

# Section 3—Food Safety learn sheet

## Microorganisms, Enzymes and Food Spoilage



### Bacteria

**Bacteria** are single-celled organisms that are able to reproduce rapidly. They are also called **Microorganisms**. Bacteria are sometimes useful and are used in cheese-making and in yogurt. They are sometimes harmful (pathogenic) and can cause food poisoning.

<b>Temperature</b>	Bacteria generally multiply between 5°C and 63°C. the average ideal temperature for rapid bacterial multiplication is 37°C which is body temperature.
<b>Moisture</b>	Bacteria need moisture to live and multiply
<b>Time</b>	Under optimum conditions, bacteria will multiply every 10-20 minutes. To control bacteria multiplying: eat food as soon as possible after making./ cooking. If the food is not eaten straight away, cool down as quickly as possible (90 mins is the recommended time) and store in a fridge or freeze/ A blast chiller will cook food more quickly than the recommended time.
<b>Nutrients</b>	Bacteria can multiply to large numbers on high-risk foods such as meat, poultry, fish, eggs and milk. These are all high-risk foods.
<b>pH level</b>	Bacteria grow best at a neutral pH level, between 6.6 and 7.5. bacteria are unable to survive below pH 4.5. Vinegar (acetic acid) has a pH of 3.5.

### Yeast

Yeast are single-celled plants found in the air and on skins of fruit. Yeast spoils the taste of food but is not harmful. It grows only on sugary foods, but not in sugar concentrations above 50% (Jams should be 60%). It can survive without air. It can not grow at low temperatures or survive in vinegar. It is destroyed at temperature above 70°C. Yeast is a very helpful organism. It is used in baking bread, where carbon dioxide is used as a raising agent, and in wine making and brewing.

### Moulds

**Moulds** are a type of fungus, that settle on food and grow into a visible plant. Moulds grow on many foods, such as bread, cheese and meat. They like slightly acidic conditions. They need moisture and warmth (20°C—40°C) but are destroyed at 70°C. moulds can survive on the fridge but not in the freezer. Mould on food is a sign that it is not very fresh or has been stored incorrectly. Some mould can result in allergic reaction and respiratory difficulties



**Key Words:**  
Bacteria  
Microorganisms  
Moulds  
Enzymes

### Enzymes

**Enzymes** in food can be a problem for food storage. The cells break open, the enzymes escape and react with other parts of the food. Soft spots appear on fruit and vegetables and makes meat smell and taste bad. Denaturing the enzymes can help to preserve the food, e.g. through heat, use of acids, strong alkalis or salt. Enzymes are chemical catalysts that are found in all cells. Enzymes break down plant and animal tissues, causing fruit to ripen, meat to tenderise and enzymic browning to speed up.



### Ways to Prevent Oxidation (Enzymic browning)

Adding lemon juice (an acid) to a fruit salad prevents browning. Blanching vegetables before freezing prevents discoloration. Removing air by immersing potatoes in water will prevent browning. Refrigeration or freezing will slow down browning. The removal of moisture (dehydration) will prevent browning however it is slow process and the browning reaction is quick

## Bacterial Contamination



**Key Words:** Pathogens, Food poisoning, contamination

### Bacteria

Bacteria can be found everywhere, including raw food, people air and dust, equipment and utensils, soil, pests, water and food waste.

### The Dangers of Bacteria

It is essential to control the conditions that allow bacteria to multiply and cause illness, e.g. stick to strict time and temperature controls. You can become ill if you eat food that is contaminated by certain bacteria (**pathogens**) and viruses. Kitchens provide the ideal conditions for bacteria growth. Bacteria are microscopic. You cannot tell if a food is contaminated by just looking at it.

### Food Poisoning Bacteria

**Food Poisoning** is caused by bacteria multiplying in or on food.

Pathogenic Bacteria	Food Affected	Symptoms	Onset	Special Note
Salmonella	Raw meat; Eggs; Seafood; Dairy products	Diarrhoea; Vomiting; Fever	12-36 hours	May be fatal to the elderly and babies; found in human and animal excreta
Staphylococcus Aureus	Cooked sliced meat; Dairy products; Anything touched by hand	Vomiting; diarrhoea; abdominal pain	1-6 hours	Present in nasal passages, throat and skin; associated with dirty food handlers; good personal hygiene is crucial
Clostridium perfringens	Raw and cooked meat products	Nausea; Diarrhoea; Abdominal pain	8-22 hours	
Clostridium Botulinum	Incorrectly canned meat, fish or vegetables	Paralysis; difficulty breathing; double vision; Nausea; Vomiting	12-48 hours	Rare
Bacillus cereus	Cooked rice, pasta and cereal foods	Nausea; Diarrhoea; Vomiting	1-6 hours	

### Food-borne Disease

Food-borne diseases are caused by pathogenic microbes (bacteria and viruses) carried on food. These microbes do not multiply on the food but in the person who has eaten the food

Pathogenic Microbes	Food Affected	Symptoms	Onset	Special Note
Escherichia-Coli (E.Coli)	Raw meat; untreated milk and water	Vomiting; blood in diarrhoea; kidney damage/failure	12-24 hours	Causes gastro=enteritis in humans
Listeria Monocytogenes	Soft cheese; pate; unpasteurised milk; under-cooked meat; incorrectly heated cook-chill meals	A range of symptoms from mild flu-like symptoms to septicaemia, meningitis and pneumonia	No specific time	Can cause miscarriage, premature labour and birth
Campylobacter	Meat; shellfish; untreated water; washing raw poultry	Diarrhoea; headache; fever Abdominal pain	1-11 days	Easily transmitted between humans. Raw meat and poultry <b>MUST NOT</b> be washed as this spreads bacteria
Norovirus	Shellfish; Raw vegetables; salads	Nausea; vomiting; Diarrhoea; Abdominal pain; fever	1-2 days	Projectile vomiting. The virus can survive for several days if not cleaned up properly

### Preventing contamination

Preventing **Contamination** is key to food safety. Keep the kitchen clean and tidy. Clean and disinfect all areas, equipment and utensils. Keep food covered. Handle food as little as possible. Store food correctly. Cook food thoroughly. Remove food waste and rubbish.

### Food Poisoning

Food poisoning is caused by harmful bacteria multiplying in or on food. Symptoms usually pass in a few days and the sufferer will make a full recovery. Food poisoning can affect anyone, but some people may suffer more than others e.g. babies/ elderly/ pregnant ladies/ people who suffer from allergies

## Microorganisms in Food Production

### The dairy industry

It would be impossible to make cheese without a **starter culture**. As the culture grows in the milk, it converts the sugar lactose into lactic acid. As the cheese ripens the culture gives it a balanced aroma taste and texture. Cheeses that rely on moulds for their characteristics:

Blue Cheese	Soft Ripened Cheese	Rind-washed cheese
The cheese is treated with a mould. As the cheese matures, the mould grows creating blue veins.	<i>P. camemberti</i> is allowed to grow on the outside of the cheese, causing the cheese to age from the outside in, forming a soft white crust and runny inside	Rind-washed cheese also ripen inwards but they are washed with brine and other ingredients e.g. beer and wine, which contains mould, making them attractive to bacteria, which adds to the flavour



Blue cheese  
E.g. Stilton/ Roquefort



Soft ripened cheese  
E.g. brie/ camembert



Rind-washed cheese  
E.g. Limburger

### Yoghurt

In yoghurt, the culture is responsible for the taste and texture of the final product. In recent years **probiotic** cultures have become popular in dairy products because of their health benefits. Probiotic cultures are carefully selected strains, and there is good evidence that they help improve digestion, safeguard the immune system, and keep the body's intestinal flora in balance. Probiotic cultures are classified as a functional food.



**Key Words:**  
Starter culture  
probiotic

### The meat industry

Meat starter cultures are used to make dried, fermented products such as salami, pepperoni, chorizo and dried ham. Lactic bacteria develop the flavour and colour of the products. A wide variety of moulds are used to ripen the surface of sausages, preserving the natural quality of the product and controlling the development of flavour.

### Yeast

Yeast is used in bread making as well as in beer and wine. Yeast is a microorganism and requires sugar to grow.

## Buying and Storing Food

### Buying Safe food

Make sure the food is safe for consumption. Check for signs of damage to tins, packets and packaging. Check the date marks— **use by/ best before**. Stock rotation makes sure that food is used within date and prevents unnecessary waste.

### Use by dates

A use by is a safety date found on foods and their packaging. Use-by dates are found on highly perishable, packaged food such as meat, fish, dairy products that require chilling and have a short shelf life.

### Best-before dates

Best-before dates usually appear on less perishable foods that have a long shelf life, such as canned, dried and **frozen food** products.

**Key Words:** use-by date, best before date, frozen food, chilled food

## Preparing and Cooking Food

### Personal Hygiene

Food handlers are a common source of pathogenic bacteria. When preparing food you must maintain high standards of **personal hygiene** to avoid contamination leading to illness. A clean apron should be always be worn to protect the food. All jewellery removed, hair tied up/ covered with hairnet/ finger nails kept short with no nail varnish. Washing hand prior to food handling, after handling high-risk foods/going/ to the toilet/ sneezing/ handling waste are all important to prevent contamination occurring.

**Key Words:**  
Hygiene,  
high risk foods, Danger zone,  
reheating, core temperature  
of pathogenic bacteria.



### Preparing food

Food needs to be protected from contamination during preparation as the food is usually uncovered. Food should be handled as little as possible and kept out of the **danger zone** (5-63°C). To prevent cross contamination, raw food and cooked food must be prepared separately using separate utensils e.g. Red chopping board and knife for raw meat. When preparing food, some foods are more of a risk than others; these are high-risk foods such as Protein-based foods, moist foods and ready to eat foods.

### Cooking and reheating

Pathogenic bacteria can be destroyed and food made safe by through cooking. To make sure bacteria are killed to thickest part of the food should reach 70°C for 2 minutes. Liquids should be stirred to avoid hot spots. Large items should be turned to ensure even cooking. Hot holding is the process of storing food warm for service this must be no lower than 63°C for a maximum of 90 minutes. Food must not be **reheated** more than once and should reach a **core temperature** of 75°C

### Cleaning

All food contact surfaces and hand contact surfaces must be cleaned and disinfected after use (clean as you go). Food preparation areas must be kept clean to protect from bacterial/ chemical/ physical contamination and to prevent slips and trips. **Types of Food Poisoning**  
Microbial/ Physical/ Chemical contamination  
**Temperature Probes**  
Temperature probes are used to take the core temperature of food. Care must be taken to ensure the probe does not cause contamination.

### Chilled food storage

Fridges should be set at 1°C—4°C to make sure **chilled food** held below 5°C. door handles should be cleaned. Ready to eat food should be stored above raw food (that needs cooking). Foods must be kept covered.

### Frozen Food Storage

Bacteria are dormant in the freezer. Foods should be stored at -18°C or below. Food should be well wrapped to prevent freezer burn through loss of moisture.

### Defrosting

Defrosted food must be treated like chilled food. Frozen food must be fully defrosted prior to cooking as ice crystals may still be present in the centre, cooking will melt these but not cook the food thoroughly.