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# UNIT 10

## Food safety and hygiene

- 10.1 Foodborne illness
- 10.2 Cross-contamination
- 10.3 Preventing foodborne illness
- 10.4 Food allergies and intolerances

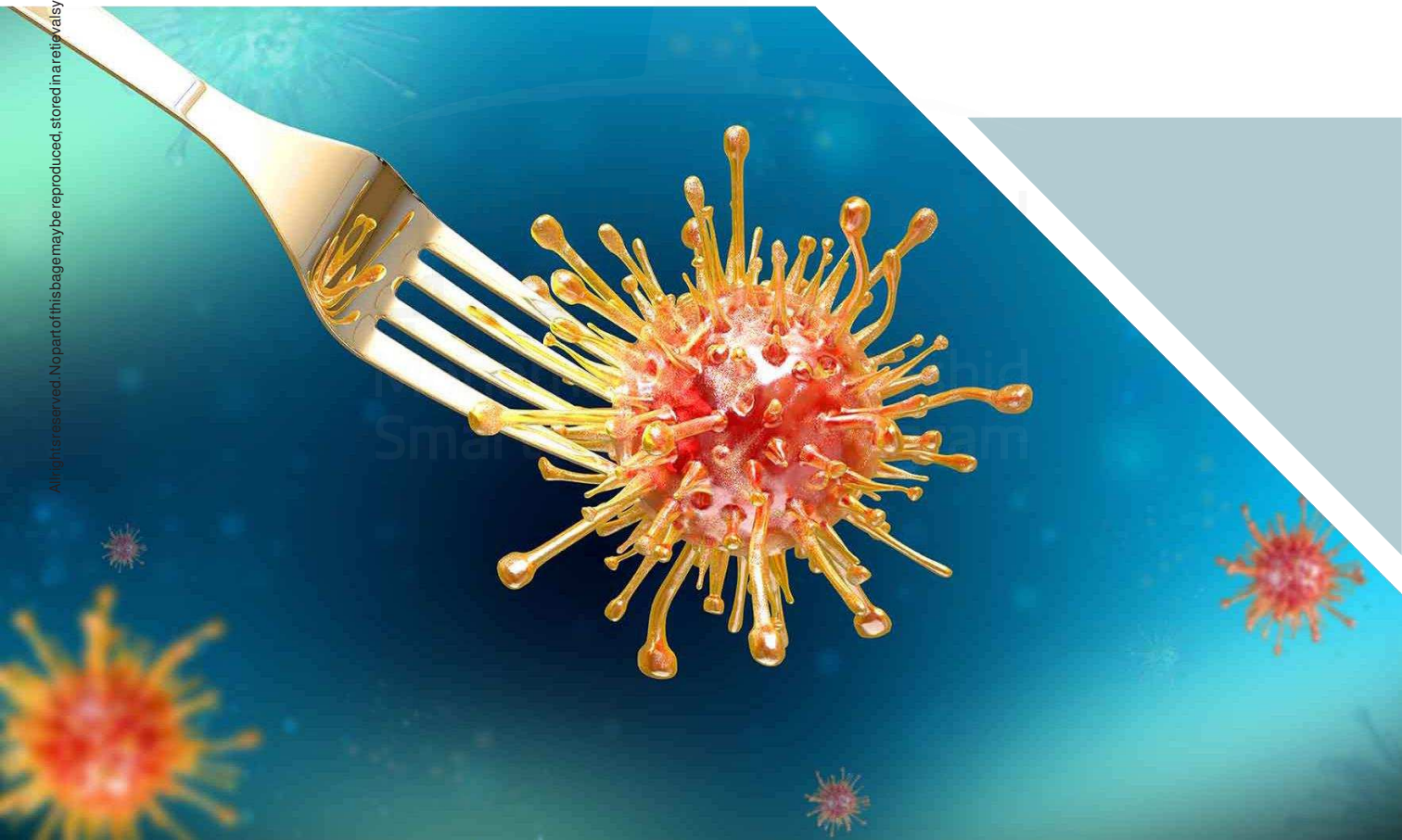
برنامج محمد بن راشد  
للتعلم الذكي

Mohammed Bin Rashid  
Smart Learning Program

# Introduction

Foodborne illnesses, also known as food poisoning, are caused by eating food that are contaminated with bacteria, viruses or other harmful substances. Food can become contaminated at any point during slaughter, processing, transport, storage, or preparation. There are many different bacteria that cause more than 200 foodborne illnesses. For every ten people who eat contaminated food, one person will become ill. Foodborne illness can cause death, particularly in young children and older adults.

In this unit, you will look at the components of food safety and storage that can lead to foodborne illness. You will understand how to prevent causing foodborne illnesses, and five key steps which should be taken in order to prevent the spread of dangerous bacteria to humans ranging from hand washing to food storage. You will explore the many causes of allergies and intolerances and how they are treated.





## Learning outcomes

Standard HS.4.2.01 Recognise the importance of food safety and hygiene in avoiding foodborne illness and cross-contamination and explore food related allergies and intolerances.

### Learning outcomes:

- |               |   |
|---------------|---|
| HS.4.2.01.001 | List the causes of foodborne illness.   |
| HS.4.2.01.002 | Explore the concept of cross-contamination.   |
| HS.4.2.01.003 | Identify the importance of proper hygiene practices when handling and storing food and preparing meals. |
| HS.4.2.01.004 | Compare and contrast food allergies and food intolerances.  |



## Keywords

Word	Form	Definition
allergy	noun	a medical condition that causes someone to become sick after eating or touching something that is harmless to most people
anaphylaxis	noun	a serious allergic reaction that can cause death
bacteria	noun	a group of very small living things that cause disease
contaminated	verb	when food becomes dangerous because a harmful or unwanted substance gets into it, like bacteria
diarrhoea	noun	an illness that causes waste to be passed from the body frequently in liquid rather than solid form
disease	noun	a condition that prevents the body or mind from working normally
faeces	noun	solid waste that is released from the body
foodborne	noun	when something is carried through food, such as a disease
symptom	noun	a change felt by the body or mind that suggests a disease is present
transmission	noun	the process by which something is spread or passed from one person or thing to another

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## Discussion: Foodborne illnesses

Have you ever had a foodborne illness? What signs and symptoms did you have? Do you know anything about the different kinds of foodborne illnesses? Discuss with your class.

Most foodborne illnesses happen suddenly and last a short time. They can occur from 6–72 hours after eating contaminated food. Most people recover on their own without treatment. Occasionally, foodborne illnesses may lead to more serious complications.



### Keyword

#### **contaminated**

when food becomes dangerous because a harmful or unwanted substance gets into it, such as bacteria



### Did you know?

One in ten people fall ill after eating contaminated food. Each year 420,000 people in the world die from foodborne illness. From this number, 125,000 are children younger than five years of age.



## 10.1 Foodborne illness

### Bacteria

Harmful bacteria may already be in foods when you buy them. Raw foods may be contaminated with bacteria that cause foodborne illness. There are many opportunities for contamination to happen, including during:

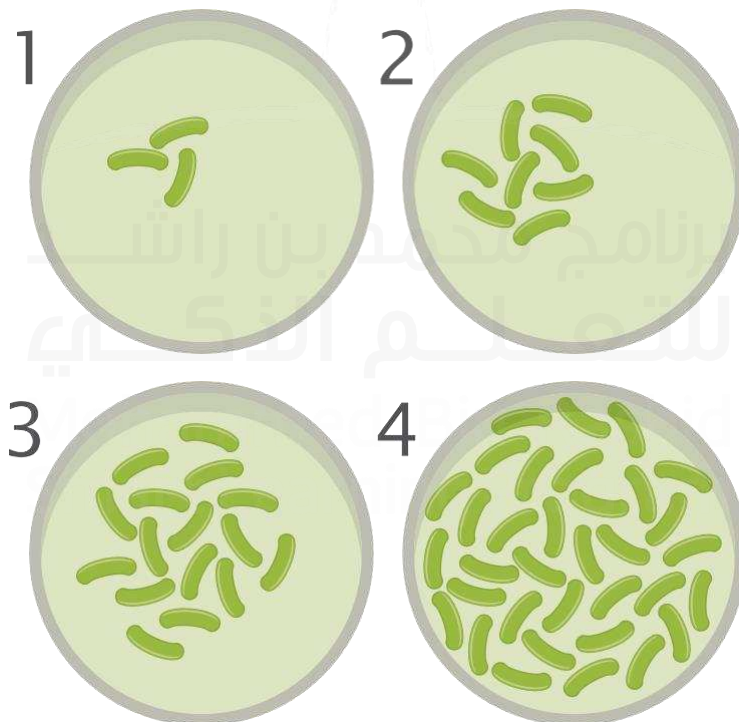
- ”” growth.
- ”” harvesting.
- ”” slaughter.
- ”” processing
- ”” storage.
- ”” transportation.
- ”” preparation in a kitchen.



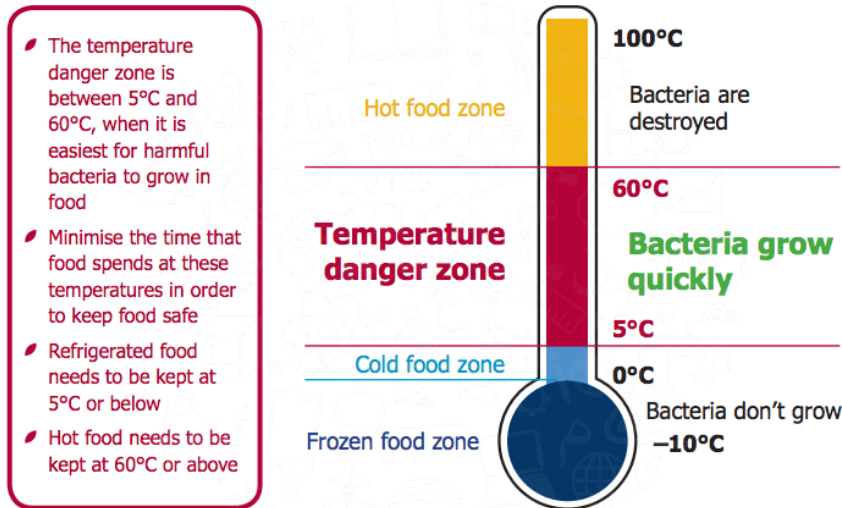
### Bacterial growth

Bacteria grow by multiplying and they can do this very quickly. They need certain conditions to grow. They include:

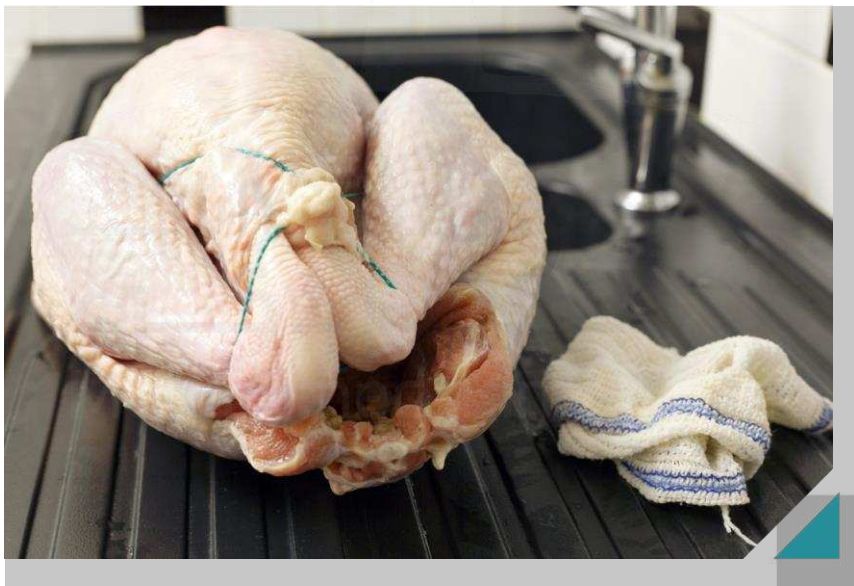
- ”” **Time:** Bacteria double every 15 minutes. This means that within six hours, one bacterium can multiply to over 16 million.



► **Warmth:** Bacteria need warmth to multiply. The ideal temperature is 37°C. They can multiply in temperatures between 5°C and 60°C.



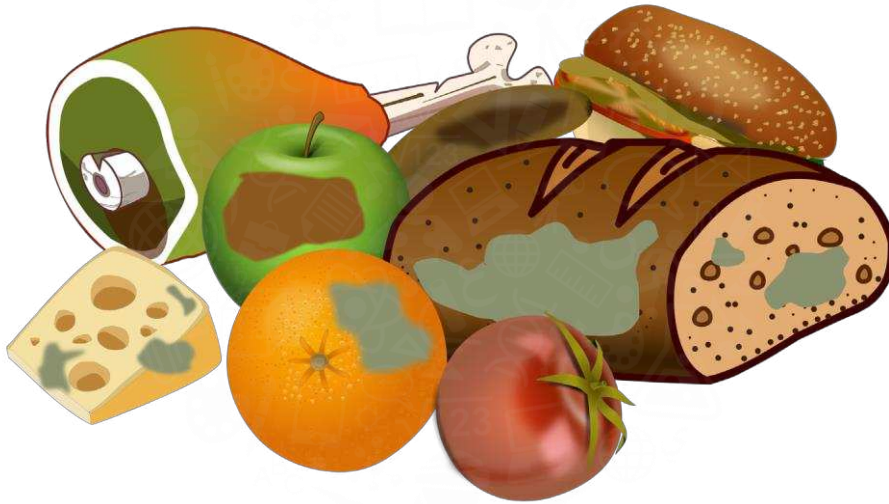
When food is not stored properly, it gives bacteria the chance to grow. Keeping food in the fridge can reduce the growth of bacteria. Freezing food can further slow, or even stop this growth.



However, bacteria in refrigerated or frozen foods will become active again when brought to room temperature. These foods must be properly cooked to kill any harmful bacteria.

## 10.1 Foodborne illness

”” **Food:** Just like people, bacteria need nutrients to grow. Meat, seafood, ~~and~~ rice, cooked pasta, milk, cheese and eggs are all foods that provide ideal growing conditions for bacteria.



”” **Water:** Bacteria need moisture to grow.



### Further information

Some of the illness-causing bacteria that are commonly found in foods are:

- ”” Campylobacter
- ”” Escherichia coli (E. coli)
- ”” Salmonella
- ”” Listeria



### Did you know?

Food containing harmful bacteria and other harmful substances such as viruses, parasites or chemicals can cause more than 200 diseases ranging from diarrhoeal disease to cancer.

## High-risk foods

Some foods are more likely to make you sick than others. This is because these foods are more at risk of bacterial growth. If they are not cooked to a safe temperature, or stored or handled properly, there is a higher chance they will make you sick.

Most foodborne illnesses develop quickly. However, some can take days to develop, so it can be difficult to find the exact cause of the illness. Knowing which foods to be extra careful with when storing, handling and cooking is helpful.



## Poultry

Raw and undercooked poultry can be dangerous. Small amounts of bacteria can make people very sick. Cooking to a safe temperature normally kills dangerous bacteria. Avoid washing raw chicken as this will spread the bacteria around the kitchen. Wash and sanitise anything that raw poultry has touched.





## 10.1 Foodborne illness

### Eggs

Raw and undercooked eggs are also high-risk. Bacteria can live in the yolk, the white part of the egg and the eggshell. Normally the egg will not look, smell or taste any different.



### Seafood

From the moment a fish is caught until it is eaten, it must be properly stored. There are lots of different bacteria and toxins that can cause foodborne illness from fish. Fish can become contaminated through sewage in the water where they live. Even cooking to at high temperatures cannot kill some of the toxins found in seafood.



## Rice

Sometimes bacteria can live in uncooked rice. Cooked rice provides heat, moisture and food which are perfect conditions for bacteria to multiply.



## Vegetables

Vegetables are a common source of foodborne illness, especially when eaten raw. They can become contaminated at many stages from growth to storage to preparation. Leafy green vegetables are especially dangerous as they are usually eaten raw. It is important to wash vegetables before eating them.





## 10.2 Cross-contamination



### What is cross-contamination?

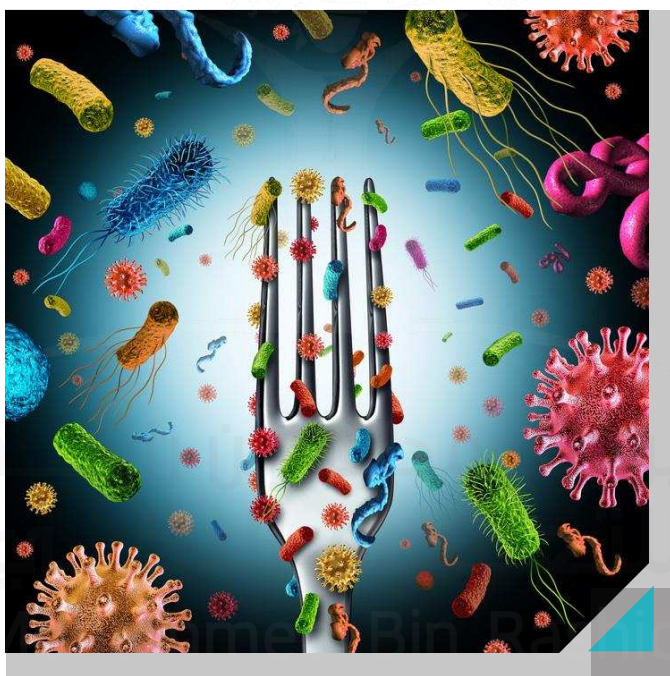
Cross-contamination can occur when particles of an allergy-containing food accidentally land on another food that is normally safe to eat. This can happen quite easily, especially if the person preparing food is not careful.



#### Remember

Contamination is when food becomes dangerous because a harmful or unwanted substance like bacteria gets into it.

Your food travels a long distance from its origin (where it is grown or made) until it gets to your plate. It can be handled by many different people and exposed to lots of different conditions. As a result, there are many points where food can become contaminated.



### Types of cross-contamination

Let's look at three main types of cross-contamination:

- ”” Food-to-food
- ”” Equipment-to-food
- ”” People-to-food

## Food-to-food

This is the process of adding contaminated food to non-contaminated food. Harmful bacteria spread and multiply. Raw, undercooked or unclean food can contain large amounts of bacteria. If these bacteria are consumed, they could make you ill.

All of the high-risk foods that you know about have a chance of causing food-to-food contamination.



### Remember

High-risk foods include leafy green vegetables, leftover rice as well as raw eggs, poultry and seafood.



## 10.2 Cross-contamination

### Equipment to food

This is one of the most common types of cross-contamination.

Bacteria can live for a long time on surfaces like countertops, cutting boards, utensils, storage containers and factory equipment. Therefore, it is very important to wash all surfaces and equipment properly using soap and hot water.



When equipment is not washed properly, it can transfer a large number of harmful bacteria to food. This can happen at any point during production or preparation.



### Example

Using the same cutting board and knife to cut raw meat and vegetables can be very harmful.

There are globally recognised colour codes which are used to identify which chopping board to use depending on the food that is being prepared.

## Prevent cross-contamination

Use the correct colour coded chopping boards and knives

**Raw meats and poultry only**

**Raw fish and shellfish only**

**Raw unwashed vegetables, salads and fruits only**

**Ready to eat and cooked foods only**

**Washed vegetables, salads and fruits only**

**Bakery and dairy products only**

**Food Hygiene Act 1995**

### People-to-food

It is easy for humans to transfer bacteria from their bodies or clothes to food during many steps of food preparation. This includes using dirty tea towels.



#### Example

A person may cough into their hand or someone may touch raw chicken. In both of these cases, if either person continues to prepare a meal without washing their hands, they may transfer bacteria to food.



## 10.3 Preventing foodborne illness



### Five keys to safer food

The five keys to safer food is a global health message that everyone all over the world should know. They help prevent foodborne illnesses and improve health.



# World Health Organization



### Video: Five keys to safer food

Watch the video showing five steps to safe food handling and storage.

#### 1. Keep clean

Just because something looks clean it does not mean that it is. It takes over 2.5 billion bacteria to make 250ml of water look cloudy. However, in some cases, it only takes twenty harmful bacteria to make a person sick.

#### Why is it important?

Dangerous germs are widely found in soil, water, animals and people. These germs are carried by hands, clothes and kitchen equipment. The slightest contact can transfer germs to food and cause foodborne diseases.

## Handwashing

Hands transfer germs from one place to another, so handwashing is very important. You should wash your hands:

- ”” before handling food.
- ”” before eating.
- ”” after going to the toilet.
- ”” after handling raw meat or poultry.
- ”” after blowing your nose.
- ”” after handling rubbish.
- ”” after handling cleaning products.
- ”” after touching animals or playing with pets.



By now, you should be very familiar with how to properly wash your hands.



## Cleaning plates and kitchen equipment

Some general advice from the WHO includes the following:

- ”” Clean while preparing food so bacteria do not have a chance to grow.
- ”” Pay special attention to equipment that may touch both raw food and the mouth.
- ”” Sanitise cutting boards and equipment after they have been in contact with raw meat or seafood.
- ”” Don't forget to clean and dry the cleaning equipment as bacteria grow fast in damp places.





## 10.3 Preventing foodborne illness



### Think

Know the difference between cleaning and sanitising. Cleaning is the process of physically removing dirt and crumbs of food. Sanitising is the process of killing germs or disinfecting.

### Protect food from pests

Pests include cockroaches, mice, rats, flies and insects. They can pass harmful germs onto food and kitchen surfaces. Pets carry pests in their fur or their feet. Do the following things to keep food safe from pests:



- ▮▮ Food should be covered or in closed containers.
- ▮▮ Rubbish bins should be covered and rubbish should be removed regularly.
- ▮▮ Food preparation areas should be in good condition (repair cracks or holes).
- ▮▮ Keep house pets away from food preparation areas.

### 2. Separate raw and cooked food

Separating raw and prepared foods will prevent cross-contamination.

#### Why is it important?

Raw food, especially meat, poultry and seafood (and their juices) contain dangerous bacteria which can move onto other foods during food preparation and storage.



## How to keep raw food and prepared foods separate

- While shopping, keep raw meat, poultry and seafood separate from other foods.
- In the fridge, store raw meat, seafood and poultry on shelves or sections **below** cooked foods.
- Store food in containers with lids to stop raw and cooked foods from touching.
- Wash plates that have been in contact with raw foods, and always use a **clean** plate for cooked foods.



### 3. Cook thoroughly



#### Keyword

#### thoroughly

being careful about doing something in the correct way

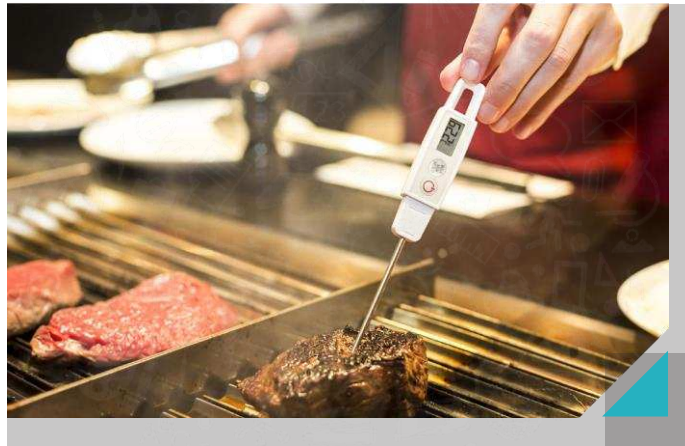
#### Why is it important?

Proper cooking can kill almost all dangerous bacteria. Cooking food to 70°C can ensure it is safe to eat. A temperature of 70°C can kill large groups of bacteria within thirty seconds.

## 10.3 Preventing foodborne illness

### How to cook food thoroughly

Use a thermometer to check that foods reach 70°C. Make sure the thermometer is cleaned and sanitised after each use. This will avoid cross-contamination between raw and cooked foods.



Sometimes a thermometer will not be available. There are other ways to check that food is properly cooked. This includes:

- ▄▄ Cook meat and poultry until the juices are clear and the inside is not pink.
- ▄▄ Cook eggs and seafood until piping hot the whole way through.
- ▄▄ Boil liquid-based foods like soups and stews. Allow them to remain boiling for at least one minute.



### Further information

#### Using a microwave oven

Microwave ovens can cook and reheat foods unevenly. They sometimes can leave cold spots where dangerous bacteria can survive. It is very important to check that food cooked or reheated in a microwave is at least 70°C the whole way through to the centre.

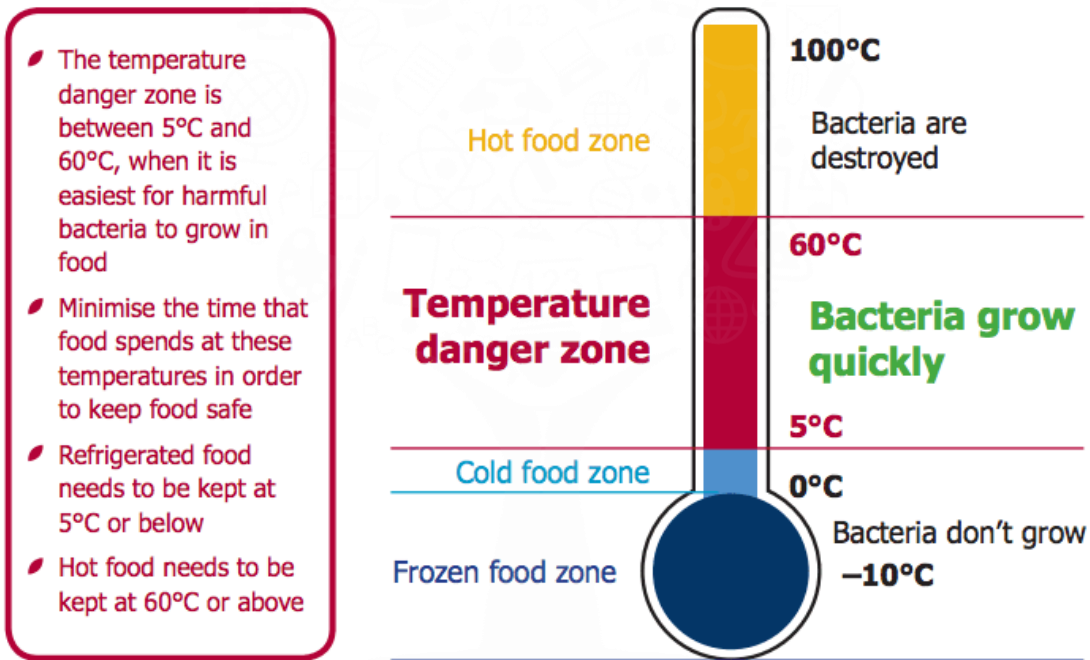
Some plastic containers release toxic chemicals when they are heated. They should not be used in a microwave to reheat food. Always check that the equipment you are using is microwave safe.



## 4. Keep food at safe temperatures

### What are the safe temperatures for food?

The danger zone is the temperature range between 5°C-60°C. This is where bacteria multiply very quickly. Bacteria cannot grow if it is too hot or too cold. Therefore, storing food at a temperature below five degrees is advised.



### How to keep food at safe temperatures

- ☛ Cool and store all leftover food quickly. Slice large pieces of meat into small pieces and place food in a clean, cool container.
- ☛ Leftover food should not be stored in the fridge for more than three days and should not be reheated more than once. This is because food enters the danger zone once it is reheated and bacteria can grow quickly.
- ☛ Thaw frozen food in the fridge.
- ☛ Cool hot food until the steam no longer rises from it. You should not leave food to cool for more than two hours.



## 10.3 Preventing foodborne illness

### 5. Use safe water and raw materials

Safe' means that water and food are free from dangerous bacteria and chemicals that could cause illness.



#### Why is it important?

Raw materials (including water) may be contaminated with dangerous bacteria and chemicals. You should be careful when buying raw materials and carry out simple measures. For example, you should wash and peel fruits and vegetables to reduce the risk of eating dangerous bacteria.



#### Further information

##### Is tap water safe in the UAE?

In the UAE, seawater is treated in a process that removes salt, dirt and germs before it flows through the taps. The water is completely safe to drink when it leaves the water treatment plant, but it must pass through tanks from the treatment plant to the homes of residents. In this journey, there may be contamination by bacteria and chemicals, or chlorine may be added which can give it an unpleasant taste. Therefore, a lot of UAE residents choose not to drink tap water unless it has been filtered at home.

#### Safe water is needed to:

- ” wash fruit and vegetables.
- ” add to food and drinks.
- ” make ice.
- ” clean cooking equipment.
- ” wash hands.



#### Selecting safe raw materials

- ” Select fresh foods.
- ” Avoid rotten food.
- ” Choose dairy products that have been pasteurised.
- ” If you are buying ready-to-eat cooked foods, make sure they are stored **correctly** (not in the danger zone).

# Five keys to safer food

## Keep clean

- ✓ Wash your hands before handling food and often during food preparation.
- ✓ Wash your hands after going to the toilet.
- ✓ Wash and sanitise all surfaces and equipment used for food preparation.
- ✓ Wash and sanitise all surfaces and equipment used for food preparation.
- ✓ Protect kitchen areas and food from insects, pests and other animals.

### Why?

While most microorganisms do not cause disease, dangerous microorganisms are widely found in soil, water, animals and people. These microorganisms are carried on hands, wiping cloths and utensils, especially cutting boards and knives. The slightest contact can transfer them to food and cause foodborne diseases.



## Separate raw and cooked

- ✓ Separate raw meat, poultry and seafood from other foods.
- ✓ Use separate equipment and utensils such as knives and cutting boards for handling raw foods.
- ✓ Store food in containers to avoid contact between raw and prepared foods.

### Why?

Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous microorganisms which may be transferred onto other foods during food preparation and storage.



## Cook thoroughly

- ✓ Cook food thoroughly, especially meat, poultry, eggs and seafood.
- ✓ Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer.
- ✓ Reheat cooked food thoroughly.

### Why?

Proper cooking kills almost all dangerous microorganisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include mince/meats, rolled roasts, large joints of meat and whole poultry.

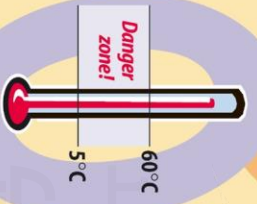


## Keep food at safe temperatures

- ✓ Do not leave cooked food at room temperature for more than 2 hours.
- ✓ Refrigerate promptly, all cooked and perishable food (preferably below 5°C).
- ✓ Keep cooked food piping hot (more than 60°C) prior to serving.
- ✓ Do not store food too long even in the refrigerator.
- ✓ Do not thaw frozen food at room temperature.

### Why?

Microorganisms can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of microorganisms is slowed down or stopped. Some dangerous microorganisms still grow below 5°C.

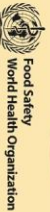


## Use safe water and raw materials

- ✓ Use safe water or treat it to make it safe.
- ✓ Select fresh and wholesome foods.
- ✓ Choose foods processed for safety, such as pasteurized milk.
- ✓ Wash fruits and vegetables, especially if eaten raw.
- ✓ Do not use food beyond its expiry date.

### Why?

Raw materials, including water and ice, may be contaminated with dangerous microorganisms and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Care in selection of raw materials and simple measures such as washing and peeling may reduce the risk.



Knowledge = Prevention

WHO/CDC Joint Food Safety  
Distribution: Geneva  
Original English

Design: Marilyn Langfield. Illustration: Janet Petipierre



## 10.4 Food allergies and intolerances



### Food allergies



#### Discussion: Allergies

Do you, or anyone you know, have a food allergy? If so, what is the allergy? What would happen if you (or the person you know) ate this food? Discuss with your class.

A food allergy is when the body's immune system responds unusually to certain foods. When you have a food allergy, your body reacts to the food and tries to fight against it. It might handle harmless substances in the food you eat and see them as a threat. This tells the body to release chemicals which cause an allergic reaction. Food allergies can be so severe that they cause a reaction called anaphylaxis. They can even be life-threatening.



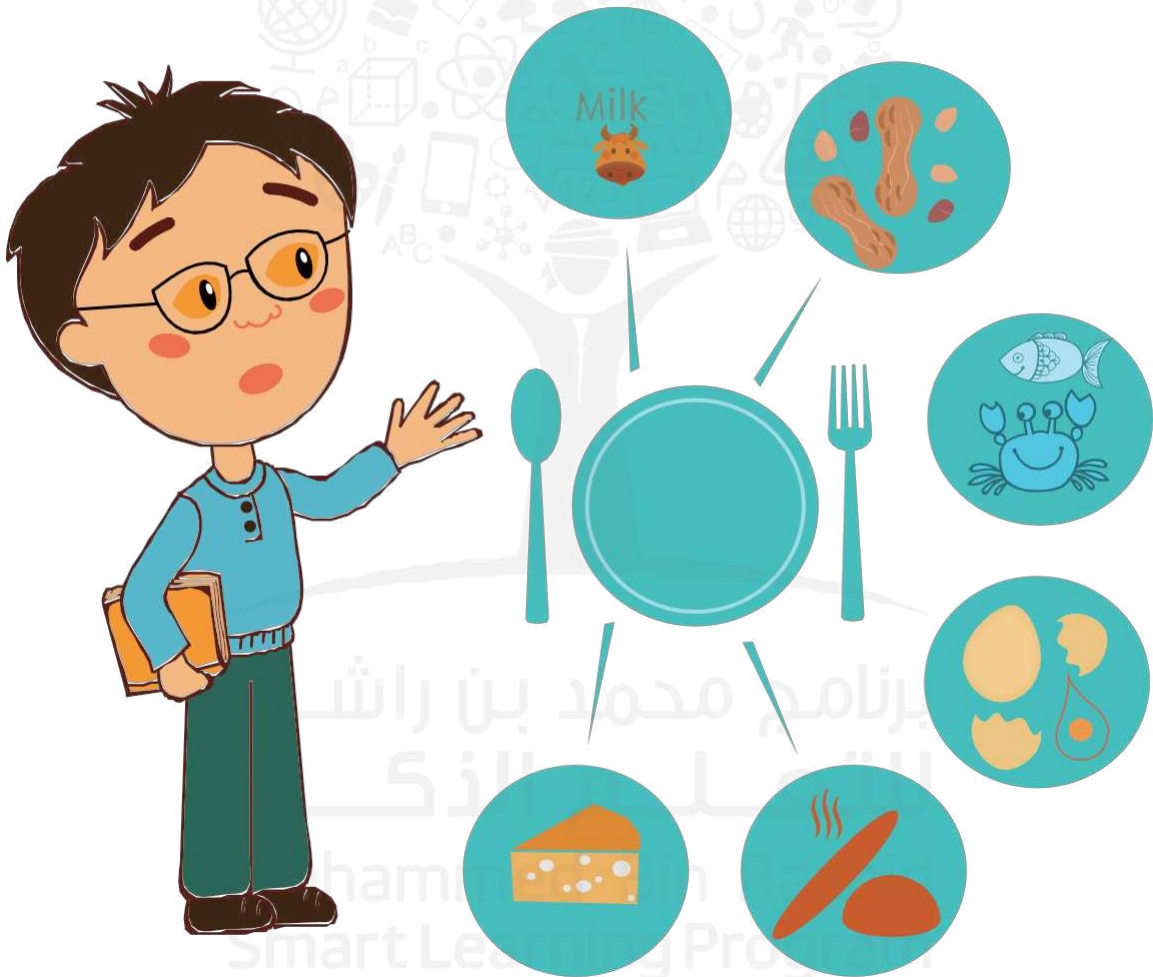
#### Did you know?

Allergies can develop at any stage in life. For example, shellfish allergies are more likely to develop in adulthood.

## Common causes of allergy

Foods that commonly cause allergies are called allergens. Some examples of allergens include:

Peanuts (and other nuts)	Shellfish
Eggs	Fish
Gluten	Milk and dairy foods
Mustard	Sesame seeds



### Did you know?

More than 170 foods have been reported to cause allergic reactions.

## 10.4 Food allergies and intolerances



### Further information

#### The rise in food allergy cases

The number of people with food allergies has risen a lot over the past few decades. The reason for this is unclear but there are a couple of theories that suggest why. One theory is that the typical child's diet has changed a lot over the last thirty to forty years. Another theory is that children are growing up in 'germ-free' environments. Their immune systems might not develop properly because they are not exposed to germs. When they eat certain foods, their bodies mistake harmless substances for bacteria, and they think they are being attacked, causing an allergic reaction.

### Food intolerances

Food intolerance happens when the body cannot properly digest the food that is eaten. It can also happen when a particular food irritates the digestive system. It can be difficult to know if a person has a food intolerance as the symptoms are similar to other conditions. Reactions due to food intolerances are not life-threatening.

### Types of intolerances

Some common types of food intolerance are:

Lactose	Caffeine
Gluten	Histamine in mushrooms and pickles
Additives e.g. artificial sweeteners, colouring or flavours	



## Lactose intolerance

This is one of the most common intolerances. It happens when a person has digestive problems after eating dairy products. Their body cannot digest lactose which is a natural sugar found in milk, yoghurt and soft cheeses.

## Gluten intolerance

Many people experience digestive problems caused by gluten, but not all of these people are gluten intolerant. Gluten is a protein in wheat, barley and rye. It is used in foods like bread, pasta, cereal, pastries, cookies and doughnuts.

## Signs and symptoms of food allergies

The signs and symptoms of allergies and intolerances are very similar. They can range from person to person depending on how mild or severe their reaction is. If a person suffers a mild reaction on one occasion, it does not mean that their reaction will be mild the next time.



hives



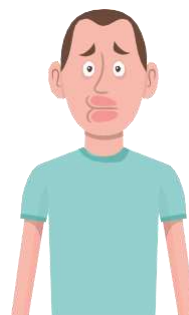
itchy mouth



swollen face



swollen tongue



swollen lips



nausea or vomiting



abdominal pain



trouble breathing



dizziness



diarrhoea



## 10.4 Food allergies and intolerances

The following table shows a comparison between the signs and symptoms of food allergies and food intolerances.

Food allergy	Food intolerance
<ul style="list-style-type: none"> <li>” It usually comes on suddenly.</li> <li>” Small amounts of food can trigger a reaction.</li> <li>” A reaction happens every time the food is eaten.</li> <li>” It can be life-threatening.</li> </ul>	<ul style="list-style-type: none"> <li>” It usually comes on gradually.</li> <li>” A reaction may only happen when a lot of the food is eaten.</li> <li>” A reaction may only happen if the food is eaten often.</li> <li>” It is not life-threatening.</li> </ul>

Symptoms of allergic reactions	Symptoms of food intolerance
<ul style="list-style-type: none"> <li>” Rashes or hives</li> <li>” Itchy mouth</li> <li>” Swelling of face, tongue and lips</li> <li>” Trouble breathing</li> </ul>	<ul style="list-style-type: none"> <li>” Gas</li> <li>” Stomach cramps/bloating</li> <li>” Heartburn</li> <li>” Headaches</li> </ul>

Symptoms of both
<ul style="list-style-type: none"> <li>” Nausea</li> <li>” Abdominal pain</li> <li>” Diarrhoea</li> <li>” Vomiting</li> </ul>

Food intolerances can be hard to diagnose. This is because the symptoms that people experience are similar to those of many other conditions, such as irritable bowel syndrome and irritable bowel disease.

The best way to diagnose food intolerance is to monitor symptoms alongside the foods that are eaten. Removing suspected foods from the diet and seeing if any changes are noticed is a good method.



## Further information

### Anaphylaxis

Anaphylaxis is a severe allergic reaction to certain foods and it can lead to death. A person who has an anaphylaxis reaction needs immediate emergency medical care.

Symptoms of anaphylaxis include:

- ”” Difficulty breathing
- ”” Rash on the skin
- ”” Rapid heart rate
- ”” Nausea

If someone has a severe reaction, they may go into a state known as anaphylactic shock. The sufferer should be treated with an injection of adrenaline that comes in the form of an auto-injector and an ambulance should be called immediately. Most people with severe allergies carry an adrenaline auto-injector with them.

