9. Food safety

9.1 The importance of safe food

Food may become difficult to obtain in an emergency or following a disaster. Crops may be destroyed in the fields, animals may be drowned, food supply lines may become disrupted, and people may be forced to flee to areas where they have no access to food. Moreover, the safety of whatever food there is may be affected, resulting in a greater risk of epidemics of foodborne disease.

Food safety problems vary in nature, severity and extent, and depend on the situation during the emergency or disaster. For example, during floods and hurricanes, food may become contaminated by surface water that has itself been contaminated by sewage and wastewaters. Flood waters often pick up large quantities of wastes and pathogenic bacteria from farms, sewer systems, latrines and septic tanks. The crowding of survivors after disasters may aggravate the situation, particularly if sanitary conditions are poor.

Any breakdown in vital services, such as water supply or electricity, also severely affects food safety. In the absence of electricity, cold storage may be more difficult, if not impossible, and foods may be subject to bacterial growth. This may happen at all stages of the food chain, from production to consumption. Lack of safe drinking-water and sanitation hampers the hygienic preparation of food and increases the risk of food contamination. Populations of pests and stray animals, such as dogs and cats, may also increase in the aftermath of disasters. Flies and other rapidly-breeding insects may increase dramatically in numbers. People may be tempted to eat drowned animals after floods, which carries a risk. Food is especially susceptible to contamination when it is stored and prepared out of doors or in damaged homes where windows and possibly even walls are no longer intact.

Fires or explosions may result in foodstuffs becoming contaminated with dangerous chemicals or microorganisms, as well as being damaged by water. Food may be damaged by smoke, chemicals used in fire fighting, or by other chemicals originating from the accidental release or improper use of insecticides, aerosols, rodenticides and other toxic substances.

Disaster-affected people eating food from centralized kitchens that are not properly equipped or run are extremely vulnerable to outbreaks of foodborne disease. The combination of environmental contamination and improper handling of food increases the risk of epidemics of diseases such as cholera and shigellosis.

In emergencies and disasters, food safety authorities should review all stages of the food supply, from production, processing and manufacturing, transport, distribution, and sale, to preparation in food service and catering establishments and households. It is essential to assess in what way the food supply may have been adversely affected, and to identify the priority measures (including education of the public) needed to protect consumers. The measures that should be considered are detailed in Sections 9.2 and 9.3, but most of them require planning and preparedness before emergencies or disasters occur. For example, suitable locations for mass feeding, such as school kitchens, as well as equipment, supplies and training facilities, should be identified as part of emergency preparedness planning.

9.2 Food control

9.2.1 Food control measures

Following a disaster, an assessment should be made of its effects on the quality and safety of food. Food safety authorities should ensure that foods that have not been affected are adequately protected, are not exposed to other sources of contamination, and are not kept under conditions in which bacterial growth may occur (see Table 9.1). For example, in warehouses that have been flooded, high humidity favours the growth of moulds and bacteria in foodstuffs. Whatever intact foods remain should be moved to a dry place, away from the walls and off the floor.

The extent and type of damage to food should be assessed, and a decision made regarding the separation and reconditioning of salvageable food. Unsalvageable food should be disposed of properly, either by using it as animal feed, if appropriate, or by destroying it. In addition, before they resume their activities, food businesses should be monitored to ensure they have regained the ability to ensure food safety.

If crop fields have been contaminated by human excreta, such as following floods or damage to sewerage systems, an assessment should be carried out rapidly to assess the contamination of crops and to establish measures, such as delayed harvesting and thorough cooking, to reduce the risk of transmitting faecal pathogens. Attention is also needed when pigs or cattle graze on contaminated land, to avoid the transmission of tapeworms. If water bodies used for fishing or for harvesting water vegetables have been contaminated, assessment and analysis of risk should be undertaken to decide what special measures may be needed to prevent the spread of fish tapeworms or parasitic flukes, or of diseases such as salmonella and cholera.

9.2.2 Salvageable and unsalvageable foods

Public health and food safety authorities may be asked to examine food and advise on its fitness for human and/or animal consumption and, whether food is salvageable or unsalvageable.

Salvageable foods are those that have been damaged, but that can be rendered safe through reprocessing. Unsalvageable foods are those that are irremediably damaged by microbiological, chemical or physical contaminants, or that have been exposed to conditions making such contamination likely; they should be destroyed.

The necessary precautions should be taken to ensure that all foods that have been contaminated (or are likely to have been contaminated) and that cannot be made safe by reprocessing are properly disposed of. Contamination may occur without visible signs (e.g. bottles and jars can become contaminated by seepage through crown caps and screw tops), hence the guiding principle is: if there is any doubt as to the safety of the food, it should be destroyed (New Zealand Ministry of Health, 1995).

However, food is a valuable commodity, particularly in emergencies. Faced with severe shortages, people may consume food that is unfit or not intended for human consumption. For example, in 1971–1972 in Iraq, bread prepared from seed grain treated with methyl mercury caused an outbreak of poisoning. Thousands of people were affected and several hundreds died. Any decision taken by the health authorities should therefore be based on a risk–benefit assessment: where there is a risk of a shortage, the salvaging of food should be considered, provided it does not endanger public health. In disasters and emergencies, people are likely to suffer from malnutrition as a result of food shortages, and malnourished people are more vulnerable to foodborne hazards, i.e. they may be harmed by lower doses of pathogens or toxic chemicals than healthy people. In general, foods chemically contaminated as a result of pollution, chemical spills or other secondary accidents involving toxic waste are difficult or impossible to salvage and may need to be destroyed.

Table 9.1 **Control measures for ensuring food safety**

Step	Hazard	Action
Supply/purchase	Contamination of raw foodstuffs	Obtain foods from a reliable supplier.
		Specify conditions of production and transport.
	Contamination of ready-to-eat foods	Purchase foods from reliable supplier.
		Request application of the HACCP[1] system during food preparation.
Receipt of food	Contamination of high-risk foods with pathogens	Control conditions of transport (temperature and time).
Storage	Further contamination	Store foods wrapped or in closed container.
		Control pests.
	Growth of bacteria	Control temperature and duration of storage, rotate stock.
Preparation	Further contamination, via hands or in other ways	Wash hands before handling food.
		Prevent cross-contamination via surfaces, cooking utensils.
		Separate cooked foods from raw foods.
		Use boiled water, particularly if the food is not subject to subsequent cooking.
	Growth of bacteria	Limit time of exposure of food to room temperature.
Cooking	Survival of pathogens	Make sure that food is cooked thoroughly (i.e. all parts have reached at least 70 °C, particularly the thickest parts and/or centre).
Cooling and cold holding	Growth of surviving bacteria or their spores, production of toxins	Cool food as quickly as possible to temperatures below 5 °C, e.g. place foods in shallow trays and cool to chill temperatures.
		Avoid overfilling the refrigerator or cold storage room. During long periods of cold storage, monitor the temperature fluctuations and, when necessary, take measures.
	Contamination from various sources	Cover food properly, avoid direct or indirect contact with raw foods and non-potable water.
		Use clean utensils to handle cooked food.
Hot holding[2]	Growth of surviving bacteria or their spores, production of toxins	Ensure that food is kept hot (i.e. above 60 °C).
Reheating[3]	Survival of bacteria	Ensure that the food is thoroughly reheated.
Serving	Growth of bacteria, spores, production of toxins	Ensure that food is thoroughly reheated.
	Contamination	Prevent contact with raw foods, unclean utensils and non-potable water.
		Do not touch food with hands.
		Serve food when it is still hot.

[1] HACCP: hazard analysis critical control point. See (Bryan, 1992).
[2] Alternative step to cooling.
[3] This step is necessary for foods that have been prepared in advance, as well as leftovers.

The disposal of food deemed unfit for human consumption should be confirmed and documented. It should be carried out in a manner that prevents the deliberate or accidental diversion to the human food supply. The condemned food may be compacted and buried, incinerated, or denatured by adding obviously inedible substances, such as used motor oil, diesel fuel, etc. (World Health Organization, 1992a).

9.2.3 Inspection of food businesses

After a disaster has occurred, food industries and catering establishments should be inspected. Steps should be taken to ensure that foods that have been adversely affected are not marketed. Businesses should resume their activities only when the necessary conditions for safe food production or preparation are met, i.e. when the premises used for food production or preparation have been cleaned and disinfected; electricity, water supplies and sanitation have been restored; equipment is operating; properly trained staff are available; etc. Slaughterhouses should also be inspected.

Markets usually recover or develop quickly in emergencies and provide a valuable means of access to food for the disaster-affected population. However, markets should be regularly inspected and the cooperation of stallholders should be sought to ensure that safe food preparation and handling is carried out.

Controls should be in place to ensure that irredeemably damaged foods are not marketed and that food distributed through markets, retailers or street food vendors has not been subject to time–temperature abuse or otherwise contaminated. When salvaged foods are sold, they should be labelled accordingly and consumers should be clearly informed of measures they need to take to render them safe.

9.2.4 Control of donated or imported food

During food relief operations, the authorities responsible for food and health should monitor the condition of donated or imported food from its port of entry onwards. Food that is found on inspection and/or laboratory analysis to be unfit for human consumption should be condemned and rejected. Where there is a large demand for food, and the defect is such that safety is not seriously compromised, the conditional acceptance of substandard food may be considered.

9.3 Food safety and nutrition

9.3.1 General considerations

General principles for the safe handling and preparation of food apply to all contexts, including the household, mass-feeding centers for disaster-affected people, and targeted-feeding centers, such as therapeutic-feeding centers. Box 9.1 presents a modified version of WHO's golden rules for safe food preparation (World Health Organization, 1991d).

9.3.2 Providing dry rations for household cooking

After a disaster, as soon as families have reestablished their capacity to cook, any food they may be given is usually distributed in dry form to prepare and consume in their homes or temporary shelters. In addition to safe water for food preparation, a means of washing hands and utensils will be needed. People may not always be familiar with all kinds of dry foods, especially when the foods have been supplied by international food aid programmes. When necessary, they should be shown how to prepare any unusual foods. A shortage of fuel for cooking may also be a major constraint, and this may need to be supplied to ensure adequate cooking and reheating of cooked food. Otherwise, common cooking facilities may need to be provided for every block of shelters. With

Box 9.1 **Golden rules for safe food preparation**[1]

1. **Cook raw foods thoroughly.** Under normal circumstances raw foodstuffs and water may become contaminated with pathogens, but in times of disaster the risk of contamination is even greater. Thorough cooking will kill the pathogens, which means the temperature of all parts of the food must reach at least 70 °C. Uncooked fruits or vegetables should not be eaten, unless they can be peeled. If milk has not been pasteurized, it should be boiled before use. Cooking will not necessarily destroy biotoxins.
2. **Eat cooked food immediately.** When cooked foods cool to room temperature, bacteria begin to grow. The longer the wait, the greater the risk. To be on the safe side, eat cooked foods as soon as they come off the heat.
3. **Prepare food for only one meal.** Foods should be prepared freshly and for one meal only, as far as possible. If foods have to be prepared in advance, or if there are leftovers, they should be stored cold, i.e. below 5 °C (in a refrigerator or in a cold box), or hot, i.e. above 60 °C. This rule is vitally important when it is planned to store food for more than 4–5 hours. Cooked foods that have been stored must be thoroughly reheated before eating, i.e. all parts reheated to at least 70 °C. Thorough reheating of foods is essential if refrigerators have ceased to operate for some hours due to power cuts.
4. **Avoid contact between raw foods and cooked foods.** Safely cooked food can become contaminated through even the slightest contact with raw food. This cross-contamination can be direct, e.g. when raw fish comes into contact with cooked foods. It can also be indirect. For example, preparing raw fish and then using the same unwashed cutting surface and knife to slice cooked food should be avoided, or all the potential risks of illness that were present before cooking may be reintroduced. Cross-contamination may also occur in a freezer when the power has been off for some time and this should be checked for. The juice of raw meat and poultry may drip onto other foods.
5. **Choose foods processed for safety.** Many foods, such as fruits and vegetables, are best in their natural state. However, in disasters and emergencies, they may not be safe and should be peeled before consumption if eaten raw. Foods that have been processed (e.g. canned food and packed dried food) and that have not been affected by the disaster may be safer. Dry rations may be easier to keep safe, as they do not need cold-storage, but they do need to be kept dry.
6. **Wash hands repeatedly.** Hands should be washed thoroughly before preparing, serving or eating food and after every interruption, especially after use of the toilet or latrine, changing a baby or touching animals. After preparing raw foods, especially those of animal origin, hands should be washed again before handling cooked or ready-to-eat foods.
7. **Keep all food preparation premises meticulously clean.** Since foods are so easily contaminated, any surface used for food preparation must be kept absolutely clean. Scraps of food and crumbs are potential reservoirs of germs and can attract insects and animals. The immediate surrounding of the temporary shelter, especially the kitchen and food storage areas, should be cleaned and sullage and solid kitchen waste should be disposed of properly. Food should be stored in closed containers to protect it from insects, rodents and other animals. Fly and rat traps should be used if necessary.
8. **Use safe water.** Safe water is just as important for food preparation as for drinking. If the supply of safe/potable water has been disrupted, the water intended for drinking or food preparation should be boiled. For example, condensed or powdered milk must be reconstituted with potable water only. Ice made from unsafe water will also be unsafe and may be a source of food contamination.
9. **Be cautious with foods purchased outside.** Sometimes food served in restaurants and by street food-vendors is not prepared under hygienic conditions. In times of disasters or emergencies, the risk that such foods are contaminated is greater. Therefore, caution must be exercised in the choice of food: only food that has been thoroughly cooked and is still hot when served should be eaten. Food bought from street food-vendors should be thoroughly cooked in the presence of the customer. Apart from fruits and vegetables that can

be peeled, raw or undercooked foods should be avoided. Only water that has been boiled, or disinfected with chlorine or iodine, should be drunk. Beverages such as hot tea or coffee, wine, beer, carbonated water or soft drinks, packaged fruit juices and bottled water are usually safe to drink, if not damaged by the disaster. Ice should be avoided, unless it is made from safe water.

10. **Breast-feed infants and young children.** Breast milk is the ideal source of nourishment for infants during their first months of life. It protects infants against diarrhoea through its anti-infective properties, and minimizes their exposure to foodborne pathogens. In times of epidemics and disaster situations, when foods may be contaminated or scarce, breast milk will ensure a safe and nutritionally adequate food for infants from birth up to the age of 4–6 months. Continued breast-feeding after this age can also contribute to the prevention of foodborne infections in older infants and young children.

[1] Source: World Health Organization (1991d).

decentralized cooking, accidental fires are a hazard, and fire-fighting equipment should be placed at strategic locations. Responsible volunteers should look out for fires and should be able to control them.

The advantage of providing dry rations is that recipients have more independence. Individual dry rations also avoid the risk of widespread intoxications or infections, which increases when mass cooking is done under unhygienic conditions. Nevertheless, with the appropriate safeguards listed above, centralized cooking may sometimes be necessary, especially if water and fuel supplies are scarce and sanitation is unsatisfactory.

9.3.3 Mass-feeding centres

A general feeding programme, based on the distribution of cooked food, may be necessary for a short initial period in situations where people do not have the necessary resources to prepare their own meals hygienically, or in some conflict situations where they risk having dry rations taken from them. However, mass preparation of cooked food has a number of disadvantages, including the risk of food-borne disease transmission (World Health Organization, 2000b). As soon as conditions allow, general feeding programmes should be based on the distribution of dry rations. In some cases, as an alternative to mass feeding, it may be possible to help households by providing dry rations that do not need cooking or by setting up temporary shared neighbourhood kitchens where people can prepare food for their own families or in groups.

Large-scale preparation of cooked food may also be done in supplementary-feeding centres that provide vulnerable and moderately malnourished individuals with a cooked supplement to the daily diet. The measures recommended in this section are also relevant to therapeutic-feeding centres. Additional precautions required in therapeutic-feeding centres are described in section 9.3.4.

Where mass food preparation is necessary, it is essential to supervise food handling practices and ensure strict adherence to food safety rules to minimize the risk of mass food intoxication or epidemics of foodborne infections. Basic rules of hygiene are given in World Health Organization (1995b). The general recommendations given in Box 9.1 and Table 9.1 are valid for most operations.

It is essential that food-handlers and supervisors who oversee the preparation of food in mass-feeding centres are trained in safe food handling (Jacob, 1989) and in HACCP, the hazard analysis critical control point system (Bryan, 1992). The latter will help them to think critically, analyse the prevailing conditions and potential hazards, and adapt their food safety measures to the situation. The HACCP system can be applied to each specific food-preparation activity, and the hazards related to foods or operations can be identified and control measures determined.

It is of the utmost importance that employees and volunteers who are preparing foods should not be suffering from an illness with any of the following symptoms: jaundice, diarrhoea, vomiting, fever, sore throat (with fever), visibly infected skin lesions (boils, cuts, etc.), or discharge from the ears, eyes or nose.

All personnel should therefore be made aware of their responsibilities and of the importance of observing the rules for safe food handling. All food-handlers should be instructed to report to their supervisor anyone suffering from an illness with any of the symptoms mentioned above. Posters aimed at reminding staff about the rules of safe food handling may be helpful, and should be placed at strategic places in the food preparation area. Illustrations will be particularly useful if food-handlers are illiterate. The local health committee has an important role in facilitating safe community feeding activities.

Where centralized catering is required, one kitchen should be set up for every 200–300 families (1000–1500 people), with a supervisor appointed to ensure food safety in all centers. Kitchens and eating areas should be sturdy, well-roofed and well-ventilated structures, in areas of the settlement with good access and space for users to wait for meals.

Box 9.2 outlines the facilities that should be available in mass-feeding centers and therapeutic-feeding centers.

9.3.4 Therapeutic-feeding centres

Food safety is perhaps most important where therapeutic or intensive child feeding is under way (World Health Organization, 2000b). Children fed in this way are very vulnerable to infections, and specific measures are required (see Box 9.3), in addition to those required generally for food safety in centralized catering centres (see Box 9.1). Cooking and feeding for therapeutic-feeding patients should be done in a building specifically allocated for this. To ensure optimal sanitary conditions, the maximum size for such a feeding unit should be sufficient for about 50 children and their parents or guardians. If more space is needed, additional units should be provided.

9.3.5 Breastfeeding and breast-milk substitutes

WHO recommends full and exclusive breastfeeding of infants until 4–6 months of age, with continued breastfeeding with adequate complementary feeding for up to two years if possible (World Health Organization 2000a). Aid workers should be able to encourage breastfeeding practices if they understand and follow the guidelines given below:

- Support all mothers in breastfeeding in accordance with WHO recommendations.
- If a mother is sick or malnourished, give her extra food and support so that she can continue breastfeeding her baby.
- If a mother has stopped or reduced breastfeeding, help her to relactate or reestablish exclusive breastfeeding.
- If an infant's biological mother is not available, arrange for another mother to breastfeed it.
- If no other woman is available to provide breast-milk, provide a suitable substitute, e.g. infant formula or animal milk, while taking the necessary precautions, such as:
  - — the infant formula to be used must be in generic packaging, and must not display the brand name;
  - — clear instructions must be given on how to prepare the formula hygienically;
  - — the formula must be freshly prepared for each feed: no left-overs must be kept;
  - — parents and guardians must be advised to feed infants by cup, and to avoid the use of feeding bottles, teats and pacifiers.

For infants 6 months and older, infant formula is not needed.

Box 9.2 **Facilities needed at mass-feeding centres**

- **Water supplies.** Only safe water should be used for all purposes in the feeding premises. Piped water may be suspect, especially after certain disasters. Water should be tested as soon as possible (see section 7.4.2), and if in doubt, water supplies should be chlorinated in the centre.
- **Toilets for staff and users.** Separate, safe excreta-disposal facilities for staff and people being served should be provided at the mass-feeding centre. At least one toilet should be provided for every 50 people working or eating at the centre. Toilets and latrines must be kept clean at all times. Anal cleansing materials should normally be supplied.
- **Hand-washing facilities.** A sufficient number of basins, each with soap, nail brush and a clean towel, must be provided for the food-handlers. They should be located in or near the toilets.
- **Facilities for dealing with liquid wastes from kitchens.** If not discharged into public sewers, kitchen wastewaters should be disposed of by other sanitary methods, such as a soakaway or covered cesspool. A grease trap or strainer must always be provided and properly maintained to prevent clogging (see Section 8.4.2).
- **Facilities for dealing with solid wastes from kitchens.** Solid kitchen wastes must be deposited immediately in rubbish bins. Filled bins should not be left in the preparation and cooking areas, but should be tightly covered and taken outside for collection and disposal.
- **Basins, tables, chopping blocks.** All furniture and equipment must be kept as clean as possible. Surfaces in contact with food during preparation and serving should be thoroughly cleaned and disinfected with a strong chlorine solution (100 mg/l) after each meal.
- **Facilities for dish washing.** Separate basins must be provided for washing, eating and cooking utensils. Any grease or food scraps on the utensils should be scraped into a rubbish bin; the utensils should then be washed in a basin with hot water and detergent, and rinsed. They should then be laid on wire baskets or trays and immersed in boiling water for disinfection for 5 minutes; alternatively they may be immersed in a sterilization solution, preferably hot, (e.g. sodium hypochlorite or calcium hypochlorite solution at 100 mg chlorine/litre for 30 seconds). Wiping dry is unnecessary, and undesirable if clean cloths are not available. The baskets or trays should be dried in a dust-free place.
- **Adequate and appropriate materials for cooking/refrigeration.** When refrigeration is not available, damaged or perishable foods should be bought on a daily basis and cooked and served as soon as possible. Centrally produced ice may allow the use of improvised cool chests for the short-term storage of some perishables. It may also be possible to use a kerosene-powered refrigerator, or a portable generator for electric refrigerators. Staff should aim to prepare food sufficient only for each meal, to avoid the need to store cooked food.
- **Layout to prevent cross-contamination**. The space inside the food preparation premises should be arranged so as to prevent cross-contamination of prepared food from sources of contamination, such as raw food and especially animal products.
- **Adequate and appropriate materials for eating.** Common cups, plates and cutlery are acceptable if they are thoroughly washed and/or disinfected after use. Disposable plates, cups, etc., may be appropriate, especially when disaster victims are in transit.
- **Control of rodents and other pests** Effective ways to combat flies include, trapping flies, properly screening kitchen areas, and disposing of waste and sullage. Spraying against flies is not necessary. If rodenticides are used in food-storage areas and kitchens, they should be labelled and their use should be carefully monitored. They should never be placed on surfaces used for food preparation, or where they could accidentally fall into food being prepared.
- **Food safety information.** Food safety educational material, such as posters, should be provided in accessible places in the food preparation areas.

Box 9.3 **Specific measures required in therapeutic-feeding centres**

- Ensure that dry feeds are not reconstituted in advance and that the leftovers are not stored for the next meal.
- Make sure that foods prepared from raw ingredients are thoroughly cooked and, after preparation, given immediately they are cool enough to eat.
- Make sure that safe water is given to infants and children, and is used to prepare complementary food (or reconstituted feed). If in doubt, boil the water before use. Store water so that it is safe from all sources of contamination, e.g. hands during serving.
- Make sure that helpers or parents feeding and attending to infants and children wash their hands before feeding them and are aware of the principles of safe food handling. Cups, plates and spoons should be washed after every meal.
- Equip the therapeutic-feeding unit with a large boiled or chlorinated and well-monitored water supply (at least 30 litres per person); a facility for helpers or mothers to wash their hands before assisting children; a separate facility for washing the cups and other utensils; and latrines.
- Install showers or other facilities so that patients and helpers who stay in the centre overnight can bathe.
- Provide a screened, shaded area protected from dust, flies, etc. with sufficient floor space covered with matting or plastic for mothers or helpers to sit with weak children who need to be fed. Feeding weak children with a cup and spoon can be very time-consuming.

HIV and infant feeding

HIV infection can be transmitted through breastfeeding. Nevertheless, breastfeeding should be encouraged among mothers who are HIV-negative or of unknown HIV status. During the emergency phase following a disaster, it may not be possible to provide testing facilities for pregnant women and mothers, or to provide drugs to reduce transmission. In the postemergency phase, the possibility of reducing transmission through breastfeeding with voluntary testing, drugs and alternative feeding practices for HIV-positive mothers should be considered.

9.4 Public education and information

While education of the public in food safety is important at all times, in disasters and emergencies it becomes vital. In such circumstances, the possible contamination of raw foodstuffs, the pollution of the environment, and the disruption of basic health services increase both the risks of epidemics of foodborne diseases and the severity of their health consequences. It is then necessary to intensify health education activities and extend the channels for communication with the public.

The WHO golden rules for safe food preparation, adapted to emergencies and disasters (see Box 9.1), can provide a basis for public education on food safety.

Special attention should be drawn to the importance of breastfeeding and, in particular, the grave risks of using breast-milk substitutes under the unhygienic conditions that may prevail during emergencies, particularly if sanitation is compromised, safe water is scarce, and facilities for sterilization (i.e. for heating or boiling) are unavailable to mothers.

It is therefore necessary to:

— remind the public of the rules of safe food handling whenever the contamination of water or raw foodstuffs could give rise to epidemics of microbial foodborne diseases, such as after hurricanes, floods and earthquakes;
— advise the public to avoid the types of food that are likely to be contaminated following an explosion in a chemical plant situated near home garden plots, or a nuclear accident that contaminates pastures or crops with radionuclides.

Ideally, households should be prepared in advance and have access to alternative facilities for safe food storage and preparation, and agents for disinfecting water. This preparation may include bottled gas or wood for cooking food and boiling water, and ice-boxes and ice for cold storage, whenever electricity, gas or water supplies are disrupted.

9.5 Safe and hygienic warehouse management

Storage structures should have good roofs and ventilation. Bags must not lie directly on the floor—pallets, boards, heavy branches, bricks, or clean, dry plastic bags or sheets should be placed underneath them. Products should be kept at least 40 centimetres from walls and 10 centimetres from the floor. Damaged bags should be rebagged and stored apart from undamaged ones. A reserve of good-quality empty bags should be kept for this purpose. Spilled food should be swept up and disposed of promptly to discourage rats. Bags should be piled two-by-two cross-wise to permit ventilation. Wet bags should be allowed to dry in the sun before storing them.

Spills of cooking oil in the warehouse should be immediately cleaned up to prevent workers slipping and injuring themselves. Similarly, bags should not be piled too high and piles should be stable so that workers are not injured by falling bags.

Fuel, pesticides, chlorine and other chemical stocks should never be stored in the same place as food.

9.6 Further information

For further information on:

— food safety procedures, see: World Health Organization (1984a), World Health Organization (1989b), World Health Organization (1991d), Bryan (1992), World Health Organization (1992a);
— supplementary and therapeutic feeding, see: Sphere Project (2000), World Health Organization (2000a);
— breastfeeding and breast-milk substitutes, see: United Nations High Commissioner for Refugees (1989), Savage-King (1992), World Health Organization (2000b), Sphere Project (2000);
— food storage, see: Walker (1992).