENTIAL SKILLS PROGRAM

SAFE FOOD HANDLING

Training session for Team Members and Team Leaders

Introduction to the kitchens

Plans and list of equipment. Care and use of equipment, including dishwasher, food processor, mixer, toaster. Use and cleaning of colour coded chopping boards. Notification of breakages and missing items. Use and cleaning of stoves. Movement through the kitchen. Recording of fridge/freezer temperatures.

Menu

Planning the menu. Ordering supplies, before camp and during camp. Swapping recipes and ideas.

Ordering supplies

Menu and order to ______ three weeks before. Ordering of milk and bread. Extras needed? Meat. Receiving goods into the kitchen.

Hygiene

Personal hygiene and dress. Tea towels, hand towels, aprons, dish cloths washed daily. Washing of hands, use of disinfectant hand rinse. Washing up. Who does what, in food prep eg. salads, veg prep. Serving of meals. Tea towels, use of. Cleanliness of kitchen, use of sanitiser.

Team building

Whose kitchen is this? Leadership. Sharing the duties, knowing your responsibilities. Humility.

RESPONSIBILITY AND SUPERVISION

Personal responsibility: The individual food handler is responsible for matters of personal hygiene and food handling. The motivation for maintaining a high standard should stem from an appreciation of the considerable responsibility each food handler has for public health, and a determination to be truly professional in the way the job is conducted. Those who are supervisors carry an even greater responsibility. The performance of the staff or team in the area of food hygiene is in large part a reflection of the supervisor's/cook's commitment to and understanding of, the principles and

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practice of food handling.

It is vital that supervisors maintain and demonstrate their commitment, enthusiasm and loyalty to their job, their place of work and acceptable practices of hygiene. Apathetic and careless supervisors may result in apathetic and careless workers. To effectively carry out their role, the supervisor must:

- Ensure adequate preparation and training of staff/team.
- Establish standards of performance and achievement.
- Establish a review process and on-going training.

• Encourage staff and volunteers in a sense of commitment to their work and an awareness of the importance of their job.

In delegating jobs, the supervisor should know the capacities, training and abilities of staff, volunteers and campers well enough to have the right people in the right job. Supervisors should also maintain a high level of understanding of the practical aspects of the various work processes under their direction and control.

TRAINING

The benefits of a well-trained staff/team cannot be over-stressed. Effective food hygiene training could result in the savings of quite prohibitive costs.

Training is best undertaken on an on-going basis but with two distinct categories:

- Orientation Training.
- Continuous In-service Training.

ORIENTATION TRAINING

This is the time when the new employees or team members get to 'know the ropes'. This can occur at an informal level and can be related to the simple mechanics of doing the job. To ensure proper practices of hygienic food handling, new members of staff and volunteers should be made aware of:

- The significance of food-borne disease.
- Their responsibilities for the health of customers/campers and their responsibilities under the relevant food hygiene regulations.
- The ways in which food may be contaminated.
- The basic principles of food hygiene.
- Personal hygiene requirements.
- Specific food handling procedures pertinent to their particular set of tasks.

To achieve this satisfactorily, a formal training procedure needs to be established.

On going Training

Skills and knowledge gained at the orientation need to be reinforced and up-dated on a continual basis. More specifically, on-going training can achieve the following purposes:

- Up-dating and revising of previously gained knowledge and skills.
- Retraining for new tasks, new positions.
- Training for new techniques and procedures.
- Addressing specific problems identified in the course of observations/inspections.

The When and Where of Training

The first decision which has to be made is that food hygiene training has a high priority. If that principle is established, arrangements for training can be organised.

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