Unit 3 & 4: Food and Technology

Course Outline

Unit 3: Food preparation, processing and food controls

Area of study 1: Maintaining food safety in Australia

Outcome 1 - explain the roles and responsibilities of and the relationship between national, state and local authorities in ensuring and maintaining food safety within Australia.

Area of study 2: Food preparation and processing

Outcome 2 - Analyse preparation, processing and preservation techniques for key foods, and prepare foods safely and hygienically using these techniques

Area of study 3: Developing a design plan (folio)

Outcome 3 - develop a design brief, evaluation criteria and a design plan for the development of a food product.

Unit 4: Food product development and emerging trends

Area of study 1: Implementing a design plan (folio)

Outcome 1 - safely and hygienically implement the production plans for a set of four – six food items that comprise the product, evaluate then sensory properties of the food items, evaluate the product using the evaluation criteria, and evaluate the efficiency and effectiveness of production activities

Area of study 2: Food product development

Outcome 2 - analyse driving forces related to food product development, analyse new and emerging food products, and explain processes involved in the development and marketing of food products

Contribution to final assessment

<table>
<thead>
<tr>
<th>Task</th>
<th>Percentage contribution</th>
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<tbody>
<tr>
<td>School – assessed Task for unit 3 &amp; 4 (folio)</td>
<td>40%</td>
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<tr>
<td>School - assessed Coursework for Unit 3</td>
<td>18%</td>
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<tr>
<td>School - assessed Coursework for Unit 4</td>
<td>12%</td>
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<td>End of year Exam</td>
<td>30%</td>
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</tbody>
</table>
Unit 3 & 4 Food and Technology

Expectations in class

- Attendance and on time
- Catch up on work when absent
- Notes to be taken individually
- Containers to be brought to prac classes

How to do well in Unit 3 & 4 Food and Technology

- Attendance
- Complete all work requirements
- Seek feedback – particularly on folio work
- Your teacher is your best resource – meet regularly with teacher during your own time
- Detail – the students who do well go beyond the basic detail
- Start planning now for SAT (folio) and exam – begin thinking of themes collecting recipes, working glossary
Unit 3: Food and Technology

Holiday Homework

Chapter 1: Food Spoilage and food poisoning

<table>
<thead>
<tr>
<th>Topic/Worksheet</th>
<th>Activity/questions to complete</th>
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</thead>
<tbody>
<tr>
<td>Glossary</td>
<td>✏ All glossary words</td>
</tr>
<tr>
<td>Causes of food spoilage and food poisoning</td>
<td>✏ Q1 ✏ Q2</td>
</tr>
<tr>
<td>Packed lunches may cause food poisoning</td>
<td>✏ Q1 ✏ Q2 ✏ Q3 ✏ Q4 ✏ Q5 ✏ Q6 ✏ Q7 ✏ Q8</td>
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<tr>
<td>Knowledge Check</td>
<td>✏ Q1 ✏ Q2 ✏ Q3 ✏ Q4 ✏ Q5</td>
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<tr>
<td>Chapter Questions (pg 5 and 10)</td>
<td>✏ Q1 ✏ Q2 ✏ Q3 ✏ Q4 ✏ Q6 ✏ Q7 ✏ Q8 ✏ Q10</td>
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<td>✏ Q11 ✏ Q16 ✏ Q17 ✏ Q19 ✏ Q20</td>
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<tr>
<td>Revision Activity</td>
<td>✏ Q1 ✏ Q2 ✏ Q3 ✏ Q4</td>
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Due Date: 1st Day Term 1

You will be expected to come to class Day 1 with the required textbook:

Food Solutions Food and Technology Units 3 & 4 (3rd Ed.)
<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>Use – be specific</th>
<th>Appropriate food or ingredients to use</th>
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<td>Equipment Name</td>
<td>Use – be specific</td>
<td>Appropriate food or ingredients to use</td>
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<td>----------------</td>
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<td>----------------------------------------</td>
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<tr>
<td>Shredder</td>
<td>To reduce to small shreds or pulverize by rubbing against a rough or sharp perforated surface</td>
<td>Cheese, Chocolate, Carrot</td>
</tr>
</tbody>
</table>
**Key terms**

**Bacteria** are single-cell microorganisms that can cause food poisoning when they are consumed live in food, or through the toxins they produce once they are ingested.

**Cross-contamination** of food involves the transfer of harmful bacteria from uncooked or raw food to food that has already been cooked or prepared.

**Enzymes** are chemical substances that act as biological catalysts in plants, animals and micro-organisms. They bring about and speed up chemical reactions in foods without becoming involved in the reaction.

**Food poisoning** is an illness caused by consuming foods contaminated by bacteria, chemicals or biological contamination.

**Food spoilage** is a reduction in the food quality identified by deterioration in the physical, chemical and/or sensory properties.

**Moulds** are a form of fungi that reproduce by forming spores.

**Yeasts** are single-cell microscopic fungi that reproduce by a process called 'budding'.
Safe food

Food is safe only if there is no risk of harm to humans when they consume it. Australia has one of the safest food supplies in the world, but the incidence of food-borne illness is on the increase.

According to recent data release by OzFoodNet, Australia's food-borne illness surveillance network, over 5.4 million cases of food-borne illness occur in Australia every year at a cost of almost $3 billion a year.

There are several reasons for the rise in the incidence and reporting of food-borne illness:

- changing patterns of food consumption leading to more meals being eaten away from the home
- greater diversity of food available
- emergence of new food-borne pathogens
- increase in the group of the population most at risk—elderly people are now a greater proportion of the total population
- better diagnosis and food testing
- enhanced surveillance and greater awareness of the incidence through the media.

Food spoilage

Food spoilage occurs when there is a reduction in the food quality identified by deterioration in the physical, chemical and/or sensory properties.

When the physical, sensory or chemical properties of a food, such as its nutrient value, colour, flavour, texture or appearance begin to deteriorate or reduce in quality, the food is said to 'spoil'. This means it is usually unpleasant to eat. Food spoilage can be caused by several factors, including the action of naturally occurring enzymes in the food, or moulds or yeasts, which can 'attack' the food. Food that has spoiled will show quite clear changes in its physical appearance, texture, odour, colour or flavour.

However, while the food may be less pleasant to eat, it will not generally be poisonous or cause any physical harm if consumed.

Some of the most common forms of food spoilage include:
- biscuits that have absorbed moisture from the air and become soft
- bread and cake that have staled because they have lost moisture
- mould on jam, bread or citrus fruit
- milk that has developed a sour flavour and odour
- fruit that has become bruised and overripe
- vegetables that have become limp.

Causes of food spoilage

Yeast, moulds and enzymatic breakdown are the main causes of food spoilage of fresh foods.

Yeast

Yeast are single-cell microscopic fungi that reproduce by a process called 'budding'. In this process, a small bud appears on the side of the mother cell. When the daughter cell reaches half the size of the mother cell, it separates from the mother cell and grows to its full size before reproducing again.

Wild yeast spores are those that float around naturally in the air and can cause food spoilage in foods such as fruit juices and vinegar products. The yeasts produce bubbles on the surface of the liquid and also give off a strong 'yeasty' odour, and have an unpleasant taste. The yeast used to make bread is a specific strain of yeast and doesn't spoil food.

Moulds

Moulds, like yeasts, are a form of fungi. They reproduce by forming spores, particularly on foods such as bread, cheese and citrus fruits. They appear
as a dark-coloured fuzzy mass on the surface of the food. They are carried in the air and form like seeds on a flower head. Some moulds found in grains and nuts produce harmful toxins, which can be extremely dangerous if consumed. However, some moulds play an important role in cheese making. For example, mould creates the blue veins in blue cheese; a different type of mould is used to form a protective coating on brie and camembert.

Enzymes
Enzymes are chemical substances that act as biological catalysts in plants, animals and microorganisms. They bring about and speed up chemical reactions in foods without becoming involved in the reaction.

Enzymes are protein substances that are naturally present in food. They cause food to ripen and age. When fruit ripens, there is a change in colour; a process that is particularly evident when bananas ripen. Enzymes are also responsible for converting the starch, which is naturally present in fruit, to sugar and so causing fruit to soften as it ripens and develop a sweet taste. This can be seen when green pears begin to ripen and change from having a very firm texture to being soft and edible. If the food is allowed to continue to ripen past its peak, it becomes soft and bruised, and develops an unpleasant aroma. It is at this stage, that it is described as being spoilt. The browning of a cut apple or an avocado is the result of the enzymes in action and is often referred to as 'enzymatic browning'.

### Food poisoning

Food poisoning is an illness caused by consuming food contaminated by bacteria, chemicals or biological contamination.

Symptoms of food poisoning can vary, depending on the severity of the poisoning, but generally include quite severe stomach cramps, vomiting and diarrhoea. Food that can cause food poisoning may appear harmless and its physical properties of appearance, aroma, flavour and texture may be normal.

### Causes of food poisoning

There are three main causes of food poisoning:

1. **Bacterial contamination**—This mainly occurs through poor food handling. The bacteria that are most commonly linked to food poisoning are *Bacillus cereus*, *Listeria monocytogenes* and *Salmonella*. Most reported cases of food poisoning are caused by bacterial contamination.

2. **Biological contamination**—This occurs when we eat foods containing naturally occurring substances that are poisonous to humans, such as some species of mushrooms, green potatoes, which contain solanine, and the leaves of rhubarb, which contain oxalic acid.

3. **Chemical contamination**—This occurs through the misuse of agricultural compounds such as herbicides and insecticides; organic mercury compounds have also been shown to contaminate some fish supplies.

### Bacterial food poisoning

<table>
<thead>
<tr>
<th>Food poisoning agent</th>
<th>How food is contaminated</th>
<th>Food sources that can be contaminated</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Salmonella</em></td>
<td><em>Salmonella</em> causes an infection when food that contains the live bacteria is eaten. <em>Salmonella</em> is responsible for approximately 70 per cent of all food poisoning cases. It can be fatal in the elderly, the sick and the very young.</td>
<td>Raw meat, poultry, sausages, dried egg powder, mayonnaise</td>
</tr>
<tr>
<td><em>Bacillus cereus</em></td>
<td>These bacteria are normally found in the soil, but form spores and so are easily distributed in air and dust. Spores are resistant to high temperatures and are protected by starch such as rice.</td>
<td>Cereals, especially boiled rice that has been left to cool at room temperature before use, vegetables such as potatoes</td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
<td><em>Listeria monocytogenes</em> is able to grow in extreme conditions, including refrigeration, and can survive the pasteurisation process. It causes the food-borne disease listeriosis, and can result in death. It can also lead to miscarriage or stillbirth.</td>
<td>Milk products, soft cheeses such as brie and camembert</td>
</tr>
</tbody>
</table>
Bacteria

Food poisoning is usually caused by bacteria. Bacteria are single-cell micro-organisms that can cause food poisoning if they are consumed live in food, or through the toxins they produce once ingested. A wide range of bacteria can cause food poisoning; some cause only mild symptoms, including headaches, nausea, vomiting or diarrhoea, while others can be fatal. Typically, symptoms occur between 6 and 8 hours after eating, but can occur at any time from 1 hour to 8 days after infection and usually last 2–3 days.

Conditions required for the growth of bacteria

Bacteria are living organisms that grow best under specific conditions. To optimise their growth, bacteria need:

- a moist, damp environment
- a temperature between 5°C and 60°C
- sufficient time to grow
- an appropriate food supply
- a low-acid environment

Many bacteria also require oxygen for growth.

- Moisture—Bacteria need moisture to be able to carry out their normal cell functions and to be able to divide and multiply. In a food preparation area, bacteria can grow in any moist environment, such as on wet dishcloths and damp tea towels, in water left lying in the sink or in equipment and utensils that haven't been dried properly.

- Temperature control—Most bacteria will grow, provided they have enough food and moisture, and if the temperature is between 5°C and 60°C. This temperature range is called the ‘danger zone’. Bacteria can be inhibited from growing if they are too cold; that is if food is kept in the refrigerator—or if they are too hot, by food being kept in a heated environment.

4 Food Solutions Units 3 & 4
• Time—Given ideal conditions, one bacterium can reproduce itself by splitting into two and dividing every 20 minutes. This process of division is called ‘binary fission’. Therefore, one bacterium can multiply to produce approximately 17 million bacteria within eight hours.

High-risk foods are foods such as milk, soft cheese, cream, meat, fish, poultry, cooked pasta and rice, coconut, gelatine, ice-cream and pastries.

Low-risk foods are foods such as margarine, butter, cooking oil, citrus fruit, vinegar, salted fish, jams and most vegetables.

• Low-acid environment—Bacteria require a low-acid environment to flourish, such as protein-based foods, and are less likely to grow in highly acidic foods such as fruit, vinegars, jams and most vegetables.

• Oxygen supply—Many bacteria need oxygen for survival and in order to reproduce. Many food preservation techniques rely on the removal of oxygen to extend the shelf life of the food, for example, canning, bottling, dehydration and vacuum packaging.

**NEWS FLASH**

**HEALTH ALERT**

**THE 12 MOST POISONOUS FOODS**

The following foods have been identified as most likely to cause food poisoning:

- Milk
- Soft cheese
- Cream
- Cooked pasta
- Cooked rice
- Poultry
- Meat
- Fish
- Gelatine
- Pastries
- Ice-cream
- Ice-cream

High-risk foods for food poisoning

Understanding the text

1. Describe the way in which yeast can cause food to spoil.
2. Name two foods that are likely to develop moulds.
3. Describe the role of enzymes in fruits.
4. Explain the difference between food spoilage and food poisoning.
5. Draw up a knowledge map of the four main causes of food spoilage and food poisoning, highlighting the way in which they affect food and listing the foods they affect most.
6. How does biological contamination of food differ from bacterial contamination?
7. Why is Salmonella contamination such a concern to food authorities? What foods are most at risk from being contaminated by Salmonella?
8. Explain how cereal-based dishes such as fried rice can lead to food poisoning incidents.
9. Describe the best method of keeping food out of the ‘danger zone’ and why this method is an important food safety consideration.
10. Explain why some foods are a high risk for food poisoning and others are considered to be low-risk foods.
Activity

Food spoilage and poisoning
Complete the following table summarising food spoilage and food poisoning.

<table>
<thead>
<tr>
<th>Food spoilage</th>
<th>Food poisoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>Definition</td>
</tr>
<tr>
<td>Causes</td>
<td>Causes</td>
</tr>
<tr>
<td>of food spoilage</td>
<td>of food poisoning</td>
</tr>
<tr>
<td>Examples of foods that can spoil</td>
<td>Examples of foods that can become contaminated with food-poisoning bacteria</td>
</tr>
</tbody>
</table>

Preventing food spoilage and food poisoning

Food is very easily spilt and contaminated, so it is essential to establish very rigorous food safety practices to minimise the risk of food spoilage and food poisoning. An effective food safety program covers a wide range of areas, including personal hygiene; the design and cleanliness of food premises including garbage and pest control; the purchase and storage of food supplies; safe food-handling practices; and measures to avoid cross-contamination.

Personal hygiene

The first step in the preparation of safe food is ensuring that all staff follow sound personal hygiene practices. The following rules should be observed.

- Wash hands very thoroughly before handling or preparing food and particularly after using the toilet, blowing your nose or coughing, handling raw food, eating, smoking, touching pets, or handling money or rubbish.
- Do not wear rings or any other jewellery.
- Keep fingernails short and do not wear nail polish or nail extensions when handling food.
- Wear a clean apron or other protective clothing.
- Tie the hair back or wear a hat or hairnet to prevent loose strands of hair contaminating food products.
- Sanitise cuts and cover with a clean, waterproof dressing.

Design of premises

In the food industry, best-practice procedures ensure that the premises where food is prepared, stored and sold are well designed and maintained in a clean and sanitary manner. These procedures help to protect food and make sure that it is free from contamination. The main considerations for food manufacturers or food retailers are:

- establishment of logical workflow—efficient movement from raw ingredients to finished product. This includes the safety of staff at each workstation
- separate areas for the preparation of raw and cooked food
- appropriate facilities to enable staff to maintain a high level of personal hygiene. An example is foot-operated or magic-eye washbasins
- provision of workstations designed for easy cleaning and maintenance
- adequate supply of hot and cold water
- temperature control for refrigeration, cooking and food display
- adequate lighting, ventilation and exhaust facilities
- appropriate pest control methods and garbage disposal.

Cleanliness of premises

One of the most common causes of food contamination is poor cleanliness of the premises and the equipment used in food preparation. It is essential that premises and equipment are cleaned when changing from the preparation of one type of food to another, as well as at the end of each food preparation cycle. One of the most important rules to remember is 'Clean as you go'.

Cleaning must cover all areas of the food preparation area, including the walls and floors, all fixtures and fittings such as benches, and all food preparation equipment, including stoves and mixers, and all crockery and cutlery.

It is essential to use detergent or a chemical sanitiser and very hot water (above 82°C) to make sure all bacteria are destroyed.
Garbage
It is important to remove garbage regularly because it can contaminate food, smell bad and attract pests. Good practice in this area involves:
- ensuring garbage containers are fly-proof and rodent-proof and do not leak or absorb liquids
- using containers that are easily cleaned and have tight-fitting lids
- removing garbage and waste from food-handling areas and workstations as often as necessary—at least daily
- keeping garbage containers in good repair and cleaning them away from food preparation areas
- cleaning garbage storage areas regularly.

Pest control
Pests such as insects and rodents can spoil food products by damaging the food itself or the package surrounding the food. Insects may not eat large quantities of the food, but once damaged, microbial growths are more likely to occur. Insects such as weevils spoil cereals and dried fruit by eating holes in the packaging material, leaving their faeces and body parts in the food and producing 'off' odours in the food. Rats and mice damage and contaminate food by gnawing and chewing and making body contact with the product and contaminating it with their faeces. They will eat anything, but prefer meat, fruit, vegetables and bakery goods.

Three strategies can be used to prevent insect and rodent infestation:
1. Build them out—Seal all unnecessary gaps around fittings, in walls and floors of the building, and ensure there is adequate space for cleaning.
2. Starve them out—Store food correctly, clean up all spills immediately, and clean effectively so there is no source of food for the pests.
3. Chase them out—If pests enter the premises, baits can be used. These are toxic and should be handled and stored carefully to avoid contaminating food.

Purchasing food
Contamination of food supplies can sometimes occur at the point of manufacture or processing, or in the transportation of food. It is therefore essential to purchase food only from reputable suppliers who implement correct food storage and handling procedures. To ensure the food you purchase is safe and free from contamination:
- check the 'use-by' or 'best-before' date
- examine the food supplies for any sign of contamination, such as a rancid smell or mould
- look for signs of damage on packaging and cans
- ensure that frozen foods remain frozen and do not show signs of thawing
- check that the food is transported in a registered food transport vehicle that is kept hygienically clean and that the food is transported at the correct temperature.

Storage
Storing food correctly is one of the key factors in preventing food spoilage and food poisoning. Shelf life is the period of time in which the quality of a food product remains satisfactory after processing and purchase. The shelf life of food will vary depending on the physical and chemical properties of the food and the methods of processing, packaging, distribution and storage. Fresh foods or 'perishable' foods are fragile and so the shelf life is short, particularly if there is poor temperature control during storage. Foods that have been processed by canning, freezing or drying are often described as 'shelf stable' or non-perishable, and have an extended shelf life.

Refrigeration
Refrigeration is the cooling of foods to between 4°C and 8°C. This reduction in temperature retards the deterioration of food and slows down the micro-organism growth and enzyme activity. The lower the temperature, the slower the chemical changes in food and the slower the microbial growth. Refrigeration does not kill the micro-organisms. Once the food has been returned to room temperature, they will be reactivated and spoilage will begin. Cover all cooked foods and store them on a shelf above uncooked foods. This minimises the risk of food-poisoning organisms being transferred from uncooked to cooked foods through dripping of moisture.
Shelf life of food

<table>
<thead>
<tr>
<th>Perishable foods</th>
<th>Semi-perishable foods</th>
<th>Semi-stable / not perishable foods</th>
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<tbody>
<tr>
<td>Liquid milk, some processed dairy products, fresh meat, fish, poultry, fresh fruit and vegetables, sliced meats such as ham</td>
<td>Butter, margarine, cheese, eggs, some pickled foods, some fruits and vegetables, including citrus fruit, potatoes and onions</td>
<td>Dried foods, nuts, grains, cereals, canned food, salt and sugar</td>
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<tr>
<td>Refrigerate at 2–5°C</td>
<td>Refrigerate at 2–5°C</td>
<td>Frozen foods, including meats, vegetables, pastries, pie shells, bread and bread rolls</td>
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<tr>
<td>Storage times:</td>
<td>Storage times:</td>
<td>Storage times</td>
</tr>
<tr>
<td>• vegetables—5–7 days</td>
<td>• Butter—up to 2 months</td>
<td>Pantry—in cool, dry area; tightly sealed containers from 3 months to 3 years</td>
</tr>
<tr>
<td>• milk—5–7 days</td>
<td>• Margarine—up to 6 months</td>
<td>Canned food up to 3 years</td>
</tr>
<tr>
<td>• fresh meat—3 days</td>
<td>• Eggs—up to 4 weeks</td>
<td>Freezer—store at −18°C in a tightly sealed package or container</td>
</tr>
<tr>
<td>• fish—2 days</td>
<td>• Onions and potatoes—store separately in a cool, dark pantry</td>
<td>Shelf-stable foods have a longer shelf life because they have low moisture content or the processing and packaging system, and the storage environment has excluded oxygen. Freezing deactivates bacteria and allows food to be stored for up to 6 months.</td>
</tr>
<tr>
<td>• sliced meat—5 days</td>
<td>Foods last longer because of natural inhibitors such as the shell of an egg, or added inhibitors like sugar, salt or vinegar.</td>
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<tr>
<td>Cold temperatures slow down changes that cause food to spoil or to go stale and prevent growth of bacteria.</td>
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</table>

Tips for storing food safely

- Store perishable food such as meat, fresh milk and fresh fruit and vegetables in the refrigerator at below 5°C.
- Separate cooked food and raw food in the refrigerator.
- Store raw food on a lower shelf so that juices cannot drip onto cooked food.
- Cover all food placed in the refrigerator.
- Store poultry separately from fresh meat and other protein foods to avoid cross-contamination.
- Make sure all foods that have a strong odour are firmly covered.
- Cool hot food for 20–30 minutes before placing in the refrigerator to avoid affecting the holding temperature of the refrigerator.
- Store frozen foods below −18°C.
- Package and seal foods to be frozen carefully to avoid ‘freezer burn’—the build-up of ice crystals on the outside of food that can cause it to dry out.
- Store non-perishable foods such as flour, sugar, canned and dry packaged food in a cool, dry place and above floor level.
- Check the seals on cans and do not store cans that are misshapen, swollen or dented as these are signs that they may have become contaminated.
- Check that all food is clearly labelled and include a ‘use-by’ or ‘best-before’ date.
- Rotate all food in the refrigerator, freezer or pantry so that food is used on a ‘first-in, first out’ system.
- Do not store cleaning materials near food.

Safe food-handling practices

To maximise food safety and minimise the risk of food contamination, it is essential for all people handling food to follow the seven principles of safe food handling:

1. Observe the rules for good personal hygiene.
2. Only purchase food from reputable suppliers.
3. Follow and practise safe food hygiene including storage and preparation of food to prevent cross-contamination.
4. When preparing, storing, serving or transporting food keep it out of the ‘danger zone’—keep hot food hot (above 60°C) and cold food cold (below 5°C).
5. Prevent contamination of food supplies, equipment and premises by insects and rodents.
6. Ensure that the premises and all equipment are kept in a clean and sanitary condition.
7. Do not allow staff to work with food if there is any sign of illness, no matter how mild.
Avoiding cross-contamination

One of the most common causes of food poisoning is through the cross-contamination of food. Cross-contamination of food involves the transfer of harmful bacteria from uncooked or raw food to food that has already been cooked or prepared. Cooking kills most of the harmful bacteria present in food. However, if raw food comes into contact with food that has been cooked, bacteria can be transferred to the cooked food.

Major risks in cross-contamination

- Storing raw and cooked ingredients together—Processed or prepared foods should be stored in sealed containers above raw foods. Raw vegetables that contain micro-organisms that might cause spoilage should also be stored separately, in refrigerated areas.

- Raw food such as chicken—This is the source of Salmonella bacteria on a chopping board. Cutting another food on the same board without washing the board can deposit Salmonella in cracks or crevices on the board, which can then be transferred to a high-risk food, such as cooked meat. The use of coloured boards for particular food types in commercial food preparation kitchens is one way in which health authorities have tried to overcome the problem of cross-contamination; for example, white boards for dairy products, red for raw meats and green for fruit and vegetables.

- The sink—This can be another major risk area. Bacteria can transfer from one food to another when rinsed in the sink if the sink is not carefully cleaned between uses.

- 'Double dipping'—Using a spoon to taste food and then using the same spoon to mix or stir the food allows bacteria present in the mouth to be transferred to the food that is being prepared. Equally dangerous is using one spoon to taste one food and then another product.

- Tea towels—These are a potential source of cross-contamination. Tea towels should only be used to dry dishes. They should not be used to dry dishes and then to wipe chopping boards, hands or benches or to cover food.
Activity

Look at the graph below showing the causes of food-borne illness in Australia. Answer the questions that follow.

1. List five unhygienic personal practices that may account for 9 per cent of food-borne illnesses.
2. Explain how each of the following foods may become unsafe:
   - fresh chicken
   - uncooked salad vegetables
   - cooked rice
   - beef and vegetable casserole left on the bench to cool after cooking.
3. Inadequate cooking leads to 27 per cent of food-borne illness in Australia. Explain why inadequate cooking of food can lead to so many cases of food-borne illness.
4. Explain how cross-contamination can be prevented when preparing food.
5. Correct holding temperatures are critical when storing cooked food. What safe holding temperatures are necessary for keeping lasagna hot, ready for serving?
6. What temperature is necessary to store the lasagna safely in the refrigerator for reheating later?

Understanding the text

11. Explain how well-designed food premises can help to prevent food spoilage and food contamination.
12. Describe how you would store fresh meat, cheese and flour safely.
13. List four ways of checking that food is safe to purchase.
14. Write a list of points for a cleaning schedule suitable for staff working in a small food outlet.
15. Explain why it is important for food premises to take strict pest control measures.
16. Explain what is meant by the term 'shelf life'. Why do shelf-stable foods have a prolonged shelf life?
17. How does the principle of stock rotation operate in a food business? Why is it good practice?
18. Draw up a knowledge map to summarise the main safe food-handling practices.
19. What is meant by the term 'cross-contamination'?
20. Outline three of the main causes of cross-contamination of food.

Preparing for exams

Applying knowledge

Draw a diagram to demonstrate the conditions required for the growth of bacteria.

Analysing information

1. Explain why covering food is an effective strategy in preventing food spoilage and food poisoning.
2. Explain the problems that may occur if food is not stored at the correct temperature.

Evaluating concepts

Rank the factors involved in preventing cross-contamination in food from the 'most important' to the 'least important'. Justify the ranking you give to each of the factors.
# Glossary of key terms

<table>
<thead>
<tr>
<th>Key term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>food spoilage</td>
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<tr>
<td>food poisoning</td>
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<tr>
<td>enzymes</td>
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<td>moulds</td>
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<td>chemical contamination</td>
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<td>yeasts</td>
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<td>physical contamination</td>
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<tr>
<td>bacteria</td>
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<tr>
<td>danger zone</td>
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<td>biological contamination</td>
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<td>high risk foods</td>
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<tr>
<td>cross contamination</td>
<td></td>
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<tr>
<td>enzymic browning</td>
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<tr>
<td>low risk foods</td>
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</table>
Causes of food spoilage and food poisoning

Food spoilage is caused by the actions of moulds, yeasts and enzymes.

Food poisoning results from the consumption of food containing harmful substances — certain bacteria, chemical contaminants and naturally-occurring substances like oxalic acid and solanine.

1. List common foods that may be affected by each of these causes of food spoilage:
   - enzymes
   - moulds
   - yeasts.

2. List common foods that may be affected by bacteria.
Apply your knowledge of food spoilage and food poisoning.
Potential contamination in food processing

There are four key ways in which food can be contaminated as it moves from its raw state, through various stages of processing and sale to the consumer, to eventually being consumed.

Define each of the following types of contamination and provide examples of how food spoilage or food poisoning may result.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Bacterial contamination</td>
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</tr>
<tr>
<td>Biological contamination</td>
<td></td>
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<tr>
<td>Physical contamination</td>
<td></td>
</tr>
<tr>
<td>Chemical contamination</td>
<td></td>
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</tbody>
</table>
Causes of bacterial growth
Create a mind-map explaining the factors that contribute to growth of bacteria in food.
Packed lunches may cause food poisoning

By Danny Rose

More workers are taking a packed lunch as the economic downturn bites, prompting health officials to warn of the risks of food poisoning. Food Safety Information Council chair Dr Michael Byles says rules must be followed to ensure a packed lunch is easy on the wallet and the stomach. Gastroenteritis, caused by salmonella bacteria, prompts more than a million visits every year to Australian doctors, who write 300,000 prescriptions for antibiotics to treat it.

Salmonella also plays a role in 120 Australian deaths, on average, per annum.

'Preparing lunches for your family is a great money saver but there are simple food safety rules that need to be followed,' Dr Byles said. 'If you take leftovers to microwave at work, make sure you divide your cooked leftovers into small lunch-sized portions so they cool quickly and refrigerate, or freeze, as soon as they have stopped steaming.' Dr Byles said leftover lunches should be kept for no more than two or three days, and 'if in doubt throw it out'.

When at work they should be put in the office fridge, and later reheated 'until they are steaming hot all the way through' for lunch.

The office fridge should also be 'uncrowded', he says, and running at or below five degrees Celsius. Office kitchens should also be kept clean to discourage the spread of bacteria, Dr Byles says, and this includes regular cleaning or replacement of dish cloths, sponges, brushes and tea towels.

'If working on construction sites, outdoors or other environments with limited access to refrigerators, pack food in insulated containers with frozen drinks or freezer bricks and place the container in a cool place between meal breaks,' Dr Byles said.

Lunches for school children could also be kept cool by placing a frozen juice box, or water bottle, with the lunch. Cold meats, chicken or egg sandwiches should be packed between cold items and Dr Byles says 'risky' foods like egg-based mayonnaise and soft cheeses should be avoided in school lunches.

Raw fruit and vegetables should be washed before eating, and the utensils used to make the lunch should also be clean. 'Lunches can safely be prepared ahead of time provided they are kept in the fridge or frozen. Always practice scrupulous hand-washing,' Dr Byles said.

People with food poisoning should not go to work or school, and they should not handle food for 48 hours after symptoms such as vomiting and diarrhoea stop.

Read the article 'Packed lunches may cause food poisoning' and answer the following.

1. The article refers to 'if in doubt throw it out'. List three signs that indicate a food should no longer be consumed.

2. Salmonella is identified as a leading cause of food poisoning. Name three food sources which can contain salmonella.

3. List two other common types of bacteria and foods commonly affected by each.

4. List the two high-risk foods identified in the article. Explain why these foods are considered high-risk?

5. Temperature is discussed in the article as an important factor which influences the rate of bacterial growth. List three other factors which contribute to the growth of bacteria.

6. Choose one of these factors and explain how it contributes to bacterial growth.

7. The article mentions a number of ways to prevent food poisoning from occurring. Identify three of these ways.

8. Suggest two additional ways that food poisoning can be prevented.
Knowledge check

1. Food poisoning and food spoilage, although similar are quite different. Explain in detail the difference between food spoilage and food poisoning.

2. Food spoilage is mostly caused by the actions of yeasts, moulds and enzymes, while food poisoning is caused by bacteria. Define the terms ‘yeast’, ‘mould’ and ‘enzyme’ and list the foods that each are commonly found on.

3. The rate at which bacteria grow depends on temperature. Explain how each of the following temperatures will have an effect on the rate of bacterial growth in food.
   -18°C
   4°C
   31°C
   80°C

4. Identify three conditions, other than temperature, that bacteria need in order to survive.

5. Identify three high-risk foods and explain why they are more likely to cause food poisoning.
Revision activity

1. The foods listed below are subject to food spoilage. Place each of the foods in the correct cause of food spoilage.

<table>
<thead>
<tr>
<th>Yeasts</th>
<th>Moulds</th>
<th>Enzymes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bread</td>
<td>orange juice</td>
<td>banana</td>
</tr>
<tr>
<td>apple</td>
<td>beef</td>
<td>lettuce</td>
</tr>
<tr>
<td>chicken</td>
<td>vinegar</td>
<td>tasty cheese</td>
</tr>
<tr>
<td>soft cheese</td>
<td>avocado</td>
<td>fruit salad</td>
</tr>
</tbody>
</table>

2. Classify the following foods as either high or low risk foods for food poisoning.

<table>
<thead>
<tr>
<th>High risk</th>
<th>Low risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>uncooked rice</td>
<td>fresh mayonnaise</td>
</tr>
<tr>
<td>cooked rice</td>
<td>pickled onions</td>
</tr>
<tr>
<td>fresh fish and seafood</td>
<td>tomato chutney</td>
</tr>
<tr>
<td>cream</td>
<td>cream cheese</td>
</tr>
<tr>
<td>tuna in brine</td>
<td>coffee</td>
</tr>
<tr>
<td>crackers</td>
<td>cooked kidney beans</td>
</tr>
<tr>
<td>pasta salad</td>
<td>sultanas</td>
</tr>
<tr>
<td>sushii</td>
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</table>

3. What are the characteristics of high risk foods?

4. What are the characteristics of low risk foods?