

## Causes of disease

This chapter deals with common-sense measures and some necessary precautions which should be taken to preserve the health of those aboard ship and to prevent the spread of disease where it has occurred. Of the many causes of disease, infection by living organisms is the commonest and an understanding of their mode of spread is necessary if healthy living and working conditions are to be maintained.

Microbes (germs) can be classified in broad terms as viruses, bacteria, and fungi. They are widely disseminated throughout nature and although most of them are not harmful to mankind certain organisms may invade the body and produce particular diseases. They gain entry to the body, usually through the nose or mouth or the broken skin. Infection can take place directly from person to person or it may be conveyed indirectly in air, water or food or by a parasite carrier (such as an insect).

The viruses of influenza, that of the common cold and much more rarely Legionnaires disease are examples of air-borne infection which is spread when the sufferer coughs or sneezes.

Typhoid fever is an example of a water-borne bacterial infection. The excreta of infected persons contaminate water supplies. Hence the necessity for safeguarding the water supply for washing as well as for drinking at all times.

Examples of two well-known bacterial diseases brought about by personal contact are syphilis and gonorrhoea.

A number of diseases are conveyed by carriers. The plague germ is conveyed by the bites of fleas living on the rat. Typhus is conveyed in similar manner by lice. Malaria and yellow fever organisms inhabit the salivary glands of the mosquito and are injected into the blood when the mosquito bites. Flies, because of their behaviour, are very prone to convey disease germs from filth to food.

Ringworm is an example of a disease caused by a fungus through contact.

## Potable water

This covers water used for drinking, cooking, the washing of cooking and eating utensils, and water used for general cleaning and bathing. Additional advice is given in Merchant Shipping Notices M.1214 and M1401.

Fresh water should be free from causes of infection and be bright, clear and virtually colourless. It should be aerated, that is, it should bubble when shaken, otherwise it has an insipid taste.

The Merchant Shipping Crew Accommodation Regulations 1997 and Merchant Shipping Crew Accommodation (Fishing Vessels) Regulations 1975 require all fresh water produced on board ship to be disinfected automatically. Electro-silver ionisation systems are acceptable for this requirement.

## Fresh water storage tanks

These water tanks are coated internally with an anti-corrosive material which will not contaminate the water. It is recommended that the tanks should be emptied annually, or

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more frequently if contamination is suspected, for inspection and maintenance after which they should be thoroughly scrubbed and flushed out, and the whole water system disinfected by chlorine (see below). Anyone entering any potable or washing water tanks should wear clean clothing and footwear, and should not be suffering from skin infections, diarrhoea or any communicable disease.

### Disinfection of the fresh water tanks and distribution system by super-chlorination

It is recommended that the storage tanks and the whole of the fresh water system should be disinfected at intervals of not more than twelve months even if the quality of the water that has been used to fill them is not suspect.

The chlorine compounds that may be used for disinfecting are chlorinated lime, high-test hypo-chlorite or commercially prepared sodium hypo-chlorite solution.

NOTE. Before being diluted by the water in the potable water system these compounds:

- are dangerous to eyes and skin – see IMO Medical First Aid Guide;
- deteriorate on exposure to air – they should, therefore, be purchased in small containers which should be sealed tightly after use;
- should be kept in a cool, dry and dark place, but where they can be easily seen and removed when needed or there is a likelihood of fire;
- Calcium Hypochlorite – is liable to spontaneous combustion if not stored as above, or if in contact with animal, vegetable, plastic or other inorganic material;
- Chlorinated Lime – is liable to facilitate fires.

See also the International Maritime Dangerous Goods Code.

Determine the volume of water necessary to fill the tanks and distribution system completely and the amount of chlorine compound required. The latter can be calculated from the manufacturer's instructions or from the table or formula shown below.

Amount of chlorine compound required for a 50–ppm (50-mg/litre solution)				
Capacity of system (including tanks and piping)	Amount of chlorine compound required			
	Chlorinated lime 25%	High-test calcium hypochlorite 70%	Sodium Hypochlorite solution	
			5%	10%
	<i>Kg</i>	<i>Kg</i>	<i>litre</i>	<i>litres</i>
for each:				
1,000 litres	0.2	0.08	1	0.5
5,000 litres	1	0.4	5	2.5
10 tonnes	2.0	0.8	10.0	5.0

NOTE.

1. Before using the above chlorine compounds check that the percentages are as in table above – if not adjust the quantity you use accordingly.

2. When chlorine compounds or solutions other than those mentioned in the table are used the dosages should be:

for powders: 
$$\frac{70 \times \text{dosage in 70\% column}}{\text{percentage of chlorine in compound}}$$

for liquids: 
$$\frac{5 \times \text{dosage in 5\% column}}{\text{percentage of chlorine in liquid}}$$

**Chlorinated lime**

Place the required amount of chlorine compound in one or more clean, dry buckets (or drums). Add a small amount of water to each bucket and mix the lime into a thick paste. Dilute the paste by adding warm water gradually, and stirring constantly, until there are about six litres of solution in each bucket. Allow the solution to stand for 30 minutes, so that the undissolved particles may settle to the bottom. Decant the clear liquid (the chlorine solution) and, if necessary, filter it through muslin or cheese-cloth prior to putting it into the tank

Chloride of lime may be sold as:	
Chloride of Lime (Stabchlor)	
Chlorinated Lime Calx Chlorinata	British
Calx Chlorinata	U.S.A.
Chlorure de Chaux Sel de Javelle	French
Chlorkalk Calcaria Chlorata	German
Calx Chlorata	Danish, Norwegian and Swedish
Cloruro di Calce	Italian
Hipoclorito Calcico Clorurado	Spanish
Hipoclorito de Calcio	Mexican
Cal Chlorada	Portuguese

**High-test calcium hypochlorite**

Place the required amount of the compound in one or more clean, dry metal buckets (or drums). Add fresh water and stir until the powder is dissolved (disregard any slight turbidity).

**Sodium hypochlorite solution**

No preparation is required.

**Procedure**

Introduce the chlorine solution into nearly empty fresh water tanks and immediately fill them to overflowing with fresh water. The turbulence of the incoming water will ensure adequate mixing.

Open the taps and outlets of the fresh water distribution system nearest the storage tanks, and allow the water to flow until you can smell chlorinated water. Then close those taps and outlets, and, working outwards from the tanks, open and close successively the other taps and outlets until they have all been flushed with chlorinated water. Care should be taken to ensure that the pressure tank is filled with chlorinated water.

In flushing the system a certain amount of the chlorinated water will have been drawn from the storage tanks. They should be refilled to overflowing, and chlorine solution should be added to make up the concentration in the tanks to 50 ppm (50 mg/litre), ie if you have drained off 380 litres of water you will need to add, for example, an additional 75 grams of chlorinated lime 25% solution.

The chlorinated water should be allowed to remain in the storage tanks and the distribution system preferably for twelve hours but not less than four hours. After the contact period the tanks and distribution system should be drained and flushed with potable water until the water no longer has an objectionable taste of chlorine.

**Hoses**

Hoses, where carried on board for the purposes of transferring water from shore mains supply or water barges, should be used solely for this purpose. They should also be suitably marked and, after use, should be drained and capped at both ends. The hoses should be stowed away from the deck in a place free from contamination.

Disinfection of hoses should be carried out as a routine measure every 6 months – or whenever any contamination is suspected – with a chlorine solution of 100 ppm (100 mg/litre). This should be allowed to stand in the completely filled hose for a period of at least one hour.

A 100 ppm strength solution can be obtained by doubling the quantities of chlorine shown in the formula for the 50 ppm hyper-chlorine solution used for disinfecting ships' water tanks which is shown in the above table.

### Taking water on board

Before taking on water check that the delivery cocks on the shore and the receiving point on the ship are properly cleaned. Examine the hose to ensure that it is clean, in good working order, and free from leaks (germs can get in through leaks in the hose). Ensure that the ends of the hose do not drag across the deck.

If you are taking water for potable purposes from a source which is new to you or about which you have doubts, you should ask the British Consul or your agents for advice as to whether the water is likely to contain germs or harmful minerals such as lead. Remember that a bright, clear, sparkling water may easily contain either deadly organisms such as cholera, or harmful minerals such as lead. It is unlikely that fresh water taken on board will contain sufficient (if any) chlorine to ensure complete safety.

It is recommended therefore that the chlorination of water outlined in the following paragraph be carried out in all vessels, including those equipped with distillation units and/or ultra violet sterilizers.

### Routine treatment of fresh water by chlorine

All fresh water taken from shore or water barge for drinking or washing should be chlorinated on loading to ensure a residual free chlorine content of 0.2 ppm at all outlets throughout the ship's freshwater distribution system. As free chlorine in a ship's water system is progressively lost in passing through the system it will, in practice, be necessary to chlorinate the water held in the storage tanks to a higher concentration than 0.2 ppm. Finding the best actual level of initial concentration may be a matter of experiment as much will depend on the size of the tank or the distribution system.

If chlorine test facilities are available, samples of treated water should be taken at tap and shower outlets at [weekly/monthly] intervals, preferably using outlets that would otherwise not be used (e.g. in unoccupied cabins) in order to reduce the presence of standing water in the system. The result of these tests should be used to adjust the concentration of chlorine in the system to obtain a minimum of 0.2 ppm at the outlets.

It should be remembered however that if drinking water supplies pass through charcoal filters close to the outlets, there will be no free chlorine at these points.

It is recommended that, initially a concentration of 0.5 ppm in the storage tanks is aimed for and this may be achieved by using an automatic chlorination unit in the ship's deck filling line or by the traditional manual method using the manufacturer's instructions for the chlorine compound in use or by calculating the quantities required by use of the following table or formula:

**Amount of chlorine compound required for a 0.5 ppm chlorine solution**

	<i>Amount of chlorine compound required</i>			
	<i>Chlorinated lime 25%</i>	<i>High-test calcium hypochlorite 70%</i>	<i>Sodium Hypochlorite solution</i>	
			<i>5%</i>	<i>10%</i>
for each:	<i>g</i>	<i>g</i>	<i>ml</i>	<i>ml</i>
1,000 litres	2	0.8	10	5
10 tonnes	20	8	100	50

**Water making plant**

All water made from seawater by low pressure evaporators or reverse osmosis plant requires to be treated by means of an automatic chlorination unit adjusted to give the required concentration on delivery to the storage tanks, or by an electro-silver ionisation system.

Ultra violet sterilizer units should only be used as a supplement to chlorination.

**Maintenance of distribution system**

The various elements of the freshwater system which might include sand filters, evaporators, reverse osmosis plant, softeners etc., should be inspected, cleaned, flushed out, back washed, recharged or items replaced where appropriate, in accordance with the maker's instructions and it is recommended that a Freshwater System Maintenance Log be kept itemising each principle unit in the system.

**Food**

A balanced diet is essential for the maintenance of good health and should contain the correct proportions of protein, carbohydrate, fats, vitamins and essential minerals such as iron. It should be varied in accordance with the needs of the consumers and the climate in which they are working. Protein is derived from such foods as meat, fish and beans; carbohydrates from cereals and bread; and vitamins and essential minerals from all of these and from fruit and vegetables.

It is also essential to avoid contamination in the food preparation area. Raw food, especially meat, should be kept separate from cooked products. Separate utensils and cutting boards etc. must be kept for each and stored separately. The food handler must wash between handling different foods and especially after handling raw meat and poultry; cooked food should be manipulated by tools and utensils and not by the hands; and work surfaces and equipment must be cleaned thoroughly and disinfected efficiently. Cleaning equipment must also be disinfected adequately.

**Vegetables**

Fresh vegetables, such as lettuce, radish, carrot, beetroot, celery and spinach should never be eaten, cooked or raw, without first being thoroughly washed in clean running water.

In many countries such crops are fertilised with human excreta and are, therefore, potentially dangerous as a source of transmission of intestinal disease such as typhoid, dysentery and intestinal parasites.

Wherever practicable, boil vegetables before serving. Where the origin of any vegetable to be eaten raw is not known, it should be soaked for two minutes in a solution of 3.5 g of stabilised chloride of lime to 5 gallons of water followed by at least two thorough rinsings in potable water.

**Fruit**

Fruit, such as oranges, bananas, grapefruit, that must be peeled before eating is generally safe. Fruit, such as apples, tomatoes, grapes, dates, that is not generally peeled, is a frequent source of diarrhoea. Before eating they should be treated in the way recommended for raw vegetables.

**Canned foods**

Each tin should be carefully examined before being opened. Never accept or use tins which are rusty, dented, damaged or blown.

**Bacteria in food**

Bacteria require moisture and warmth for growth. The most favourable temperature for growth is normal body heat, although most will thrive at temperature between 15°C and 45°C. Bacteria can multiply very fast in favourable conditions.

Unpreserved foods should therefore be stored in a refrigerator or freezer. When perishable bulk food packs are opened for use, any unused portion should be resealed and returned to the refrigerator or freezer as quickly as possible (before defrosting has occurred, if frozen).

When removed from the cold for cooking, food should be thoroughly thawed, carefully prepared, and heated to a minimum temperature of 63°C. It should be served and eaten at once, or kept above the minimum cooking temperature if there is to be any delay in serving. Inadequate defrosting before cooking food, particularly meat and poultry, may mean that the centre does not reach the minimum temperature to destroy bacteria (i.e. is only partially cooked). This is a common source of food poisoning. Frozen meat and poultry which have thawed out should not be refrozen before being thoroughly cooked.

All cooked unconsumed food should be cooled rapidly and stored in a refrigerator for up to 48 hours or in a freezer if it is to be kept for a longer period. Any food to be reheated must be heated thoroughly to the temperature necessary to kill bacterial contamination. Under no circumstances should meat products or rice be reheated more than once.

Further guidance is available in Marine Guidance Note 61 (M+F).

In any outbreak or suspected outbreak of food poisoning or illness with diarrhoea on board, the following steps should always be taken:

- try to identify the food(s) which have caused the outbreak. Make sure that no further consumption of these foods is possible by discarding them. Keep a sample if near port so that laboratory identification is possible.
- inspect all food handlers for general cleanliness and for the points listed. Forbid anyone who does not meet these standards to handle food. You may thus remove the cause of the outbreak.
- inspect all food storage and preparation areas and make sure that good food hygiene practices are being followed (next section).
- if near port, keep samples of diarrhoea or vomit (in sealed containers inside a plastic bag in a cold place, away from catering facilities) so that laboratory identification of the cause may be possible.
- treat all affected persons and prevent them spreading the disease.

### Catering staff: personal hygiene

It is of prime importance that catering staff should maintain a high standard of personal hygiene. Only by insistence that these standards are maintained will outbreaks of diarrhoea and of food poisoning be avoided.

The staff should be supplied with, and should wear, clean clothing when handling food. There should be ample supplies of soap, towels, nail brushes and hot water available for washing hands, and it is important that thorough washing of the hands follows a visit to the toilet.

Food handlers should be free from communicable diseases. Anyone suffering from a septic skin condition should be removed from duty until the condition is cured. A person who has had an attack of typhoid fever or of dysentery, and who may have become a carrier of the disease, or who has suffered from an unexplained or unusual illness, should not be allowed to prepare or handle food or utensils until cleared for such duty by a doctor.

Food handlers should be made aware of their responsibilities for the health of others and should be educated and trained in good food hygiene practices.

### General cleanliness on board ship

Cleanliness, both of the person and the environment, is essential at all times on board ship. Frequent monitoring by the master and senior officers will help to keep the crew aware of the necessity to maintain scrupulous cleanliness and will detect infestations.

Cloths for cleaning working surfaces and tables are a common source of infection. They should regularly be either boiled or soaked in disinfectant (e.g. hypochlorite solution) or replaced. It is strongly recommended that disposable cloths are used to minimise the risk of contamination.

## Insecticides

Insecticides should conform to the specification in MSN1726. They should be used only in accordance with the manufacturer's instructions and the recommendations in M1534. If going to tropical areas check that you have sufficient appropriate insecticides to deal with mosquitoes.

Insecticides are usually carried in two forms:

- a liquid insecticide intended for the destruction of flying insects such as flies and mosquitoes, and also non-flying insects such as cockroaches, bugs and ants;
- an insecticide powder intended for use on the body, personal clothing, bedding, blankets and such like, for the destruction of bugs, fleas and body lice.

In addition there are insecticides in tablet form which have to be heated by, for example, a low wattage electric lamp. These are used particularly for killing tropical mosquitoes.

It is important to appreciate the difference in practice between the control of flying insects and non-flying insects:

*Flying insects* are controlled by spraying the insecticide into the affected space. The spray diffuses rapidly and will kill the insects in flight. Do not attempt to hit individual insects as this only wastes the insecticide.

*Crawling insects* such as cockroaches usually hide and breed in cracks and crevices and in the spaces behind lockers and cooking stoves. The area around their hiding places should be thoroughly and liberally sprayed so that they come into contact with the insecticide as they emerge to feed. As this spraying cannot kill the insects' eggs, it must be repeated at regular fortnightly intervals to kill the young insects as they hatch.

*Bugs* may be present in the sheathing, wainscoting, wooden bunks, etc. The surfaces should be sprayed thoroughly to ensure the rapid destruction of the bugs as they run over the sprayed area.

The best way to deal with an infestation of bugs in bedding, mattresses, etc. is by means of a thorough dusting with insecticide powder. The bugs will eventually come into contact with the powder and be killed.

## Disinfection

A disinfectant is a substance used for cleaning instruments, materials, lavatory pans, bed pans, etc. The instructions on the container should be followed.

An antiseptic has a similar anti-bacterial action, but is generally more suitable for application to human tissues.

A deodorant dilutes or obscures odours only and has no disinfecting properties.

Disinfestation is the destruction of rats, mice and insects of all kinds which may or may not carry disease to humans.

## Sterilisation

In ships this term means the destruction of germs by the use of boiling water or steam. It is a very simple and effective way of rendering free from germs articles of all kinds. Articles to be sterilised must be boiled for 10 minutes, at least. Boiling cannot, of course, be used to sterilise certain fabrics which are damaged by boiling, such as those containing wool. A disinfectant solution must be used for these.

## Disinfection at end of illness

This term means the disinfection of a room after it has been occupied by an infectious patient.

First remove all bedding, blankets and movable articles of furniture. The bedding and blankets should be disinfected. The furniture should be left on deck, preferably in the sun, after having been thoroughly scrubbed. After emptying the cabin, give the whole surface,

including the bulkheads, deck, ceiling and all internal and external surfaces of cupboards and such like, a thorough washing down. The principal object is to clean the cabin surfaces, lockers, etc., and thereby to remove any dust and dirt that may have accumulated and which may contain germs of the disease. On completion of this procedure the room can safely be occupied.

A more thorough procedure is necessary in the case of serious infectious illnesses, such as plague, cholera, typhus, or typhoid fever. At sea, dispose of all bedding, mattresses, etc., and, after a thorough cleansing of the cabin, close it down and do not use it until authorised to do so by the Medical Officer of the next port of call. He may consider it desirable to carry out a further disinfection by other means. He should also be asked to disinfect ashore all the patient's personal clothing and belongings, remembering that the patient will require his effects, either during his subsequent stay in hospital or after his discharge from hospital.

## Isolation

The isolation of an ill patient will prevent the spread of disease to other persons on board. It is convenient to categorise isolation into two types:

- strict;
- standard.

Details of the type of isolation necessary are given in Chapter 6 at the beginning of each section dealing with a particular illness.

### Strict isolation

The patient is confined to the ship's hospital or to a cabin set aside for his sole use in a quiet part of the ship and which has been stripped of all unnecessary furnishings and carpets to facilitate cleaning and disinfection.

He must be seen only by the person who nurses him.

If disposable eating and drinking utensils are available, these should be used and later destroyed. Should ship's dishes and cutlery have to be used, they should be washed and sterilised after use and kept in the cabin or hospital. They should never be washed up with utensils used by other members of the crew.

All used bed linen and towels should be sterilised by boiling or by disinfection. Faeces and urine should be passed into bedpans or urine bottles and at sea disposed of in a flushing WC set aside for the purpose. The attendants should wear disposable gloves when handling these items and care should be taken not to splash the contents about. The pans and bottles should be sterilised after use. In port, faeces and urine should not be flushed away but should be disinfected and disposed of after consultation with the Port Health Authority. It is important to dispose of any used syringes and needles in the correct way. Place the needle and syringe into a 'sharps' box (safety container designed for disposing of contaminated sharp items which could accidentally injure and thus infect another individual). The containers should be kept in the isolation room until arrival in port when they should be handed to the Port Health Authority for disposal. The attendant's gloves should be bagged, sealed and disposed of in the same way.

NOTE: The attendant should wash his hands each time the gloves are removed.

### Standard isolation

The patient is isolated in the ship's hospital or in a cabin set aside for his use. There is no need to observe the stringent rules for strict isolation. Whilst the patient is ill, visitors should be discouraged. When he shows signs of recovery, this ban can be lifted but visitors should be instructed to stay only for short periods. Whilst he is convalescing visiting should be encouraged to relieve boredom.

In certain cases it will be necessary to deal with urine and faeces in accordance with the procedure for strict isolation, e.g. enteric fever.



## Ventilation

Adequate ventilation and a free flow of air to the crew accommodation and food stores is important for the health of all on board ship. This is often arranged by means of a recirculating air-conditioning system. With such a system, it is obviously undesirable that the air from a room occupied by an infectious person should be recirculated. Purpose-built ships' hospitals therefore have separate ventilation systems. However, when a person with an infectious disease has to occupy a cabin, all possible steps should be taken to prevent contaminated air from re-circulating. For example, a porthole or external door not subject to an inflow of air should wherever possible be opened to exhaust the contaminated air.

## Port health clearance

Measures for the prevention and control of the spread of epidemic diseases by international transport are governed by a code of rules which have been drawn up and agreed by practically all the maritime countries of the world (International Health Regulations 1969 – Third Annotated Edition). The Regulations are applied in most countries by Port Health Officers.

A Maritime Declaration of Health should be completed before arrival at the first port of call in a new country. This, however, only relates to Yellow fever, Pulmonary plague and Cholera.

It is advisable to seek advice and to give information by radio, preferably within 4–12 hours of the estimated time of arrival at the port, in any of the circumstances described below.

1. The occurrence on board during the voyage of:
  - death other than by accident;
  - illnesses where the person concerned had:
    - a temperature of 38°C or greater, which was accompanied by a rash or a glandular swelling or jaundice, or which persisted for more than 48 hours;
    - diarrhoea severe enough to interfere with work or normal activities.
2. The presence on board of:
  - a person suffering from an infectious disease or who has symptoms which may indicate the presence of an infectious disease;
  - any animal or captive bird of any species including rodents and poultry, noting any mortality or illness among such animals or birds.
3. Any other circumstances which are likely to cause the spread of infectious disease.

## Preventing heat illness

In very hot conditions the minimum of light clothing should be worn to allow the largest possible surface for free evaporation of sweat. If there is much direct heat from the sun (radiant heat), light white cotton clothing will reflect the heat and keep the body temperature below danger limits. Fair-skinned people should remember that they burn more easily and should take precautions.

Perspiration is the body's best heat control mechanism but the sweat consists mainly of salt and water which must be replaced. The salt is best taken with food and supplemented by salt-containing drinks to prevent heat cramp. At least 4 litres of fluid is required per day in conditions of moderate heat. If working in high temperatures, the requirement may rise to 6–7 litres.

When the ambient temperature is above 32°C in very humid climates, or above 43°C in dry air, there will be a risk of heat illness, especially when work has to be carried out. This applies particularly to work in engine-rooms and other enclosed spaces.

Air temperature, movement of air, humidity and radiant heat all combine to cause heat exhaustion. A number of ships, especially those operating in hot climates, will carry an hygrometer. This comprises two thermometers, one wet-bulb and one dry-bulb. The readings of the two thermometers can be used to determine a 'composite temperature' which will give an indication of the amount of work that can be undertaken per hour in given circumstances.

The 'composite temperature' is calculated by adding the wet-bulb temperature x 0.7 to the dry- bulb temperature x 0.3 measured in °C. The resulting 'composite temperature' can be used to establish the work/rest ratio as follows:

*Composite temperature °C			Work/rest ratio
Light Work	Moderate Work	Heavy Work	
30	27	25	Continuous work
30.5	28	26	75% work/25% rest per hour
31.5	29.5	28	50% work/50% rest per hour
32	31	30	25% work/75% rest per hour

\*Add 1° to the composite temperature if there is some radiant heat

\*Add 2° to the composite temperature if there is intense radiant heat

If the composite temperature is above the values in the table, extreme caution should be exercised in allowing work at all because there will be a risk of heat-stroke. In emergency conditions where the work must be done, short spells of work (say 10 minutes) may be permitted but the person must be allowed to cool off completely before being allowed back into the hot environment.

## Exposure

Sunburn, frostbite, heat illness and hypothermia may occur in the course of routine duty, and must be guarded against. Sunburn, although often only a minor discomfort, can be dangerous. A person drowsy after drinking alcohol who decides to sleep in the sun may very well wake up suffering from serious burns. Special care should also be taken against frostbite and hypothermia (lowering of the body temperature). Hypothermia will most frequently be present in men who have fallen overboard. Normal body temperature cannot be maintained in water at temperatures below 20°C. Discarding clothing and swimming movements accelerate heat loss. Treatment of heat illnesses and exposure problems are dealt with in Chapters 7 and 11.

## Lifting heavy weights

Backache, sciatica, lumbago and slipped disc are frequently caused by incorrect lifting or by attempting to lift heavy weights. If the legs are not bent and the object is lifted by straightening a bent back, there will always be a risk of damage to the spinal column. Leg and thigh muscles are the most powerful in the body and they should be used when lifting, the torso and head being kept straight to avoid bending stresses. Crew should be properly instructed in the correct technique for lifting and carrying heavy weights. They should not be allowed to attempt to raise excessively heavy objects (see Code of Safe Working Practices for Merchant Seamen).

## Exercise and boredom

Very few seafarers aboard ship exercise hard enough to cause them to become breathless or to increase the rate of their heart-beat. Ideally 20 minutes of aerobic exercise (exercise that raises the heart rate and makes breathing faster) should be taken twice a week, to help maintain cardio-vascular fitness. Such regular exercise will also help maintain muscle tone, strength and mobility. Individuals unused to regular exercise should start training programs gently and seek advice if in doubt about initial levels. If it hurts, don't do it.

On long, tedious voyages there will be boredom and lack of interest which will also be detrimental to health and well being. Awareness of the danger is the best protection.