CONTENTS

Management Principles  1

Part 1  Introduction to Food Safety  2
The Importance of Food Safety  2
Student Sheet Quiz 1  7
Student Sheet Activity 1  8

Part 2  Food Hazards and Foodborne Illness  9
Hazards to Food  9
Biological Hazards – Bacteria  11
Other Biological Hazards  14
Biological Hazards and Illness  16
Time/Temperature Control for Safety Foods  20
Physical and Chemical Hazards  24
Student Sheet Quiz 2  26
Student Sheet Activity 2  27
Student Sheet Activity 3  28
Student Sheet Activity 4  29

Part 3  Preventing Foodborne Illness  30
Personal Hygiene  30
Time and Temperature Control  34
Receiving and Storing Food  37
Preparing and Presenting Food  42
Cleaning and Sanitizing  47
Integrated Pest Management  52
Designed for Food Safety  54
Student Sheet Quiz 3  57
Student Sheet Activity 5  58

Part 4  Food Safety Control  59
Professional Good Practice  59
Management Matters  63
Student Sheet Quiz 4  64
Student Sheet Activity 6  65

Quiz & Activity Answer Key  66

Index  67

NOTE: This book uses the principles and recommendations of the Food and Drug Administration (FDA) 2009 Food Code. The danger zone temperatures used in this book are 5°C (41°F) to 57°C (135°F).
The Importance of Food Safety

Food safety involves safeguarding food from anything that could harm the health of consumers. High standards enable everyone to enjoy their food without illness, injury or other problems, but poor standards can lead to all kinds of harm – and even death. As food safety is so important to everyone, the people who work with food have legal, ethical and economic responsibilities for keeping food safe to eat. This chapter outlines the impact of foodborne disease and introduces some of the responsibilities of food service professionals.

Consumer awareness

The safety of food is high on the list of consumer expectations, but outbreaks of foodborne illness and scares about health hazards from food have often been in the headlines in recent years. Despite increased public awareness of food safety issues, there are still millions of cases of foodborne illness every year and thousands of deaths. Many of these cases are linked to retail eating establishments.

No single reason has been identified for these high figures, but factors may include:

- changes in menu trends – such as eating out more often, eating more reheated food, eating raw food (such as sushi) or eating lightly cooked food (such as meat that is still pink in the center)
- changes in domestic shopping habits – including more bulk buying so that food is stored at home for longer periods before it is eaten
- changes in farming practices, with food produced in massive quantities rather than at a small farm or by local industry
- more interstate shipping, so that food spends more time in transit, which may increase the possibility of temperature abuse
- more importation of food and ingredients
- a reduction in the use of preservatives
- seasonal variations in menu demands – so, for example, in summer there may be insufficient refrigeration space or there could be temperature abuse associated with cook-outs
- the identification of new foodborne diseases
- an increase in the number of cases of foodborne illness that are reported as a result of better public awareness – but the figures are still unlikely to show the true extent of the problem because many people with a foodborne illness do not consult a physician, so they are not included in the official statistics.
New International Food Safety Icons

The 11 international food safety icons below were published in 2005 by the International Association for Food Protection (IAFP). The purpose of the icons is to provide an easily recognizable symbol that conveys a specific food safety message to food handlers of all nationalities.

The IAFP icons are consistent with the standards presented in the FDA Food Code.

1. Thoroughly cook foods to appropriate temperatures.
2. Do not cross-contaminate between raw and ready-to-eat or cooked foods.
3. Wash hands with soap and warm running water.
4. Do not touch ready-to-eat foods with bare hands.
5. Food contact surfaces and utensils must be properly washed, rinsed, and sanitized.
6. Do not work with food or beverage if you are ill or experiencing gastrointestinal symptoms.
7. A food that requires time and temperature control for safety.
8. Cold foods must be held at 5°C (41°F) or below.
9. Hot foods must be held at 57°C (135°F) or above.
10. Do not allow foods to stay in the temperature danger zone.
11. Hot foods must be cooled from 57°C to 21°C (135°F to 70°F) within two hours and from 57°C to 5°C (135°F to 41°F) within the next 4 hours for a total cooling time of six hours.

IAFP encourages the use of the icons in training and educational materials, stickers, signs, posters or similar products. A license from IAFP to use the icons for commercial uses is required, but the icons may be reproduced free of charge (with proper copyright acknowledgement) in certain types of educational materials. The icons can be downloaded in digital format from http://www.foodprotection.org/

Icons copyright 2005, International Association for Food Protection, all rights reserved.
Student sheet  Activity 1

Objective
To consider the impact of food safety upon consumers, employers, employees and the community in general.

20 minutes

From the point of view of the consumer:
1. List at least THREE examples, from your point of view, of benefits from effective food safety at a food establishment.

2. List at least THREE examples, from your point of view, of the costs (financial and non-financial) of poor food safety at a food establishment.

3. Now repeat the exercise from the viewpoints of an employer, an employee and a member of the public.

Benefits

Problems

Continue on a separate sheet if necessary
Spoilage bacteria
These are the types of bacteria that make food spoil (sometimes called ‘rotting’, ‘decaying’, ‘deteriorating’ or ‘going bad’). Food that is putrid or decomposed is considered unfit for human consumption and must not be sold.

How bacterial contamination occurs
As bacteria exist in the environment – in water, the soil and the air – and on and inside animals, many raw foods are contaminated before they reach your establishment.

Careless or inappropriate handling may add bacteria to food – for example, through poor personal hygiene and habits. It can also spread bacteria from one food to another – such as from a raw time/temperature control for safety food to a ready-to-eat food. This is called cross-contamination and it can happen when foods touch or drip, but it also often occurs via ‘vehicles of contamination’, such as cutting boards and knives. Although bacteria can move, they cannot travel far on their own, but they are often ‘transported’ from one place to another on people, animals, equipment, utensils and wiping cloths. In particular by:

- hands
- hand-contact surfaces, such as preparation tables, cutting boards, door handles and faucets
- food-contact surfaces, such as cutting boards, containers and utensils that have not been cleaned and sanitized properly between uses.

management principles
- Encourage high standards of personal hygiene and habits.
- Insist that food is kept covered until use.
- Provide suitable utensils for moving or ‘handling’ food and encourage employees to use them.
- Keep food areas clean. Make certain that employees clean and sanitize all equipment, utensils and other food-contact surfaces after every task involving food.
- Remove garbage and trash from food areas and dispose of it safely and hygienically.
- Train employees to keep raw and cooked food apart and to use separate utensils for raw food and cooked food.
- Train employees to keep allergen-free food separate from food that contains food allergens.
The conditions that encourage fast growth

It is important to understand the conditions that enable disease-causing bacteria and fungi to multiply to levels that are harmful to consumer health. They have six main requirements which are often abbreviated to FATTOM. They are:

- food    F
- acidity level    A
- temperature    T
- time    T
- oxygen need    O
- moisture    M

These ideal conditions for pathogens are described in greater detail below and on the following two pages.

Food

Like all living things, bacteria need nutrients. Although different types of pathogenic bacteria can live on a range of foods, most prefer something that is high in protein, moist and slightly acidic. Such foods are the TCS foods described on the previous page, such as red meat, poultry, shellfish, eggs, milk and dairy products.

Acidity

Levels of acidity in a food have a significant effect on bacterial and fungal multiplication. The level of acid or its opposite, alkali, is measured on the pH scale. This runs from 0 to 14, with 7 as the neutral point. A pH below 7 is acidic, while a pH above 7 is alkaline. Most foods are neutral or slightly acidic.

Pathogenic bacteria prefer foods with a pH between 4.6 and 7.5. Acidic foods such as lemon juice and vinegar make it difficult for most bacteria to multiply and are therefore useful for preserving food – for example, as pickles. However, yeasts generally prefer slightly acidic foods (with a pH from 4 to 4.5) and can spoil products like fruit juices, wine and pickles. Molds prefer neutral conditions but may be able to tolerate acidic food with a pH as low as 2.

Temperature

Most pathogenic bacteria and fungi multiply rapidly at temperatures between 5°C (41°F) and 57°C (135°F). This range of temperatures is therefore called the temperature ‘danger zone.’ Ambient temperatures, sometimes called room temperature, are generally within the danger zone. The ideal temperature for bacterial multiplication is at about 37°C (98.6°F), which is average human body temperature.
**Student sheet  Activity 2**

**Objective**
To review aspects of the session on bacterial foodborne hazards.

Fill out the boxes with your answers.

**Across**
2. Where pathogenic bacteria come from. (6)
4. The microorganisms responsible for many cases of foodborne illness. (8)
6. Types of ‘good’ bacteria. (7)
7. The name of the process in which something gets into food that should not be there. (15)

**Down**
1. A common source of bacteria in food establishments. (6)
2. The process by which food goes bad. (8)
3. Another name for a disease-causing microorganism. (8)
5. A natural source of bacteria. (4)
Preparing and Presenting Food

People who work with food are legally responsible for producing safe food, so it is important they know exactly what they should and should not be doing. This chapter outlines the principles involved.

Preparing food

Food preparation involves a wide range of activities including washing, peeling, cutting, sieving, mixing, portioning, plating and decorating. Although methods and ingredients vary enormously, the food safety principles are the same — see the panel on the left.

Thawing frozen food

Some products may be safely cooked from frozen if the manufacturer’s instructions are followed, but many large, raw, frozen items, such as meat roasts and poultry, must be completely thawed before cooking.

Frozen food will enter the danger zone as it thaws, unless it is thawing in a refrigerated unit, so the thawing period and the final temperature before cooking must be carefully controlled.

If large food items are not thawed properly before cooking, ice crystals may remain at the center. Although the heat melts the ice and cooks the food surface, the internal temperature may not be hot enough to kill disease-causing organisms. The internal temperature may be in the danger zone — ideal for bacterial growth.

Methods of thawing

It is unsafe to thaw food at ambient temperatures (ordinary room temperatures), as bacteria can multiply rapidly on the surface, even while the center is still frozen. Approved thawing methods are:

- in a refrigeration unit at 5°C (41°F) or colder
- in a microwave oven, provided the food will be cooked immediately and the manufacturer’s instructions are followed
- submerged under running potable (drinking quality) water at 21°C (70°F) or below
- as part of the cooking process.

If a refrigerator is used, a specially designed thawing cabinet is ideal, or a refrigeration unit set aside specifically for the purpose. If you have to use a multi-purpose refrigerator for thawing, ensure that employees take special precautions to prevent cross-contamination.
### Student sheet  Activity 5

**Objective**

Memorize the required times and cooking temperatures for TCS foods.

10 minutes

Fill out the missing times and temperatures on the chart below.

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Minimum Internal Temperature</th>
<th>Minimum Holding Time at the Specified Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Stuffed poultry, fish, meat or pasta</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Stuffing containing fish, meat or poultry</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Wild game animals</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Roast (rare) beef</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Ground beef and pork</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Fish and meat not listed elsewhere on this chart</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Unpasteurized shell eggs prepared for immediate service</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Unpasteurized shell eggs cooked for late service</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Exotic species of game animal</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Comminuted fish and meat</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Injected meat</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Mechanically tenderized meat</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Food cooked in a microwave oven</td>
<td>°C (°F)</td>
<td></td>
</tr>
<tr>
<td>Steaks</td>
<td>°C (°F)</td>
<td></td>
</tr>
</tbody>
</table>

**Minimum Surface Temperature**

- °C (°F)