

## Section One: Background Material

What is the problem?	Additional information
<p>Every day people all over the world get sick from the food they eat. This sickness is called foodborne disease and is caused by dangerous microorganisms and/or toxic chemicals.</p> <p>Most foodborne disease is preventable with proper food handling.</p>	<p>Foodborne Disease:</p> <ul style="list-style-type: none"> <li>◆ Is a problem in both developing and developed countries;</li> <li>◆ Is a strain on health care systems;</li> <li>◆ Severely affects infants, young children, elderly and the sick;</li> <li>◆ Creates a vicious cycle of diarrhoea and malnutrition; and</li> <li>◆ Hurts the national economy and development and international trade.</li> </ul>
<p><b>Considerations and suggestions for the trainer</b></p> <p>For simpler language, use the terms “germ” for microorganisms and “poisons” for toxic chemicals.</p>	
What are microorganisms?	Additional information
<p>Microorganisms are very small living things, so small that they cannot be seen with the naked eye. There are three different types of microorganisms: the good, the bad and the dangerous.</p> <p>Good microorganisms are useful. They:</p> <ul style="list-style-type: none"> <li>◆ Make food and drinks (e.g. cheese, yoghurt, beer and wine);</li> <li>◆ Make medicine (e.g. penicillin); and</li> <li>◆ Help digest food in the gut.</li> </ul> <p>Bad microorganisms, or spoilage microorganisms, do not usually make people sick, but they cause our food to smell bad, taste horrible and look disgusting.</p> <p>Dangerous microorganisms make people sick and can even kill. These are called “pathogens”. Most of these microorganisms do not change the appearance of the food.</p>	<p>Microorganisms are so small that it takes 1 million to cover the head of a pin.</p> <p>Bacteria, viruses, yeasts, moulds and parasites are all microorganisms.</p> <p>The smell, taste and appearance of food are not good indicators of whether the food will make you sick. Some spoilage microorganisms do change the appearance of food and are dangerous. An example is the green mould on bread which can produce toxins.</p> <p>Examples of common dangerous foodborne microorganisms include:</p> <ul style="list-style-type: none"> <li>◆ Bacteria - <i>Salmonella</i>, <i>Shigella</i>, <i>Campylobacter</i> and <i>E. coli</i>;</li> <li>◆ Parasites - <i>Giardia</i>, <i>Trichinella</i>; and</li> <li>◆ Viruses – Hepatitis A, Norovirus.</li> </ul>
<p><b>Considerations and suggestions for the trainer</b></p> <ul style="list-style-type: none"> <li>◆ Become familiar with dangerous microorganisms in your region.</li> <li>◆ It may be appropriate to change the example showing the relative size of a microorganism. For example, 10 000 bacteria side by side would occupy one centimetre of space.</li> <li>◆ Providing pictures or actual examples of mouldy fruit may add interest, but it must be stressed that dangerous bacteria may not always make the food smell, taste or look bad.</li> </ul>	

Where do microorganisms live?	Additional information
<p>Microorganisms are everywhere, but are mostly found in:</p> <ul style="list-style-type: none"> <li>◆ Faeces;</li> <li>◆ Soil and water;</li> <li>◆ Rats, mice, insects and pests;</li> <li>◆ Domestic, marine and farm animals (e.g. dogs, fish, cows, chickens and pigs); and</li> <li>◆ People (bowel, mouth, nose, intestines, hands, fingernails and skin).</li> </ul>	<p>Human and animal faeces contain disease-causing microorganisms.</p> <p>A single teaspoon of soil contains more than 1 billion microorganisms. All living things have microorganisms associated with them.</p> <p>Animals carry microorganisms on their feet, in their mouths and on their skin.</p> <p>An average 100 000 bacteria can be found on each square centimetre of human skin.</p>
<p><b>Considerations and suggestions for the trainer</b></p> <ul style="list-style-type: none"> <li>◆ Name common sources of microorganisms in the local region.</li> </ul>	
How do microorganisms move?	Additional information
<p>Microorganisms rely on someone or something to move them around. The transfer of microorganisms from one surface to another is called "contamination".</p> <p>Hands are one of the most common means of moving microorganisms from one place to another.</p> <p>Microorganisms can be spread through contaminated food and water.</p> <p>Pets and domestic animals can also be a source of contamination.</p>	<p>If a food handler is infected with a virus and continues to prepare food, some viruses may be passed on to the consumer via the food. Hepatitis A and Norovirus are examples of viruses which can be transmitted in this way.</p> <p>Zoonoses are communicable diseases caused by microorganisms transmitted from animals to humans. Avian influenza and infections with <i>E. coli</i> 0157 are examples of zoonoses. Avian influenza can be transmitted to humans through direct contact with an infected bird or objects contaminated by their faeces.</p>
<p><b>Considerations and suggestions for the trainer</b></p> <ul style="list-style-type: none"> <li>◆ Give a demonstration of contamination by touching your hand to your face and then touching some food with that same hand.</li> <li>◆ Discuss a local foodborne disease outbreak, including the cause of the outbreak and what could be done to prevent infection in humans.</li> </ul>	

How do microorganisms grow?	Additional information
<p>Most microorganisms “grow” by multiplication. To multiply, microorganisms need:</p> <ul style="list-style-type: none"> <li>◆ Food;</li> <li>◆ Water;</li> <li>◆ Time; and</li> <li>◆ Warmth.</li> </ul> <p>Meat, seafood, cooked rice, cooked pasta, milk, cheese and eggs are foods that provide ideal conditions for microorganisms to grow.</p>	<p>One bacterium can become 2 in just 15 minutes. This means that within 6 hours, 1 bacterium can multiply to over 16 million.</p> <p>To be harmful, some bacteria need to grow to high levels. Other bacteria can cause illness when they are present in very low numbers.</p> <p>Viruses are many times smaller than bacteria. They do not grow in food or water, but these are vehicles for transmission.</p>
<p><b>Considerations and suggestions for the trainer</b></p> <ul style="list-style-type: none"> <li>◆ Discuss local foods that do and do not provide the ideal conditions for growth of microorganisms.</li> <li>◆ Dried beans, pebbles or other objects can be used to demonstrate bacterial growth. As an example of quick growth start with one object, in 15 seconds make it two objects, in another 15 seconds make it 4 objects and in another 15 seconds make it 8 objects, etc. (double the number of objects you have every 15 seconds). Please note that 15 seconds is used instead of 15 minutes so that it is possible to show how bacteria grow during a training session.</li> </ul>	
What are the symptoms of foodborne disease?	Additional information
<p>Every year, billions of people experience one or more episodes of foodborne disease, without ever knowing that their illness was caused by food.</p> <p>The most common symptoms of foodborne disease are:</p> <ul style="list-style-type: none"> <li>◆ Stomach pains;</li> <li>◆ Vomiting; and</li> <li>◆ Diarrhoea.</li> </ul> <p>The symptoms depend on the cause of the disease. Symptoms may occur very quickly after eating the food, or may take days or even weeks to appear. For most foodborne diseases, symptoms occur 24 -72 hours after the food has been eaten.</p> <p>Foodborne disease can lead to long-term health problems. Very severe diseases, including cancer, arthritis and neurological disorders can be caused by contaminated food.</p>	<p>For infants, the sick, pregnant women and the elderly, the consequences of foodborne disease are usually more severe and more often fatal.</p> <p>Drinking plenty of fluids will maintain hydration during diarrhoea.</p> <p>It is estimated that 3% of cases of foodborne disease can lead to long-term health problems.</p> <p>Mouth masks are recommended for people who may cough or sneeze while handling food. Gloves can be used to cover any cuts or lesions and should be changed frequently.</p> <p>Advice on treatment of foodborne illness differs between countries and should be adapted to the local region. However, one should seek medical advice when bowel movements are very frequent, very watery or contain blood, or last beyond 3 days.</p>

<p><b>What to do if you get sick</b></p> <p>Try not to handle or prepare food while you are sick and for 48 hours after your symptoms stop. However, if this cannot be avoided, wash your hands with soap and water first and frequently during food preparation.</p> <p><b>When symptoms are severe seek medical advice immediately.</b></p>	<p>Some foodborne diseases can be transferred from person to person. Caregivers can become sick from patients with a foodborne illness.</p>
<p><b>Considerations and suggestions for the trainer</b></p> <ul style="list-style-type: none"> <li>◆ Food industry workers need to notify their employers of the following: Hepatitis A, diarrhoea, vomiting, fever, sore throat, skin rash, other skin lesions (e.g. boils, cuts, etc.) or discharge from ears, eyes or nose.</li> <li>◆ High risk activities such as slaughtering and preparing ready to eat foods may require special personal protective equipment. Contact the local government authority for more information.</li> </ul>	
<p><b>Chemicals should not be forgotten</b></p>	<p><b>Additional information</b></p>
<p>Microorganisms are not the only cause of foodborne illness. People also get sick from poisonous chemicals, which include:</p> <ul style="list-style-type: none"> <li>◆ Natural toxins;</li> <li>◆ Metals and environmental pollutants;</li> <li>◆ Chemicals used for treating animals;</li> <li>◆ Improperly used pesticides;</li> <li>◆ Chemicals used for cleaning; and</li> <li>◆ Improperly used food additives.</li> </ul> <p>Simple measures such as washing and peeling may reduce the risk from chemicals that are found on the surface of foods.</p> <p>Appropriate storage can avoid or reduce the formation of some natural toxins.</p>	<p>“Poisoning” is a term used to describe sickness resulting from chemical contamination.</p> <p>Some “natural” toxins (e.g. aflatoxin) are caused by moulds growing on the food.</p> <p>Ingesting aflatoxins may have harmful effects on the liver that can lead to cancer.</p>
<p><b>Considerations and suggestions for the trainer</b></p> <ul style="list-style-type: none"> <li>◆ It may be useful to elaborate on some of the chemicals that are a threat to specific populations (e.g. methylmercury, arsenic).</li> <li>◆ Discuss the importance of reading and understanding instructions on the labels of chemicals used for cleaning.</li> <li>◆ Using cookware and utensils glazed with materials containing heavy metals (e.g. lead, cadmium) can result in chemical poisoning. Discuss appropriate cookware.</li> </ul>	

## You can make a difference!

Stop microorganisms from making you and other people sick by following the Five Keys to Safer Food:

1. Keep clean;
2. Separate raw and cooked;
3. Cook thoroughly;
4. Keep food at safe temperatures; and
5. Use safe water and raw materials.

## Additional information

It is very important to follow the Five Keys to Safer Food because proper food handling is key to foodborne disease prevention.

These messages are core information and should be presented to all audiences.

In some countries, it may be necessary to address the use of safe water and raw materials before presenting the Five Keys to Safer Food.

# 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 sanitize 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 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 minced 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 1°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 oil, 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**

Food Safety World Health Organization