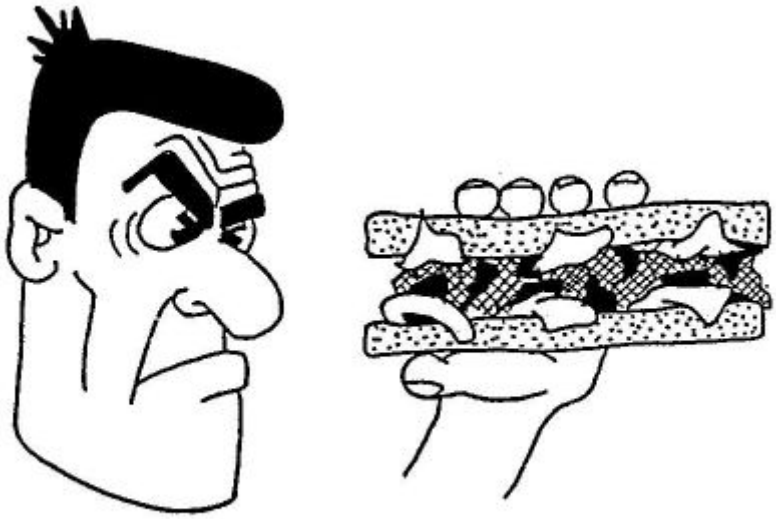
JUNEE SHIRE COUNCIL

GOOD FOOD HYGIENE



PART A

HOW AND WHY DOES

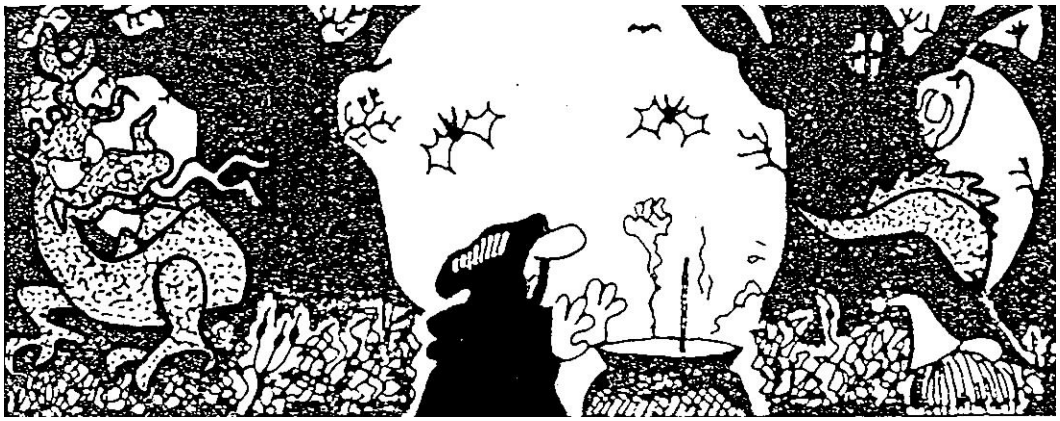
FOOD-BORNE DISEASE OCCUR?

PART A – HOW AND WHY DOES FOOD-BORNE DISEASE OCCUR?

1. WHY IS FOOD HYGIENE IMPORTANT?

As the title indicates, this booklet is concerned with the control of food-borne diseases, which result from eating contaminated foods. It is concerned particularly with the control of food poisoning, the most common and probably best known type of food-borne disease. Food poisoning is characterised by a sudden onset of gastro-intestinal symptoms such as vomiting, diarrhoea, nausea and stomach cramps, usually within 72 hours after eating the contaminated food. Other symptoms, for example fever or headache, can also occur.

In past centuries, such diseases were thought to be caused by devils and the forces of evil. It became apparent later that many diseases, including many food-borne diseases, are caused by minute living things known as micro-organisms. Today, unlike the days when disease was the doing of devils, we have the knowledge and the technology to control food-borne disease caused by micro-organisms - but still it occurs. It occurs because employees in the food processing, food service and allied industries are not made aware of the reasons food-borne disease occurs or of the means by which it can be prevented.



The aim of food hygiene education is to make food handlers aware of the means by which foods become contaminated with harmful micro-organisms, the conditions under which these micro-organisms grow (multiply) in food and the methods we can use to control contamination and growth by micro-organisms. Proper understanding and application of these procedures can virtually ensure that food poisoning will not occur. The cost of poor food hygiene can be crippling. An outbreak of food poisoning can cause loss of customers and sales, loss of prestige and goodwill, expensive legal action or prosecution and many other problems. Prevention of food-borne disease is a much less costly exercise. Some types of micro-organism also spoil food. Thus, the adoption of hygienic food handling and storage techniques can also help to control expensive spoilage.

2. WHAT ARE MICRO-ORGANISMS?

The world around us is full of living creatures that are invisible to us because of their extremely small size. These creatures, which are frequently called germs or microbes, are more correctly referred to as micro-organisms. They are called micro-organisms because they are minute and can usually be seen only with the aid of a microscope. They are found almost everywhere, on human skin and hair, in our noses, throats and intestines, in soil, water and air, on fruits, vegetables, meats and fish, in milk, fruit juice and soup, and most other places. There are thousands of different kinds of micro-organisms. Some of these cause diseases in man and animals but most are harmless to man or are beneficial. Because we cannot see micro-organisms we cannot tell how many are present or whether those present are harmful. Therefore, food handlers must rely on good hygiene to control micro-organisms in food.

There are four large groups of micro-organisms of importance in foods, namely bacteria, fungi (yeasts and moulds), viruses and parasites.

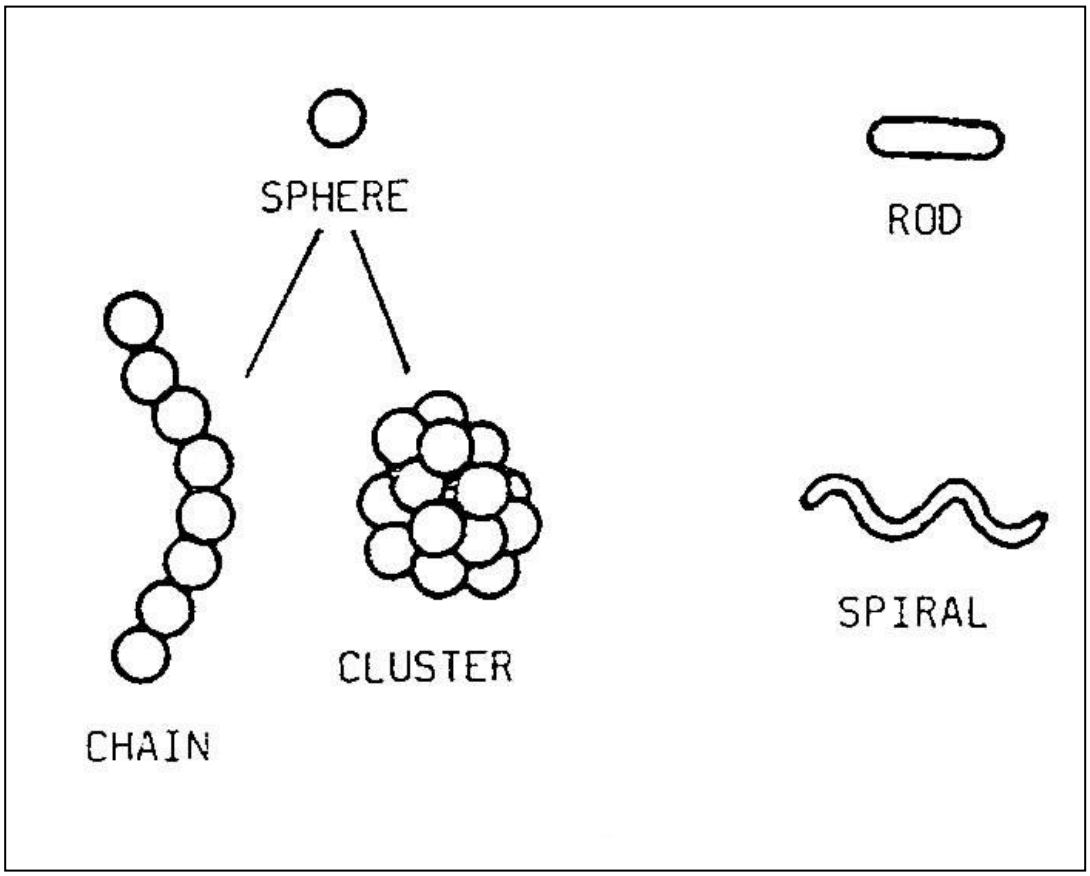
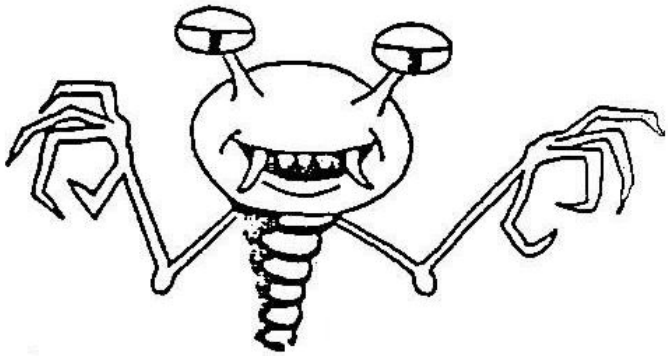


Fig1 Three main shapes of bacteria (magnified 1000 times)



Bacteria

There are three main shapes of bacteria as shown in Figure 1. They are so small that clusters of a thousand or more are only just visible to the naked eye and over a million could be placed on the head of a pin.

Particular types of bacteria are capable of producing very hardy structures called spores (shown in Figure 2). Spores are of particular concern to the food industry because they are very difficult to kill. They are able to survive drying, high temperatures, freezing, high acidity and many disinfectants.

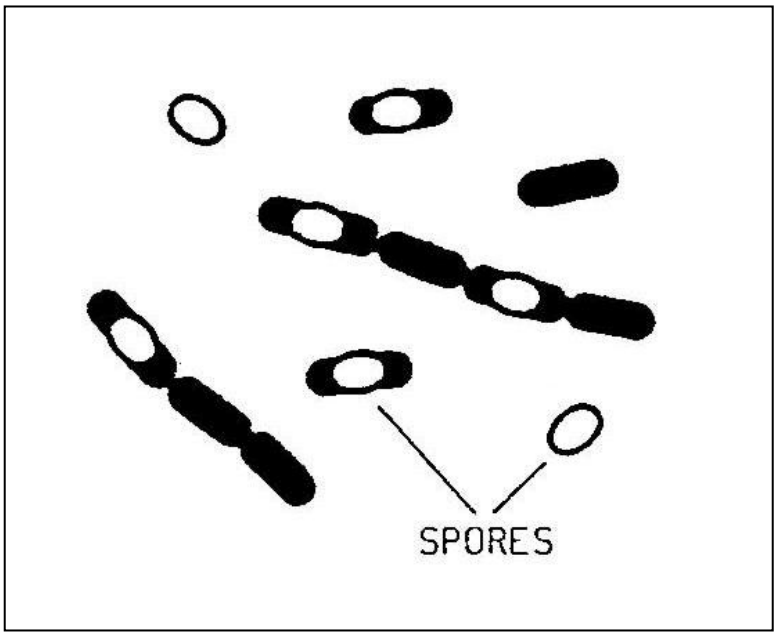


Fig 2 Bacterial cells containing spores (magnified 1000 times)

Many diseases, for example most types of food poisoning, typhoid fever, pneumonia, cholera and tetanus, are caused by certain types of bacteria. Many bacteria have useful functions such as the decomposition of waste matter. In industry, bacteria are used in the production of food and other valuable products including cheese, vinegar, yoghurt, sauerkraut, salami, and antibiotics. Some bacteria also cause spoilage of food. This booklet is concerned mainly with bacteria.

Yeasts and Moulds

Yeasts and moulds are generally more familiar to us than the bacteria because growth is often visible to the naked eye (e.g. mould on bread and oranges). Some yeasts and moulds cause food spoilage, sometimes forming toxins (poisons) as they grow in food. Yeasts are used in baking, brewing and wine making and moulds are used for antibiotic production. Moulds can be quite complex when viewed under the microscope (Figure 3), while yeasts are simpler, single-celled organisms which reproduce by budding (Figure 4).

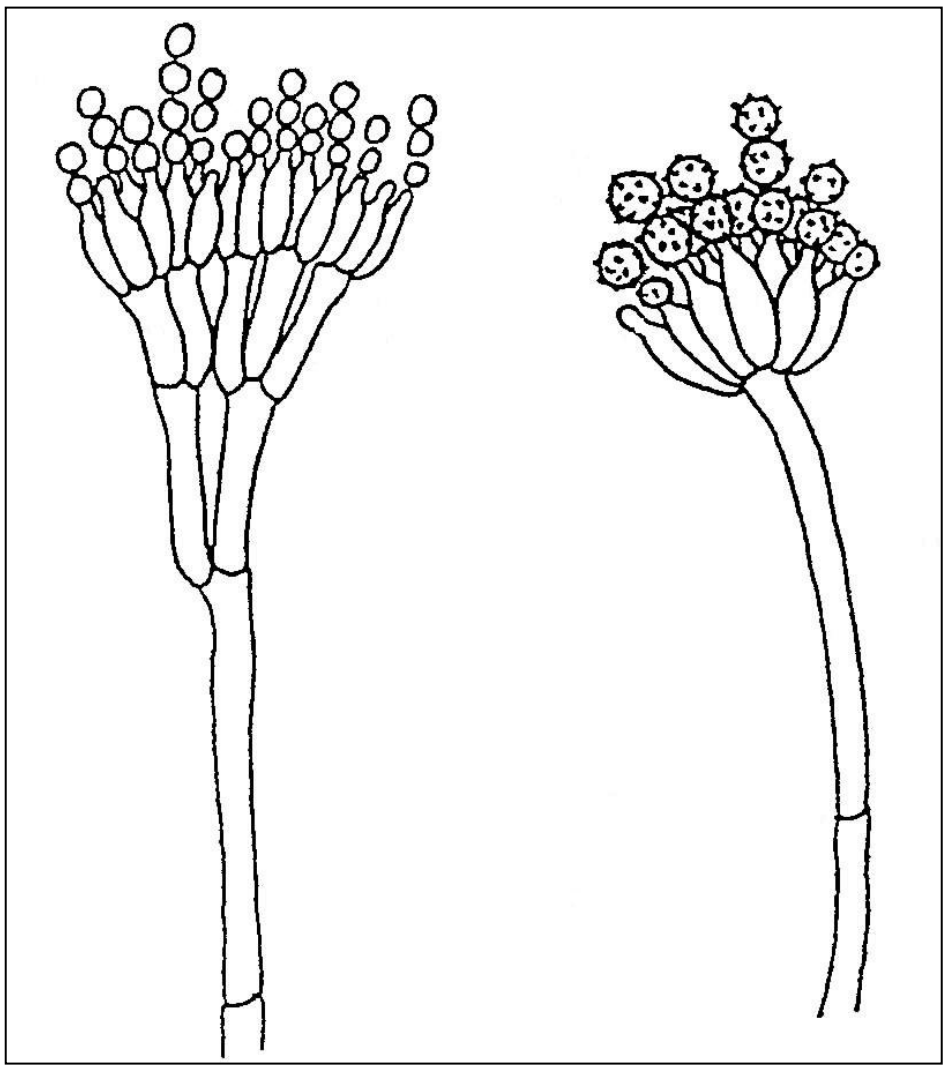


Fig 3 Microscopic shape of a mould (magnified 1000 times)

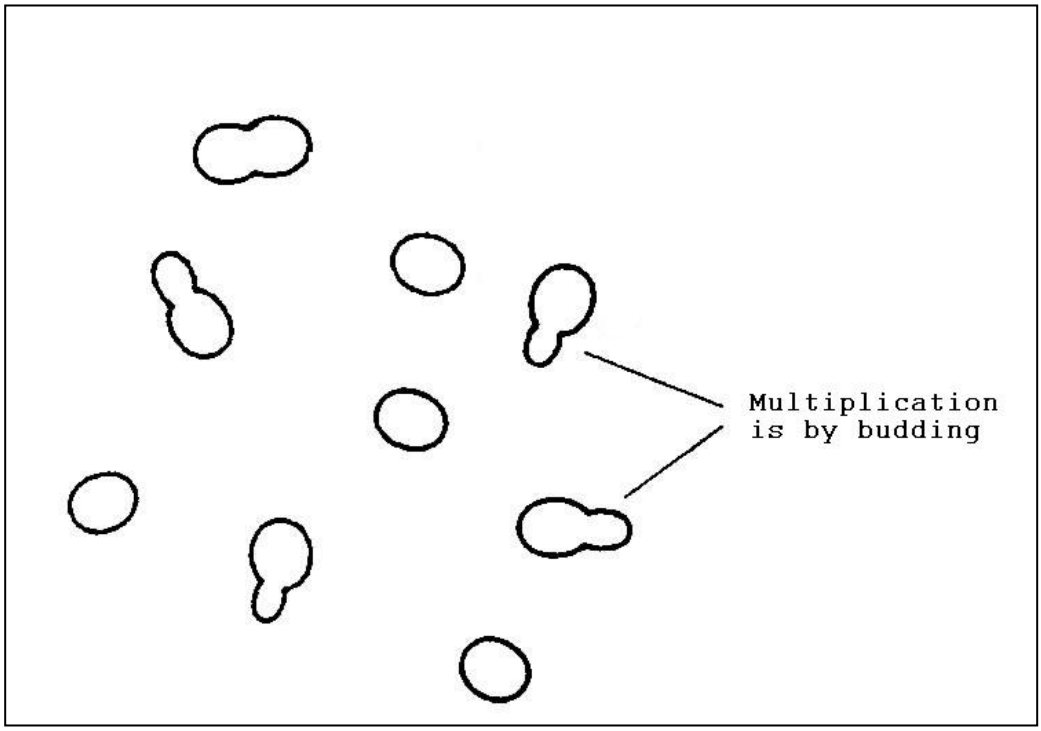


Fig 4 Microscopic shape of yeast (magnified 1000 times)

Viruses

Viruses are very small, much smaller than the bacteria. They cannot .grow in food but food can be a vehicle by which viruses are spread from person to person. Important viral diseases include hepatitis, polio, mumps, influenza, viral gastroenteritis and many others.

Parasites

The parasites of most concern to the food industry are the parasitic worms, for example the hydatid tapeworms and liver flukes which infect cattle, sheep, other domestic animals, and sometimes man. In Australia these parasites should not be a problem in meat obtained from abattoirs where proper meat inspection is practised. Meat and offal intended for use as pet food or obtained from other sources can be a problem.

3. HOW DO BACTERIA GROW AND IN WHAT FOODS?

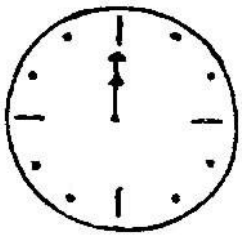
It is necessary to know a little about bacterial growth in order to properly understand the control of food-borne disease. When we say that bacteria grow, we do not mean that they become larger but that they multiply in number. Bacteria multiply simply by dividing in two, as shown in Figure 5.

Fig 5 Bacterial multiplication

Under suitable conditions, this division occurs every 10-30 minutes. This means that a single bacterial cell can multiply and become over two million bacteria in just seven hours if the right conditions are provided (Figure 6). Their rate of growth (multiplication) is quite remarkable.

Certain things must be provided before bacteria can grow. Like all other living things they require an appropriate TEMPERATURE, a suitable TYPE OF FOOD and a little TIME.

TIME	NUMBER OF BACTERIA
12.00	1
12.20 pm	2
12.40 pm	4
1.00 pm	8
2.00 pm	64
3.00 pm	512
4.00 pm	4,096
5.00 pm	32,768
6.00 pm	262,144
7.00 pm	2,097,252



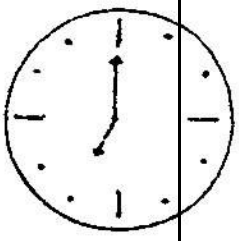


Fig 6 Bacterial multiplication

Temperature

The rate at which bacteria multiply depends on temperature. All bacteria have well-defined maximum and minimum growth temperatures, between which growth occurs and beyond which it does not. Not all bacteria grow in the same temperature ranges. Some bacteria, for example those which produce slime on meat, can grow at refrigeration temperatures (0-4°C), while others grow well at 60-70°C. The temperature range in which food poisoning bacteria can grow is 4°-60°C. The temperature range, which we call the DANGER ZONE (Figure 7), will be referred to repeatedly in this booklet. Foods in which food poisoning bacteria can grow must not be held in this temperature range for any longer than is absolutely necessary. This will be discussed further in the following pages.

Most food poisoning micro-organisms are killed by temperatures above 60°C and the speed with which they are killed increases with the temperature and the length of time they are held at these temperatures. Micro-organisms are not necessarily killed by cold. Although freezing prevents growth of micro-organisms it does not kill most micro-organisms. Bacterial spores are an exception to these rules. They can survive quite high temperatures and are not necessarily killed by cooking.

Type of Food

Like other living things, micro-organisms can grow only if they have an adequate supply of appropriate nutrients and water, different micro-organisms having varying nutritional requirements. Depending on its composition, a food may support the growth of a wide range of micro-organisms, support the growth of a limited number of types of micro-organisms or prevent microbial growth altogether. Some of the important factors affecting microbial growth in food are the moisture content of the food, its acidity or alkalinity, the availability of oxygen, and the nutrient composition of the food.

Few micro-organisms can grow in very dry foods such as dried soups, biscuits, milk powder or many types of confectionery. Yeasts and moulds tolerate lack of moisture better than bacteria and thus may spoil some foods such as dried fruits, some cakes and bakery products which will not support bacterial growth. Food poisoning bacteria grow best in very moist foods that do not contain large amounts of salt or sugar.

Acidity and alkalinity are measured on a scale called the pH scale (Figure 8). The scale ranges from 0 to 14 with 7 being neutral (i.e. neither acidic nor alkaline). Food poisoning bacteria grow most vigorously at pH values close to neutral, about pH 6 to 8, although they will grow outside this range at a slower rate. Some micro-organisms grow well at pH values far outside this range and cause spoilage of acidic foods e.g. fruit juices, pickled vegetables. Many micro-organisms require oxygen for growth while others can grow only in its absence. A third group can grow either with or without oxygen. Unfortunately there are food poisoning micro-organisms in each of these groups.

Thus, food poisoning micro-organisms can grow on the surface of foods where they are exposed to the air and in foods in which oxygen is absent (e.g. rolled roasts and pots of stew).

The foods we refer to as high risk foods, or potentially hazardous foods, are those which are capable of supporting the survival and growth of food poisoning bacteria. These foods are the moist, neutral pH foods, particularly those which are high in protein. Thus, in the category of high risk foods we would include foods such as meats, poultry, seafood, milk, eggs and many dishes prepared from these basic products and desserts. Some vegetable products such as rice and certain salads are also hazardous. Although the high risk foods mentioned above have been responsible for most outbreaks of food-borne disease, it must be remembered that almost any food can cause illness if prepared or handled carelessly.

Food Preservation and Food Spoilage

While plants and animals are alive they have defence mechanisms to help prevent infection by micro-organisms. When they die (e.g. after harvest or slaughter), the defence mechanisms break down and micro-organisms can grow readily. This is an essential natural process which helps in the break down of wastes in our environment. However, when micro-organisms grow in the products of plants or animals intended for human consumption, the result is spoilage. If the micro-organisms which grow can cause food-borne disease the result may be illness.

We can often recognise food spoilage quite readily by "off" odours or taste, by discoloration or by the presence of slime, mould or gas. This acts as a warning that the food has been mishandled or is too old to eat. Unfortunately, this protective mechanism is not reliable. The presence of micro-organisms which are capable of causing food-borne disease will not necessarily cause any detectable change in a food. Food which can make you ill may look, taste and smell perfectly normal. Thus we must rely on good hygiene.

BOILING POINT

WARMING TEMPERATURES PREVENT GROWTH OF BACTERIA

DANGER ZONE

TEMPERATURES IN THIS ZONE ALLOW RAPID GROWTH OF BACTERIA INCLUDING FOOD POISONING BACTERIA

CHILLING TEMPERATURES NO GROWTH OF FOOD POISONING BACTERIA FREEZING POINT

FREEZING TEMPERATURES STOP GROWTH OF BACTERIA

Fig 7 Effect of temperature on the growth of bacteria

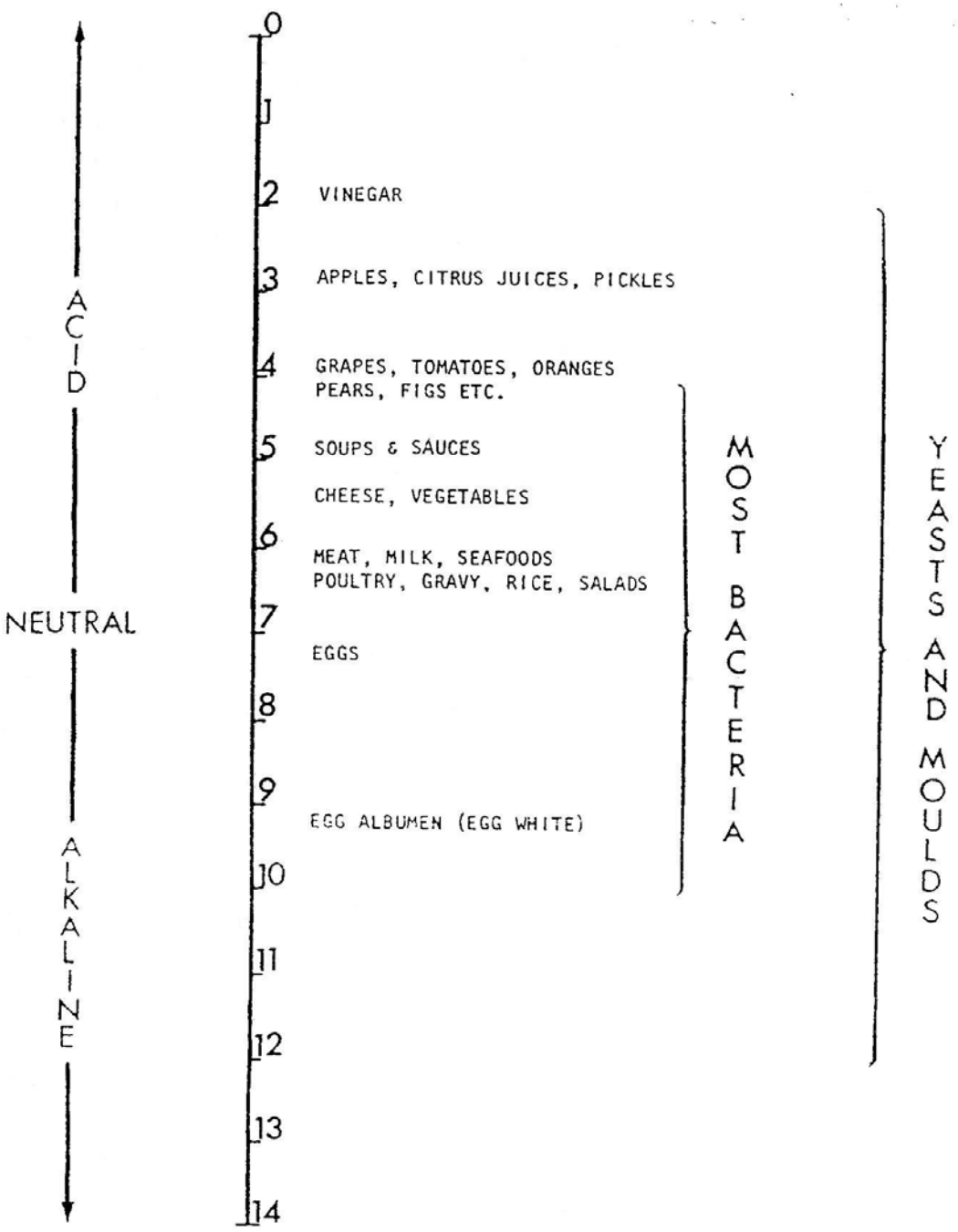


Fig 8 Food, pH and microbial growth

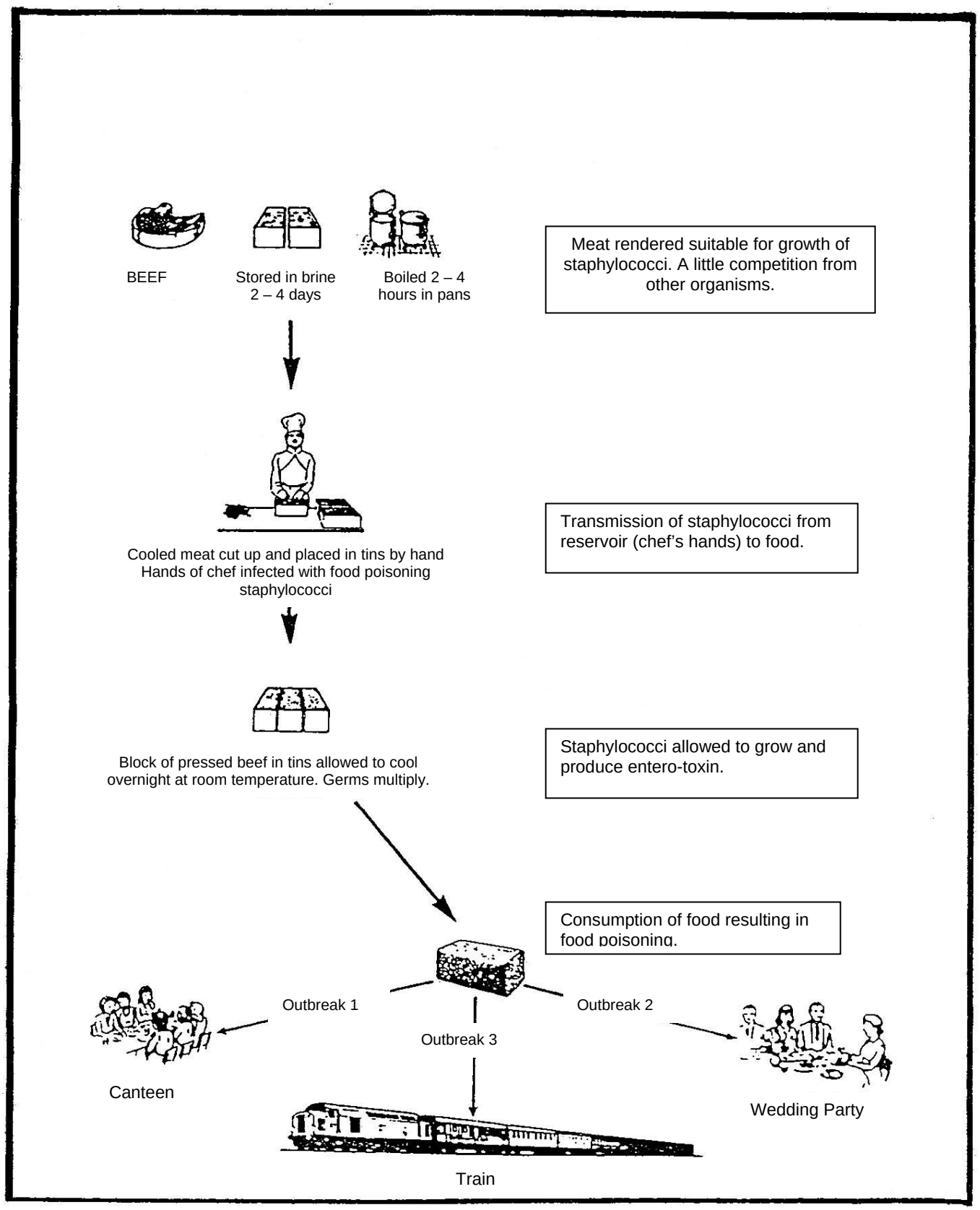


Fig 9 An example of a food poisoning outbreak.

Many methods are used to preserve food. These include:

* Heating e.g. cooking, canning, pasteurisation.

* Cooling e.g. refrigeration, freezing.

* Reducing water content e.g. drying, addition of sugar.

* Addition of chemicals e.g. smoking, pickling, addition of preservatives.

* Vacuum packaging.

Some of these processes destroy micro-organisms (e.g. heating) while others prevent (e.g. freezing) or delay (e.g. vacuum packaging) their growth. Remember that once we remove the means of preservation of a food it becomes suitable for the growth of micro-organisms (e.g. opening canned food, thawing frozen food, reconstituting dried food). A 'safe' food may then become a high risk food.

4. HOW DOES FOOD-BORNE DISEASE OCCUR

Bacterial Food Poisoning

The term bacterial food poisoning actually covers a number of different illnesses with slightly different symptoms and caused by different types of bacteria. There are two general types of bacterial food poisoning, infections (e.g. caused by Salmonella) and Toxaemia (e.g. caused by Staphylococcus). Infections occur when living cells of certain types of bacteria are swallowed. They then invade the gut and cause damage which leads to the symptoms of food poisoning. Toxaemia occurs when certain types of bacteria grow in food and release a toxin (poison). The toxin alone is sufficient to cause illness if swallowed; it is not necessary to consume living bacteria.

Before bacterial food poisoning can occur, there must nearly always be large numbers of food poisoning bacteria present in food. This means that a potentially hazardous food (i.e. a food in which food poisoning bacteria can grow) must become contaminated and must then be mishandled in such a way as to allow the bacteria to grow in the food. Therefore to prevent food poisoning we must, first, take all possible steps to prevent contamination of food with food poisoning bacteria, and second, handle food in such a way that any food poisoning bacteria present will not have an opportunity to grow.

There are many sources of food poisoning bacteria in every kitchen. Perfectly wholesome raw foods (e.g. meat, poultry, seafood, rice, spices, vegetables) as well as soil and dust, normally contain small numbers of food poisoning bacteria. Wholesome cooked foods can also contain small numbers of food poisoning

bacteria, since bacteria which form spores (e.g. Clostridium) can survive cooking. Kitchen staff are important sources of contamination. Healthy persons frequently carry food poisoning bacteria on their hands, noses, throats and in their digestive tract. Persons who are ill or who have pimples, boils, wounds or infections are walking factories for food poisoning bacteria. Many of the hygienic practices outlined later are therefore concerned with controlling food poisoning bacteria present in raw food and with good personal hygiene and personal cleanliness.

Because of these many sources of contamination in a kitchen it is difficult to ensure that food poisoning bacteria are absent from food. Therefore, it is essential that food is not held under conditions which will allow food poisoning bacteria to grow. Our main weapon is good temperature control, which figures prominently in the good hygienic practices outlined later. Once food has been mishandled and bacterial growth has occurred it cannot be readily made safe again by heating. Although heating may destroy the bacteria it will not necessarily destroy toxins which have been formed. As mentioned earlier, toxin alone is sufficient to cause illness; thus, badly handled food should be avoided. Examples of food poisoning outbreaks are illustrated in Figure 9.

Botulism is a well known and particularly severe, sometimes fatal, type of bacterial food poisoning. The illness is caused by the bacterium Clostridium botulinum, which grows only in the absence of air and which forms spores. Because of these characteristics, botulism is often caused by incorrectly canned or bottled foods and other preserved products. It is not advisable to use home preserves in a commercial food service operation and damaged or swollen cans of food must never be used.

Other Diseases

A number of serious infectious diseases can be transmitted from person to person via food. These include diseases caused by bacteria (e.g. typhoid fever, cholera, dysentery) and viruses (e.g. hepatitis, viral gastroenteritis). Food-borne outbreaks of several of these diseases in Australia have received widespread publicity recently. The main source of the micro-organisms which cause these diseases is the human body. Disease can result from consuming very small numbers of these micro-organisms so that growth in food is often not necessary for disease transmission. Therefore, transmission of these diseases by food can be avoided only by preventing contamination of food. Persons who are ill must obviously be prevented from handling food. Even healthy food handlers must exercise good personal hygiene, since people who are not apparently ill can also be sources of these micro-organisms. For example, persons infected with hepatitis virus excrete the virus in their faeces very early in the disease, before the symptoms become noticeable. At any moment a food handler could unwittingly be excreting hepatitis virus and contaminating food if good hygiene is not practised. These diseases can also be spread by food which has been contaminated by sewage or polluted water.

The importance of using clean water supplies and obtaining food and raw materials from reliable sources is obvious.

Diseases can be transmitted from domestic animals to man via food if infected animals are used for food production. The transmission of tuberculosis (TB) by unpasteurised milk from infected cows was once a well known example. Other examples include anthrax, brucellosis, and some parasitic diseases. Apart from obtaining food and raw materials from reputable sources, the control of these diseases is not generally the responsibility of the food service industry. These should be controlled much earlier in the food production chain.

Food-borne diseases can also be caused by the presence in food of various toxins formed by moulds or algae. Several moulds produce toxins (e.g. aflatoxin) which can cause diseases, including tumours, in man and animals. Food damaged by moulds should be discarded. Toxins can be accumulated by fish and crustaceans and cause food poisoning and sometimes death in humans. These toxins are not destroyed by cooking or freezing.

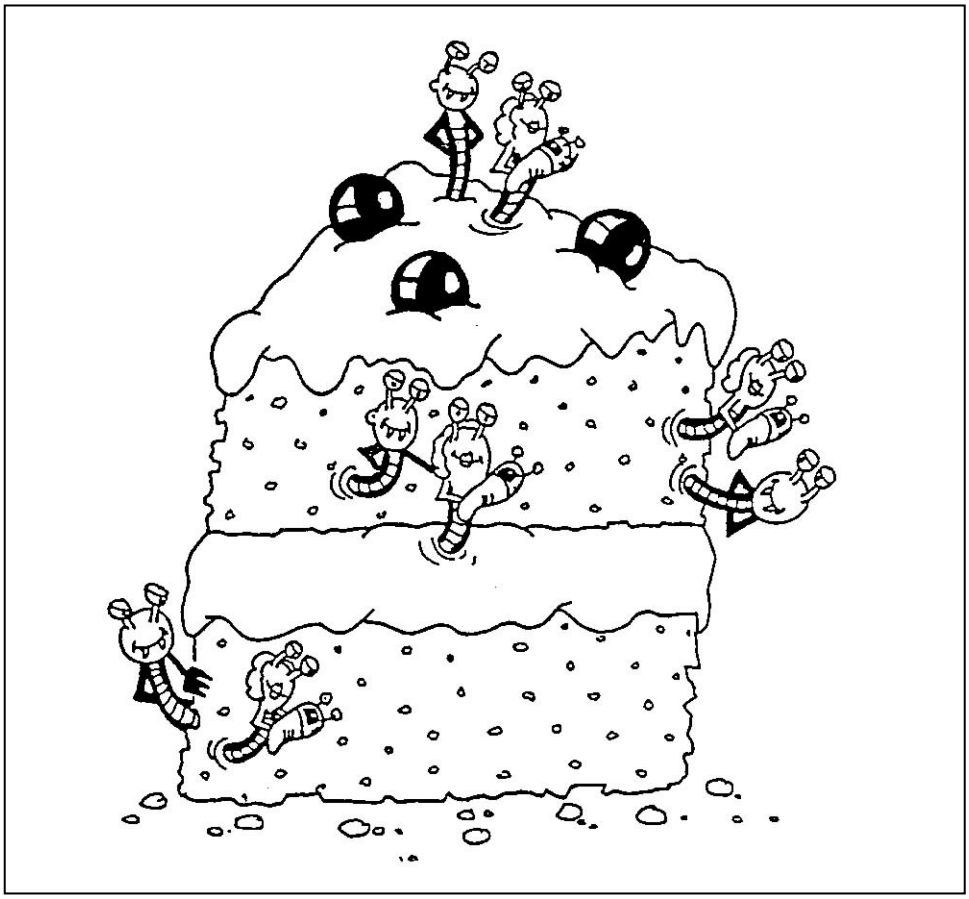
Food-borne disease may result from eating plants or animals which are naturally poisonous (e.g. puffer fish, toadstools, bitter zucchinis, red kidney beans). There should be little likelihood of naturally poisonous foods being a problem in food service establishments in Australia.

Poisonous chemicals deliberately or accidentally added to food cause problems from time to time. These chemicals include pesticides, disinfectants, heavy metals used in the manufacture of containers or utensils, and various other poisons. Such chemicals should be handled and stored with great care in food handling establishments and poisons should never be stored in or near food or food containers.

PART B

HOW TO PREVENT

FOOD-BORNE DISEASE



PART B – HOW TO PREVENT FOOD-BORNE DISEASE

1. HOW CAN FOOD HANDLERS PREVENT FOOD-BORNE DISEASE?

The previous sections have explained the nature and characteristics of micro-organisms and in particular discussed those capable of causing food-borne disease. We know were they come from, how they grow in or are transmitted by food and the types of food most likely to carry them. Although the presence of dangerous micro-organisms in food is often due to poor personal or kitchen hygiene, these micro-organisms can enter the cleanest kitchen on perfectly wholesome food and raw materials. Therefore, in addition to preventing contamination of food with dangerous micro-organisms we must also control bacterial growth by paying careful attention to the temperature at which food is handled or held.

Bearing these facts in mind, how can you prevent food-borne disease?

Obtain Food and Raw Materials from a Reputable Source

* Buy only from reputable vendors. Inspect the food on arrival - you have the right to demand only good quality products. If in doubt, visit the vendor's business premises. This applies particularly to meat, poultry and shellfish.

* Milk and cream must be pasteurised and other dairy products should be prepared from pasteurised raw materials.

* Purchase sound shelled eggs from legitimate sources; frozen and dried egg products should be pasteurised.

* Do not accept frozen foods that have been thawed and refrozen or canned and packaged foods which have been damaged.

* Rotate stock regularly.

Do Not Allow Food to Become Contaminated

Personal Hygiene

* Hands and finger nails should be kept scrupulously clean and nails neatly trimmed.

* Hands should be washed using soap and hot water, then rinsed and dried thoroughly using individual paper towels or a hot air drier. Multi use towels must not be used.

* Wash hands after
  - arrival at work
  - any work break
  - visiting the toilet
  - handling raw foods
  - handling garbage
  - using a handkerchief
  - handling money

* When preparing food, control bad hand habits e.g. do not scratch head or other parts of the body and do not arrange the hair or beard.

* Use utensils or disposable plastic gloves for preparing foods as much as possible. Use tongs, spoons, forks etc. for handling breads, pastries, sliced meats, salad items.

* Do not handle food while you are ill or have septic lesions.

* Do not sneeze or cough on food.

* Do not smoke while handling food.

* Do not taste food using fingers; spoons used for tasting should be immediately washed in hot water.

* Maintain a neat and clean appearance. Wear a cap or hairnet, a clean apron or a uniform.

Cross Contamination

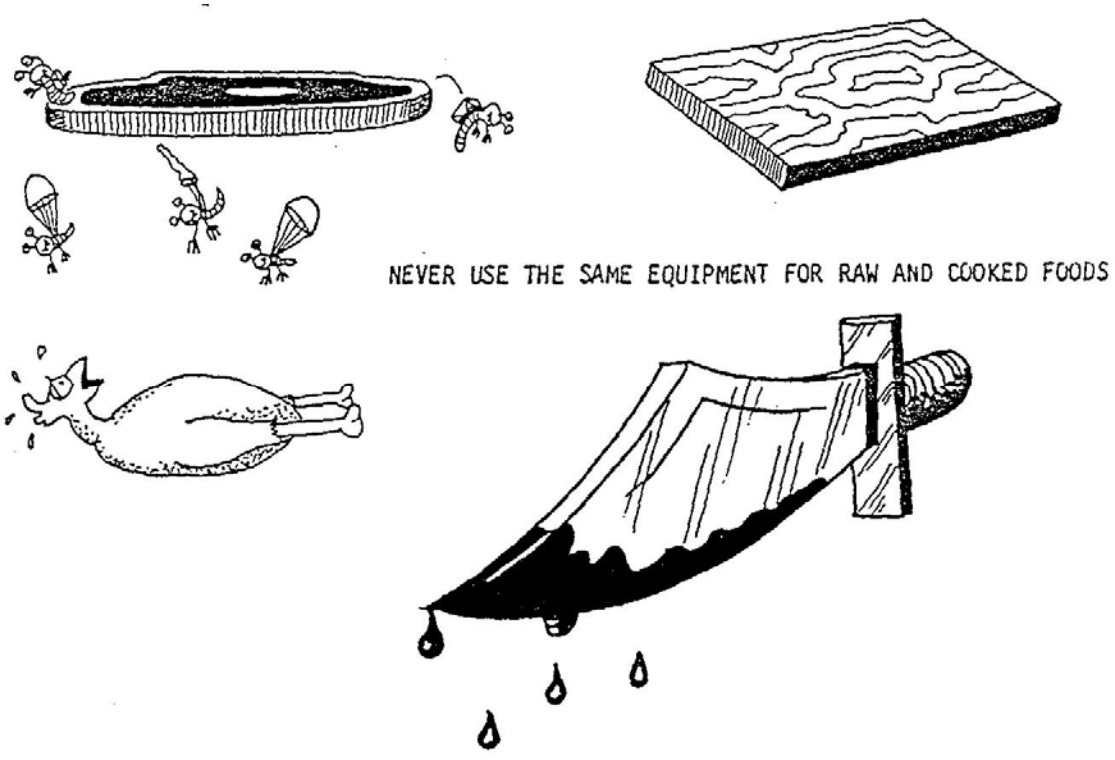
* Consider all raw flesh foods (e.g. chickens, meat, seafood, etc.)

* Unprotected foods should not be placed directly on refrigerator shelves etc.

* Store raw foods below or if possible separate from cooked foods.

* Use separate storage, preparation and display areas for raw and cooked foods. Have separate utensils, cutting boards etc. for raw and cooked foods.

* Where possible avoid wooden chopping boards.



Destroy Micro-Organisms in Food Whenever Possible

* Ensure foods are cooked adequately, particularly frozen foods.

* Use a meat thermometer to ensure proper cooking. Cook to an adequate final centre temperature e.g. 60°C (beef), 65°C (pork), 75°C (poultry and casseroles).

Do Not Allow Dangerous Bacteria to Grow in Foods

* Foods that are to be kept cold should be cooled rapidly to 5°C or below.

* Cool cooked foods in small portions or shallow pans to allow rapid cooling.

* Cold storage areas should be sufficient to accommodate all food at peak periods.

* Refrigerated materials should be spread out sufficiently for good air circulation and rapid cooling; even at peak periods.

* Cold storage areas should be carefully planned because refrigeration that is not easily accessible will not be used.

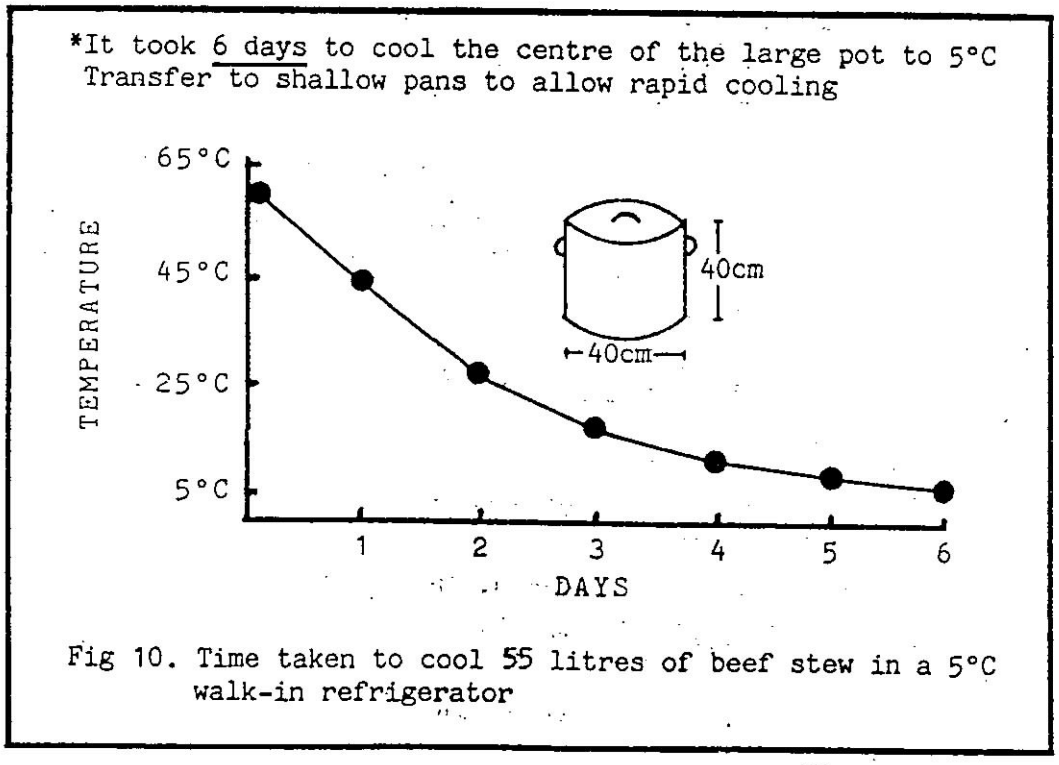


Fig 10. Time taken to cool 55 litres of beef stew in a 5°C walk-in refrigerator

* Thermometers should be installed in every refrigerator and checked frequently.

* Thaw frozen foods in the refrigerator or under cold running water.

* Keep hot foods above 60°C.

* Avoid reheating foods. If necessary reheat foods quickly to the temperature above.

* Potentially hazardous foods must not remain at room temperature for any longer than is absolutely necessary.

Maintain a Clean Kitchen

* Keep kitchen surfaces clean and in good repair.

* Do not allow food scraps to build up on floors and surfaces.

* Develop cleaning programmes appropriate to needs.

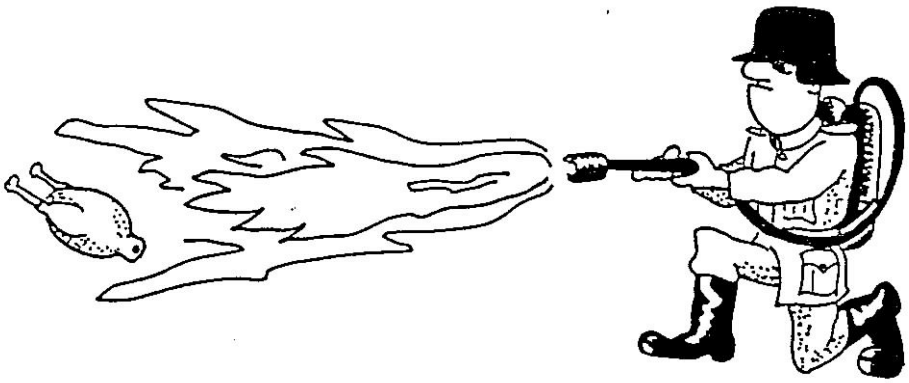
* Design and arrange equipment for easy cleaning; avoid ledges, nooks and crannies.

* Prevent customer contact with food before purchase.

* Prevent domestic pets, rodents, insects and birds from gaining access to food storage, preparation or serving areas.

* Dispose of waste in a sanitary manner away from food areas and protect from pests.

* Develop an active and appropriate pest control programme.



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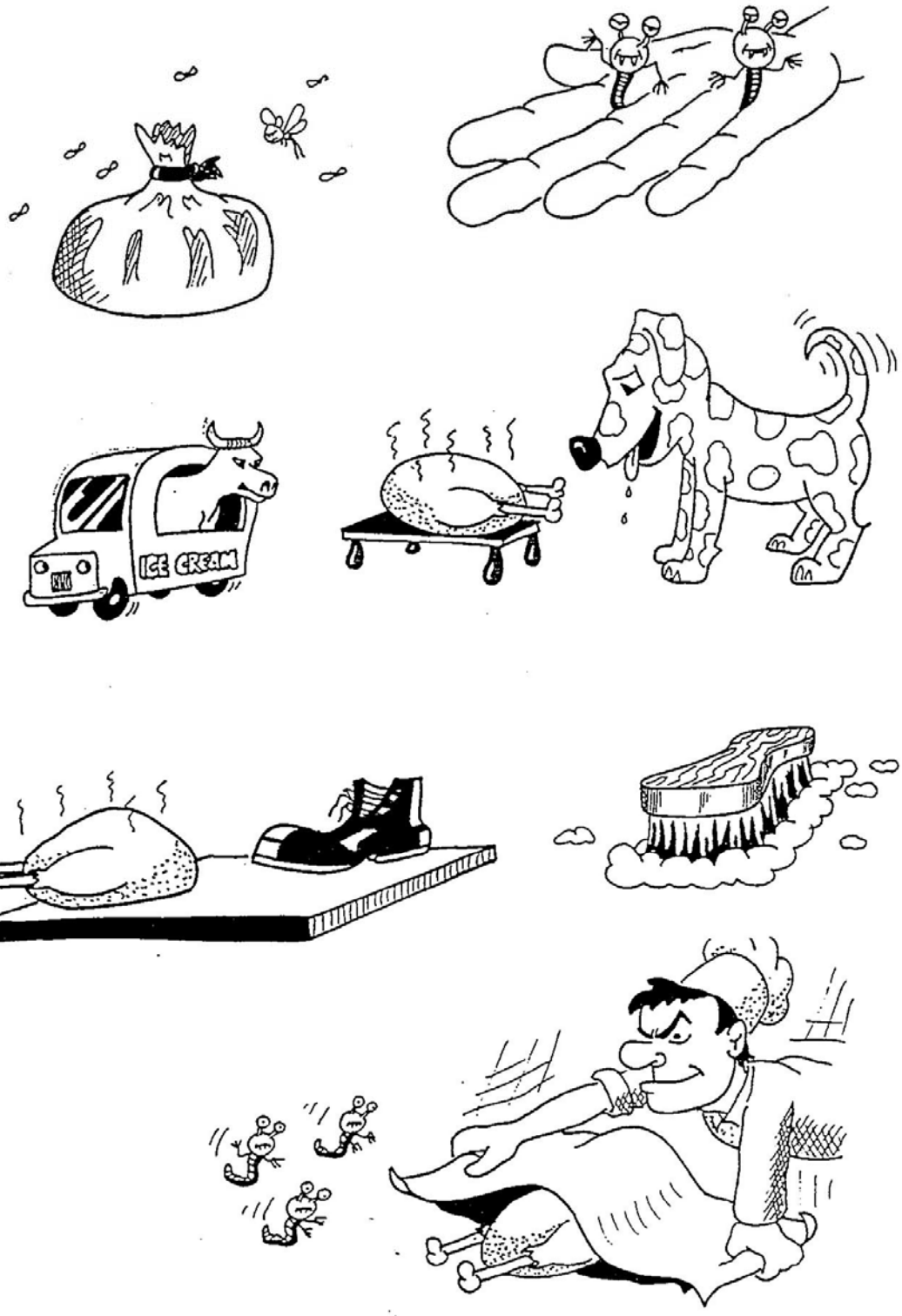

CRITICAL POINTS TO REMEMBER

* Keep hot food hot (above 60°C) and cold food cold (below 5°C).

  Do not leave cooked foods, especially meat, poultry and seafood, at room temperature for any longer than is absolutely necessary - 20 minutes maximum.

  Cooked foods should be cooled quickly in small portions or shallow containers.

  A thermometer is a most powerful weapon against food-borne disease.

* Cook all meat and poultry adequately.

  Take particular care with frozen foods.

  Use a meat thermometer.

* Avoid cross-contamination between raw flesh foods (meats, poultry, seafood) and cooked food.

  Do not use the same cutting board or utensils for raw and cooked meat or poultry.

  Wash utensils thoroughly in very hot water and detergent.

  Clean kitchen surfaces thoroughly.

  Avoid wooden cutting boards.

  Do not store raw flesh foods above or in contact with cooked food.

* Maintain a high standard of personal hygiene. Avoid handling food with fingers - use tongs or gloves.

* Do not use the contents of a swollen can. If canned or bottled food is "off", notify health authorities.

* Do not store poisonous chemicals (e.g. pesticides) in or near food containers (e.g. returnable drink bottles).

* Develop effective cleaning and pest control programmes.

* Avoid wearing jewellery on fingers (these harbour bacteria).

CLEANING AND SANITATION - STEP BY STEP

The first step in understanding effective cleaning methods is to define a few important terms associated with cleaning.

Cleaning - can be defined as the removal of unwanted dirt, soils and deposits from equipment and other areas of a food premises.

Sanitation - is a process whereby the microbial population of materials or of articles such as eating utensils, are reduced to a level judged to be safe by public health authorities. Usually it is a chemical agent that kills 99.9% of the growing bacteria (germs).

Detergent - is a cleaning agent made up of soap or a soap substitute, it may be a mixture of alkaline materials and a substance which will soften the water or it may be an organic surface active agent. Its function in cleaning is to facilitate the removal of food particles from surfaces and promote cleanliness so that all surfaces are readily accessible to sanitation by heat or chemicals.

CLEANING AND SANITATION STEP BY STEP

STEP 1	Remove all scraps of food and other materials.	Cleaning is much easier with soils removed.
STEP 2	Rinse the surface with warm water (45°C).	Surface must be wetted to allow cleaning chemicals to remove deposits.
STEP 3	Apply detergent **	Detergents lift off dirt, soils.
STEP 4	Rinse detergent from surface.	Necessary to remove traces of chemical detergent.
STEP 5	Apply sanitiser **	Sanitisers kill microbes remaining.
STEP 6	Rinse surface with either warm or hot (82°C) water.	Rinsing removes chemical sanitiser. Hot water is also a sanitiser.
STEP 7	Dry the surface.	Dry surfaces prevent any surviving bacteria from growing. Use paper towels.

** It is possible to purchase a combined detergent and sanitiser which will eliminate Step 4 and 5. See your local cleaning technologist and seek his or her advice about whether a combined detergent/sanitiser suits your needs.

DEEP FRYING - A BRIEF GUIDE

In many food establishments these days the kitchen contains a deep-frying unit where foods such as meats, poultry, chips, seafood, etc. are cooked.

Deep-fry units require special attention when it comes to cleaning and changing the shortening (fat) or prolonging the life of the shortening.

What is frying shortening?

Frying shortening is the medium which transmits the heat from the source to the food and becomes part of the fried food. These foods may contain from 7% to over 35% shortening based on weight, depending upon the food and frying conditions.

What happens as you fry?

When fresh shortening is heated in a deep fat fryer and the frying operation begins, three general chemical reactions occur simultaneously.

Hydrolysis - is the reaction of the shortening with the moisture wherein the fatty acids are separated from the glycerol forming free fatty acids.

As these free fatty acids increase as a percentage of the shortening available, due to the presence of moisture, the quality of shortening is reduced and the smoke produced during the cooking process increases.

Oxidation - during the frying procedure the surface of the shortening is protected by a blanket of steam arising from the foods being fried. During quiet times, air is able to come into contact with the shortening resulting in oxidation. This results in the deterioration of the shortening.

Polymerisation - is the union of two or more molecules of fat to form a larger molecule. This occurs due to the heat present in the frying unit and exposure to oxygen. Again this reaction results in a deterioration in the quality of the shortening.

FILTERING THE SHORTENING

How often should the shortening be filtered? This depends mainly upon the individual operation, however, once a day is a good guide. This filtering becomes necessary to remove the fine carbonised particles in the shortening and the accumulated crumbs from the bottom of the fryer. Flours from the crumbed food, starch from potatoes and small pieces of food will carbonise readily at the temperature in a frying unit.

The following points should be observed when the shortening is filtered.

1. Allow the shortening to cool to about 66 - 121°C (150 - 250°F) before filtering for best results.

2. Disposable filters have an advantage over the washable filters. If all the soap is not removed and the washable filter dried prior to use, the shortening may be damaged rather than helped by filtration.

3. Minimise the shortening's exposure to oxygen. That is, ensure that there is no excessive aeration, splashing etc. as this will promote rapid oxidation to reduce the quality of the shortening.

4. Rinse out the residual crumbs from the fryer with a portion of the filtered shortening if the fryer is not to be cleaned at this time.

5. Refill the fryer to the correct level. Add additional shortening if required.

NOTE: Efficient daily filtering will extend the shortening frying life by 10% to 15%.

HOW TO CLEAN A FRYING UNIT

Cleaning the frying unit should occur at least once (1) per week. It can be done at the same time the shortening is replaced with new material.

STEP 1 Drain the fryer and rinse it with hot water to remove all crumbs.

STEP 2 Select a quality commercial cleanser designed for this specialised task and follow the manufacturers' instructions carefully.

It needs to be a very strong cleanser which contains sodium hydroxide to emulsify grease completely. After an initial 30 minutes cleaning, 5 minutes cleaning time is sufficient. Clean the metal baskets simultaneously by immersing them in the solution.

Turn the heat off and remove all loosened deposits with stainless steel wool or metal spatula.

STEP 3 Rinse the fryer several times with clear tap water to remove any visible soap; then with a solution of 1 part vinegar to 20 parts water, rinse the fryer again. Vinegar neutralises any residues that remain on the fryer. Finally, rinse the unit again with clear water to remove the odour of the vinegar.

STEP 4 Dry the unit thoroughly with an absorbent lint free, clean cloth. This prevents the deterioration of the shortening through reaction with moisture.

ILLNESSES OF FREQUENT OCCURRENCE

NAME OF ILLNESS	CAUSATIVE AGENT	FOODS USUALLY INVOLVED	HOW INTRODUCED INTO FOOD	PREVENTATIVE OR CORRECTIVE PROCESSES
Staphylococcus Food Poisoning	Staphylococcus entero-toxin – a poison developed by staphylococcus when it grows in food.	Cooked ham or other meat, chopped or minced food, cream filled or custard pastries, other dairy products, Hollandaise sauce, bread pudding, potato salad, chicken, fish, and other meat salads "warmed over" food.	Usually food handlers through nasal discharges or purulent local skin infections. (Acne, pimples, boils, scratches and cuts).	Refrigerate moist foods during storage periods; minimise use of hands in preparation. Exclude unhealthy food handlers (having pimples, boils and other obvious infections).
Perfringens Food Poisoning	Clostridium perfringens	Meat which has been boiled, steamed, braised, or partially roasted, allowed to cool several hours and subsequentl y served either cooled or reheated.	Natural contaminate of meat and by soil on vegetables or under fingernails.	Rapidly refrigerate meat between cooking and use.
Salmonellosis	Over 800 types of Salmonella Bacteria, capable of producing gastro-intestinal	Meat and poultry, minced foods, egg products,	Faecal contamination by food handlers. Raw contaminated	By good personal hygiene of food handlers; sufficient

	illness.	custards, shell fish, soups, gravies, sauces, "warmed over" foods.	meat and poultry, liquid eggs and unpasteurised milk.	cooking and refrigeration of perishable foods. Eliminate rodents and flies.
Salmonellosis a) Typhoid Fever b) Para-typhoid A	Salmonella typhosa S. paratyphi A	Moist foods, dairy products, shell fish, raw vegetables and water.	By food handlers and other carriers.	Prohibit carriers from handling food, require strict personal cleanliness in food preparation and eliminate flies.