8 Disease Vectors

8.1 Health concerns

The control of disease vectors such as insects and rodents is necessary for the maintenance of health and healthful conditions aboard ships. Bedbugs, cockroaches, flies, lice, mosquitoes, rat fleas, rats and mice are all capable of transmitting disease.

Rats and mice are well established at port areas. Rats from ships can be vectors for many diseases and have spread epidemics of plague to many seaport cities. In addition to plague, murine typhus, salmonellosis, trichinosis, leptospirosis and rat bite fever are known to be spread by rats.

Malaria is transmitted to humans by mosquito vectors. If not properly controlled, such vectors could breed on ship and could certainly be carried by ship. Infection with malaria during voyage represents a serious risk to health and life. On board ship, the chances for early diagnosis and proper treatment are limited. Outbreaks have been reported in Japan, Poland, Ukraine, Lithuania, Spain and Denmark. For example, there were 221 reported cases of malaria among crew of Spanish ships from 1988 - 1994.

Ships can spread disease to ports via infected vectors. For example, in 1993 acute malaria was diagnosed in 2 residents of Marseilles, France, who lived close to the harbour. Neither of the patients had received blood transfusions or had travelled outside France. Entomological investigations confirmed the absence of Anopheles mosquito breeding sites in the port area. Disease transmission was thought to occur following the introduction of one or more mosquitoes by a ship arriving from tropical Africa. Weather conditions in the summer of 1993 were favourable for the survival of Anopheles and the completion of the malaria parasite life cycle.

Doctors were advised to consider malaria in the differential diagnosis of fever of unknown origin in any patient working or living in or near the harbour area (Delmont et al, 1994).

As vectors such as rodents, vermin and flying insects may have access to ships when in port, control measures for the suppression of vermin and insect infestation are necessary. These control measures should be carried out under the direction of a ship's officer charged with this responsibility. Frequent inspection is required.

8.2 Relevant Aspects of the 2003 draft of the International Health Regulation

Article 14 directs health authorities to ensure that ports have the “capacity” to inspect ships and then to issue either “Ship Sanitation Control Certificates” to direct disinfection or decontamination of the ship, including the control of vectors, or “Ship Sanitation Control Exemption Certificates” if contamination is not found.

Annex 1 describes what constitutes this “capacity” and notes that this includes the capacity to decontaminate ships.

Annex 4 describes the process of issuance of such “certificates” and states that the presence of vectors, not necessarily evidence of disease per se, is sufficient basis for the issuance of the Control Certificate to decontaminate the ship of those vectors.
Annex 5 describes the specifics for vector-borne disease control and provides health authorities with the right to control vectors found.

### 8.3 Risk factors

A primary first risk factor for ships becoming contaminated by vectors is the ports themselves. Ports receive and manage goods and people from all over the world. Therefore, ports are exposed to the risk of introduction of vectors from any other part of their host country or any other port in the world. In addition, the activities undertaken at ports, such as handling foodstuffs, attracts many species of vermin.

A second risk factor concerns the risk to those aboard ships. Being relatively isolated from medical facilities makes diagnosis and treatment of disease more difficult and potentially increases the risk of serious adverse harm.

Finally, the relatively crowded nature of ships facilitates the spread of disease and ensure a concentration of foodstuffs and hosts for vectors.

### 8.4 Design and construction control measures

#### 8.4.1 Insects

Sleeping quarters, mess rooms and dining rooms, indoor recreational areas, as well as all food spaces, should be effectively screened when vessels are in transit in areas where flies and mosquitoes are prevalent. Screening of no more than 1.6 mm spacing is recommended and care should be taken to screen all outside openings. Screen doors should open outwards and be self-closing, and the screening should be protected by heavy wire netting or other means to protect it from damage, and this may well include the use of metal kick plates. Screens should be kept in good repair. Bed nets, in good repair and properly placed, must be used in sleeping quarters not provided with screens.

#### 8.4.2 Rodents

Rats and mice gain access to ships by various means including gaining access directly by hawssers and gang plants. Others may be concealed in cargo, ship’s stores and other materials taken onto the ship. However, the prevention of rat harbourage through appropriate construction and rat-proofing will ensure almost complete control of rodents aboard the ships.

Some ships may be difficult to rat-proof without major alterations. However, there are many rat-proofing measures that can be readily undertaken. These will materially reduce rat harbourage and will keep rat populations to a minimum after the vessel has been deratted, provided that appropriate operational control measures aboard ship are regularly followed.

All rat-proofing should be kept in good repair. Concealed spaces and structural pockets, openings greater than 1.25 cm leading to voids and food spaces, gaps around penetrating fixtures (e.g. pipes or ducts passing through bulkheads or decks) regardless of location, should be obstructed with rat-proofing materials, and the insulation layer around pipes, where over 1.25 cm thick, should be protected against rat-gnawing. Detailed techniques of rodent control may...
be found in standard manuals on this subject.

8.5 Operational control measures

8.5.1 Insects

One or more of the following control measures may be employed:

- Regular inspection of ship spaces, particularly where infestation is most likely to occur, such as food-storage, food handling and refuse disposal spaces;

- Elimination of enclosed spaces in which trash and debris, food particles, or dirt may accumulate;

- Frequent cleaning of living quarters and spaces where food is stored, prepared, or served or in which dishes and utensils are washed and stored;

- Proper storage and disposal of food refuse and rubbish;

- Removal of habitat for insect larvae, such as standing water lifeboats;

- Use of screens on all structural openings to the outer air during seasons when insects are prevalent; and

- The application of suitable insecticides.

Residual and space sprays should be used for the control of any flying insects that do invade a ship. Space sprays are released as a fog or fine mist and kill on contact. Residual sprays leave a deposit on surfaces where flying insects rest and where other insects crawl. Crawling insects and vermin are best controlled by specific insecticides, properly applied to the crawling, resting and hiding places. These residues retain their killing power for a considerable period of time.

As spray insecticides may contain substances toxic to man, all surfaces that come in contact with food and all dishes and utensils and food and drink must be covered or removed during spraying operations. Insecticides must not be stored in food spaces and the containers must be marked POISON and coloured to provide ready identification.

Vessels holding water should be screened from insects and inspected frequently to check for, and eliminate, mosquito breeding. Refuse stores should be screened and inspected frequently to check for, and eliminate, the breeding of flies.

8.5.2 Rodents

The master of the ship should delegate one person, such as the ship's carpenter, to be responsible for the trapping programme. Traps should be set after leaving any port where rats might have come on board either directly from the dock or with cargo or stores. If all traps are still empty after a suitable period, perhaps two days, they can be taken up. If rats are caught, the traps in that area should be rebaited and reset until no more rats are caught. A record of where the traps were set, the dates and results should be entered in the ship's log and a copy available for the port health inspector.
Regular inspection of the ship, particularly spaces where food is stored and prepared and where refuse is collected and disposed of, as well as cargo hold while in port, will readily show whether rodents have gained access to the ship since they leave droppings.

Pests pose a major threat to the safety and suitability of food. Pest infestations can occur where there are breeding sites and a supply of food. Good hygiene practices should be employed to avoid creating an environment conducive to pests. Good sanitation, inspection of incoming materials and good monitoring can minimize the likelihood of infestation and thereby limit the need for pesticides.

Most rodenticides are poisonous to man. The containers should be marked POISON and stored away from foodstuffs and food preparation and food storage areas; they should be coloured to prevent accidental use in food preparation. As rodenticides may be very toxic, caution must be used in their application, and instructions for their use carefully followed. The local public health authority should be consulted regarding methods and procedures for pest control, and may supervise the control operation.

### 8.5.3 Preventing access

Ships should be kept in good repair and condition to prevent pest access and to eliminate breeding sites. Holes, drains and other places where pests are likely to gain access should be kept sealed. Wire mesh screens, for example, on open windows, doors and ventilators, will reduce the problem of pest entry.

### 8.5.4 Harbourage and infestation

The availability of food and water encourages pest harbourage and infestation. Potential food sources should be stored in pest-proof containers and / or stacked above the ground and away from walls. Areas both inside and outside food premises should be kept clean. Where appropriate, refuse should be stored in covered, pest proof containers.

### 8.5.5 Eradication

Pest infestations should be dealt with immediately and without adversely affecting food safety or suitability. Treatment with chemical, physical or biological agents should be carried out without posing a threat to the safety or suitability of food.

### 8.5.6 Waste Management

Suitable provision should be made for the removal and storage of waste. Waste must not be allowed to accumulate in food handling, food storage, and other working areas so far as is unavoidable for the proper functioning of the ship.

### 8.6 Verification

Sanitation systems should be monitored for effectiveness, periodically verified by means such as audits and pre-operational inspections or, where appropriate, microbiological sampling of environment and food contact surfaces and regularly reviewed and adapted to reflect changed circumstances.
8.7 References