CHAPTER 9

CONDITIONS ABOARD SHEEP CARRIERS

The Shipboard Environment

9.1 Conditions aboard a livestock carrier are similar to intensive livestock production. The sheep are penned and confined and feed is distributed to each pen. A notable difference, however, is that the sheep are subject to the stresses of weather at sea. The modern carrier generally houses sheep in pens above the main deck, not below deck. The sheep are therefore subject not only to yawing, pitching and rolling, but also to wind and seaspray. In studies carried out in 1975 and 1978, M.P. Bond and J. Hartung implicated rough seas and bad weather as a cause of sheep mortality.[1] However, this work was done on older ships and its results, if correct, would not necessarily be applicable to modern carriers.

9.2 The ALEA stated that there might be data available in masters' reports showing a correlation between mortalities and rough weather but this had not been statistically analysed. It acknowledged that rough seas would probably cause inappetance which would lead to empty gut syndrome and finally salmonellosis, but they had not examined their statistics on this.[2] Napthine and Miller observed that 'sea sickness does not appear to be a problem for sheep'. Brennan concluded that further research is required to determine whether there is a link between rough weather and mortalities.[3]

9.3 Besides sea sickness, bad weather can cause cold stress, but no evidence is available on the extent of this problem. Carriers from the eastern States of Australia cross the

Great Australian Bight to reach the Middle East. Wind and temperature combine at times to inflict a possible chill factor on the sheep which would approximate that of the Portland feedlot. Sheep may be moved out of the pens on the windward side of the ship during bad weather but this leads to overcrowding.

9.4 Bad weather may mean salt spray washing into and over the ship and may cause a deterioration in the quality of the water supply. Brennan noted that water quality changes markedly after the ship encounters rough seas.[4] Other information received by the Commmittee indicated that many sheep died of saltwater poisoning on ships in rough weather if the crews did not attend to their needs. The spray and the weather can be so severe on some ships that it is difficult for the crew to change the water.

9.5 The ALEA did not believe that water quality deteriorated. Dr Franklin commented:

> 'If we consider that by far a huge percentage of the Australian sheep population has a relatively high salt content in the normal water intakes in the paddock, the amount of sea water that may come in the spray, unless it is under extremely exceptional circumstances, I think would be insignificant.'[5]

9.6 The AVA commented that there have been occasions when sheep carriers have had to drift in the straits in the Middle East for several days in very hot weather. When the carrier is not making any headway there is inadequate ventilation and mortalities increase.[6] The ALEA confirmed that:

> 'the time when we have the biggest problem is when there is high humidity and hign temperature. This we recognise. In most circumstances we will attempt to alleviate the conditions where possible, by one mechanism or another. It is a problem area.'[7]

'Sheep can probably handle the temperature change; it is the humidity that they cannot handle. Most of the areas in the Middle East are not humid. There are certain areas that are though.'[8]

9.7 The ALEA added that the mortality rate can double or treble if the temperature is over 38 degrees and if the humidity is between 85 and 90 per cent.[9]

9.8 The weather conditions encountered on the voyage to the Middle East appear to vary throughout the year. The heat and humidity reaches its peak in August and this coincides with the worst weather conditions in the Great Australian Bight.

9.9 The weather can impinge on the unloading of sheep at Middle Eastern ports. In all ports, livestock carriers are given priority in berthing. However, delays occur because of gales, sandstorms or similar problems.[10] Political circumstances may also lead to delays.

9.10 Dr Temple Grandin suggested the development of an environmental stress index which would determine various levels of temperature, humidity and air speed necessary to maintain a suitable environment for the sheep. Additional factors to be considered would be sheep condition, wool length, pellet formulation and stocking density.

9.11 Dr Meischke of AAHQS employed a woolbreak test using the Gordon technique to measure the stress on sheep during the voyage to the Middle East. In evidence to the Committee, Dr Meischke stated that there was no direct measure of stress or indeed pain or cruelty[11] and for an indirect measure there is difficulty in the comparison of the relative merits of biochemical or physical parameters.

Veterinarians Accompanying Shipments

9.12 Veterinarians engaged by the exporting companies have been making fairly regular voyages to the Middle East on live sheep carriers. Information obtained by these veterinarians have been mainly kept within their companies.

9.13 Until recently, AAHQS veterinarians or State Government veterinarians under the aegis of the AAHQS had made occasional voyages on live sheep carriers to the Middle East. These voyages were usually made on ships which had suffered unacceptable levels of mortalities or other problems.

9.14 The lack of a programme of government veterinarians travelling onboard live sheep carriers had been criticised by the AVA, the RSPCA and other organisations.

9.15 The ALEA told the Committee that ships had a complement of trained stockmen onboard, mostly Asian stockmen with some Australian head stockmen, who were more experienced than most veterinarians travelling on the ships. The ALEA doubted whether veterinarians would accomplish more for the welfare and health of the animals than the stockmen.

9.16 In October 1984, the Minister for Primary Industry approved a pilot programme for government veterinarians to make 20 or 30 voyages a year of the total of about 100 voyages. Although the veterinarians will be able to advise on animal health problems that might arise, their primary responsibilities will be research oriented. Their work will be tied in with research projects being conducted in Western Australia, and soon to be replicated in Victoria, that are investigating the reasons for losses incurred in the trade.

9.17 The government veterinarians will also provide a reliable check of mortalities occurring onboard ships and will be able to observe and report on other animal health and welfare matters. This will provide government authorities with much needed information on shipboard conditions and animal welfare.

9.18 Mr W. Gee, Acting Director of the AAHQS, told the Committee that the industry had begun to be more co-operative with government authorities on this and other matters. Without that co-operation it would have been more difficult to implement a programme of veterinarians accompanying shipments of sheep to the Middle East. Once a ship leaves Australian waters, it no longer comes under Australian jurisdiction.

9.19 Mr Gee emphasised the need to send veterinarians who had experience in flock management and health. He added that there were enough veterinarians available within the AAHQS and State Departments of Agriculture to implement the pilot programme.

9.20 The pilot programme will be assessed to determine whether government authorities and the industry will derive enough benefits from the programme to warrant its continuation on a long-term basis.

9.21 The Committee strongly supports the recent development of government veterinary officers travelling on about 20 per cent of voyages of live sheep carriers to the Middle East. The Committee RECOMMENDS that the implementation of this scheme be given high priority by the AAHQS.

9.22 The Committee believes that the shipping companies should employ Australians as head stockmen on live sheep carriers because of their experience in handling Australian sheep. These stockmen would also be better equipped to recognise

and treat health and welfare problems which might occur during the voyage and provide information on such problems to company officials and government authorities undertaking research into these problems. The Committee RECOMMENDS that the Federal Government encourage live sheep export shipping companies to employ Australian stockmen on live sheep carriers.

Animal and Human Health Considerations

9.23 If there is an outbreak of a major disease aboard a carrier, it has been a practice for the crew to mass medicate the sheep. There are several antibiotics and other drugs available onboard ship which may be used for therapeutic or preventive purposes.[12] Electrolytes can be used as 'salt' replacers, that is the electrolyte salts, cations and anions, in the body fluids of the sheep. Two particular uses have developed. First, where the sheep are subject to hot, humid conditions and develop respiratory acidosis because of excessive breathing, electrolytes are added to the water to restore normal ion balance. The second is where diarrhoea is evident and electrolytes will help replace ions lost through the scour.[13]

9.24 Antibiotics such as terramycin are also administered via the water. The ABAH standards specify a dose of 5 g per sheep per day of a broad spectrum soluble antibiotic such as terramycin.[14] This dosage could represent an actual dose of 0.25 g of the active ingredient. This 'actual' drug dosage is not made clear in the AAHQS standards.[15] The frequency of administration depends on whether it is used for preventive or therapeutic purposes.

9.25 There has been criticism of this practice. Antibiotics are administered less frequently now for financial reasons but the Committee has received information that the antibiotics are of poor quality and are administered incorrectly. There are no health controls over the administration of antibiotics aboard livestock carriers on the high seas.[16]

9.26 It has also been claimed that the administration of antibiotics does not conform to veterinary practice within Australia since the dosages vary. In automatic water systems the water is replenished in the troughs throughout the day so the concentration of the antibiotic powder is never static. Half an hour after administration the concentration may be 50 per cent less. Antibiotics are added to water in intensive systems in Australia but it is claimed that the export companies would not pay for slow release tablets and antibiotic injectors. Trained personnel are not employed to administer antibiotics.

9.27 Dr Dobson of the South Australian Department of Agriculture reported that:

> 'The effect of medication in relation to deaths is difficult to evaluate but at the best could only be described as being of marginal benefit. Deaths actually increased to their peak about 2 days after completion of medication.'[17]

9.28 There is no information available to determine whether residues of antibiotics administered during transport to the Middle East have any harmful effects on consumers.

9.29 The importation of exotic diseases by the trade in live sheep has been raised as a potential danger for Australia. There is no evidence that this has occurred but vigilance is required by the industry and government authorities to prevent it occurring in the future.

9.30 It has been alleged that quarantine problems may result from unused fodder in ships' holds which is returned for consumption by the next load of sheep. However, returned fodder is subject to strict quarantine controls and buildup of fungal toxins within two trips is very limited.[18]

Feed and Water

9.31 Contamination of feed and water could have serious consequences for the sheep aboard a livestock carrier. The problem of salt water washing into the water troughs and contaminating the water supply has been considered but does not appear to be a significant problem.

9.32 A source of contamination of more concern is the fouling with sheep droppings of both the feed and water troughs. Marine Orders Part 43, in a note, rather than as a requirement, specify that the top of a feed or water trough should be approximately 550 mm above the pen floor.[19] They suggest that a pipe or round bar be installed 75 mm off the top edge of the trough in order to minimise fouling. Other practices to overcome the problem have been the straining of a cable in front of the troughs at a suitable height[20] and the use of kick boards in front of the troughs.[21] Dr Peter Arnold commented that troughs should be above anal height to prevent contamination.[22] Grandin noted that on one ship the feed troughs appeared to be too high and it was difficult for sheep to eat. Excessive height may reduce feed intake as sheep naturally eat in a head down position and saliva flow may be hampered by high feed troughs.[23] A fender mounted off the trough may prevent contamination and not discourage feeding but it may also occupy valuable deck space. Another suggestion has been the installation of a step up to the trough. Dr K. Dobson conducted a trial aboard the 'Viborg' in which a 7.5 cm high wooden step was placed in front of the trough, but this did not result in reduced deaths in those pens.[24]

9.33 There is evidence that sheep which drink water with some fecal contamination are able to cope with it because they are ruminants with bacteria present in their digestive system, with the qualification that the water must be visually

acceptable and have no smell. The principal reason for the reduction of fecal contamination is that the chance of spreading disease via the water system is reduced considerably. The AAHQS commented:

> 'The problems of feed troughs and feed trough contamination remain unresolved. The problems can be overcome by constant attention to cleaning but it cannot be beyond the ingenuity of man to arrive at permanent solutions.'[25]

9.34 The Committee RECOMMENDS that the DOT, in consultation with the AAHQS, investigate the problem of trough fouling aboard live sheep carriers and revise the Marine Orders accordingly.

9.35 The ready availability of feed and water is important. There is evidence that denial of feed and water leads to maladaptation, scouring and gut infection which can become generalised and lead to high mortalities.[26]

9.36 The ALEA agreed that feed should be applied on a continuous basis so that all sheep have access to feed.[27] However, only 11 carriers have automatic feed systems and another one has a system which is partly automatic.[28]

9.37 The ALEA admitted that in ships with manual feeding systems it is impossible to keep feed in troughs all the time. On the larger ships feed is available for 24 hours 'or as close to 24 hours as physically possible'.[29] The Committee received information questioning the effectiveness of automatic feed systems but the Committee has not been able to substantiate these allegations.

9.38 The Committee has received evidence that in ships with automatic feeding systems, about 25 per cent of the sheep should be able to feed at the trough at one time. With a manual system and if feed is limited to one kilogram per head per day then all

sheep in a pen must have access to the feed at the same time otherwise some sheep will probably eat more than their share. A six inch trough space per sheep means that, on present stocking densities, this is not feasible. The only solution is the installation of automatic feeding machines. The ALEA told the Committee that:

> 'provided the feed is there for a reasonably long period of time and animals have a chance to rotate, the importance of the linear access of the trough is not as high as it is in a situation where you have limited feed and limited feeding time.'[30]

9.39 The availability of the feed in ships with manual feeding systems may be restricted by the rolling and pitching of the ship during bad weather because the crew are not able to replenish the troughs. Grandin points out that an advantage of automatic troughs is that they are less likely to slosh and spill water, because only a small amount of water in a deep trough needs to be available to keep the sheep supplied.[31]

9.40 The Committee RECOMMENDS that the DOT, in consultation with the AAHQS, assess the welfare benefits of automatic feeding and watering equipment and, if necessary, amend the Marine Orders to require their installation in live sheep carriers.

9.41 The revised Marine Orders specify that evidence should be provided by the Master 'attesting the capacity and efficiency of the water-generating equipment'.[32] The Marine Orders also specify that a reserve of 25 per cent or 3 days' requirements, whichever is the less, should be carried.[33] As far as the Committee can determine, the minimum additional quantity of water is carried. The Committee received information that the reserve requirement is not enough to cover both unforeseen problems at sea or delayed unloading and that instead, 33 per cent extra feed and water should be carried.

9.42 The Victorian Department of Agriculture commented that:

> 'the Marine Orders state three days on top of their normal expected voyage time. But we have had the situation that where vessels have been unduly delayed, they have been able to call in at other ports on their way. One was a live sheep vessel just recently that was unduly delayed across the Bight and it called in at Fremantle for more fodder.'[34]

9.43 However, this does not address the problem of delays occurring in transit from Fremantle to the Middle East.

9.44 The Committee RECOMMENDS that the DOT, in consultation with the LAC and the AAHQS, consider the question of optimum volume of reserve feed and water and, if necessary, revise the Marine Orders accordingly.

9.45 The distribution of the feed from the bulk lines can also present problems. The distribution might be done by bag or bucket in the case of manual systems or by conveyor, auger or pneumatic tube in the case of automatic systems. The problem with the former is that of disruption by bad weather or inability or reluctance to distribute the feed on the part of the crew. The problem with the latter is that the pellet is subject to various degrees of crumbling by the automatic equipment. Dr K. Dobson commented:

> 'While the system was moderately efficient, the raising of the pellets by auger and lowering again resulted in considerable crumbling of the pellets. This gave rise to excessive dust which is uncomfortable for both man and sheep and which makes feed unattractive and less palatable for sheep. ... This could be decreased by using a smaller pellet. Decreasing the distance of travel in augers and pipes before it gets to the sheep should also be considered.'[35]

9.46 It appears that conveyor equipment may cause less crumbling than auger or pneumatic systems.

9.47 The Committee RECOMMENDS that the DOT assess the merits of different feed handling systems in their ability to reduce crumbling of the pellet.

9.48 The Committee further RECOMMENDS that, on the basis of the DOT assessment, satisfactory feed handling systems be required to be installed in all future carriers entering the trade, and that the Marine Orders Part 43 be revised accordingly.

Ventilation

9.49 The ALEA told the Committee that if the temperature exceeds 38 degrees celsius and if the humidity is between 85 and 90 per cent, conditions which do occur at sea in the Middle East, the sheep mortality rate can double or treble.[36] Fels reported that by improving the ventilation in a sheep carrier mortalities were kept to reasonable levels. Extensive environmental measurements by Suiter and Dyer indicated that increasing the air movement reduced mortalities significantly.[37] Dr Dennis Napthine of the Victorian Department of Agriculture confirmed this view. He believed that air movement was a critical factor influencing the survival of sheep. He recommended that a thorough study of the effects of air movement on the survival of sheep during transportation be undertaken.[38]

9.50 The consequences for the sheep of a failure of ventilation machinery are considerable. The DOT reported two occasions from January 1979 to date:

> 'the Mukairish Althaleth, flag Saudi Arabia, on a voyage from Adelaide to Jeddah, departure 1 February 1984 ... loaded 28 000 head of sheep. At one period the ventilation broke down and the losses rose from less than one sheep daily to 70 during that period. We

> had one bad failure of the mechanical ventilation on a ship called the "Persia" - its flag was Lebanon - on a voyage from Fremantle to Suez. In September 1981 it loaded 49 500 sheep and due to the ventilation breakdown, the deaths were 8764.'[39]

9.51 The ALEA commented that since the 'Persia' disaster, the new Marine Orders have required every vessel 'to have a stand by generator installed, totally separate operationally and with a separate fuel line to the main generator, so in the event of a generator breakdown you have a back up generator'.[40] However, that part of Marine Orders only took effect on 1 July 1985 for ships with a pen area for sheep of more than 10 000 square metres but will not take effect until 1 July 1987 for ships with a smaller pen area.

9.52 The AAHQS has emphasised that greater consideration should be given to ventilation design. For example, Dr Meischke reported that on one ship the exhaust and intake of ventilation were close together.[41] Dr Brennan reported that 'Investigation into the effects of ventilation on ships is urgent and should utilize the services of an air conditioning engineer accompanied by a veterinary surgeon'.[42] Grandin suggested that an engineer with practical experience ventilating aircraft carriers, mines or large buildings would contribute to better design.[43]

9.53 Designers are required to work within the specifications set by the national regulating authority which, in Australia, is the DOT. There are differing national standards. The British requirement specifies 20 air changes per hour whereas Marine Orders Part 43 specifies 20-30 changes per hour or 75 per cent of this capacity if decks are not enclosed as in the above deck supercarriers. Captain John Collins, Marine Superintendent of the British Ministry of Agriculture, Fisheries and Food, prefers 30 changes per hour. Dr Kevin Dodd, veterinary

consultant to a major cattle shipper from Eire who also exports sheep and cattle from Western Australia, believes ventilation is critical and recommends 40 changes per hour. These air change specifications apply to in-hull converted cargo vessels, not above-deck converted oil tankers, according to Dr Neil Tweddle.[44]

9.54 Professor Muller of the University of Hohenheim, West Germany, has observed that high ventilation rates are not desirable when outside temperatures are low but ventilation must still be able to remove the carbon dioxide produced by the animals. In the Middle East, ventilation should be increased to maintain relative humidity not higher than 80 per cent. This is one of the few attempts, if not the only one, to provide a scientific rather than an ad hoc basis for ventilation specification.[45]

9.55 Air changes per hour is not an entirely adequate specification for ventilation. Brennan notes that high velocity air blasts may not penetrate far when sheep are in pens and, because of turbulence, they may create dead areas adjacent to the ventilation outlets.[46] Willson noted that the total amount of air ducted into sheep areas appeared to be adequate but the 'big problem' was the distribution of air throughout the pens. Air movement was evident in the alleyways but not at all evident in the sheep pens. He also noted a 'vast difference' in the air flow rates between the bottom and top levels of the sheep pens.[47] Grandin reported that most ships transporting sheep have a ventilation system which can exceed the minimum air changes required by the Marine Orders. The problem is that 'the air is not being evenly distributed throughout the space occupied by the sheep'.[48] The air movement was measured by Dr Napthine at various points throughout the sheep areas. He observed that the wind speed was 2m/sec within 0.5 metres of the ventilation outlet but he detected no movement of air more than

one metre from the ventilation outlet. He concluded that the sheep depended almost entirely on the air movement caused by the ship's forward movement.[49] Lt Colonel Harries of the South Australian RSPCA, noted that the movement of sheep in the pen during feeding dispersed the stale air.[50]

9.56 Unpublished work by Dr Peter Arnold has indicated that four knots (2m/sec) is the minimum amount of air movement in a pen of sheep. 'Below that it becomes very dangerous.'

9.57 The ALEA was unaware of any particular minimum standard of air flow in the sheep pens but it did acknowledge that movement of air in the pens was important.[51]

9.58 Dr Brennan reported that mortalities could be accurately predicted to occur in pens on the leeward side of the sheep house following conditions of high temperatures and humidity. It was stated that high humidity impaired the cooling of the sheep and rapid gasping respiration had been observed above 32°C and 90 per cent relative humidity, or above 35°C and 33-39 mm of mercury.[52] The ALEA responded that masters will take necessary action and will even circle during a voyage if they find they are getting an air vacuum in very still conditions.[53]

9.59 The Committee received evidence from a veterinarian who had accompanied a shipment of sheep that encountered these conditions. The captain had to meet a deadline in the port of destination and refused to zig-zag the ship. The veterinarian gave his views in writing but the captain did not respond. This veterinarian added that most captains were co-operative.

9.60 The AAHQS has stated that modern livestock carriers with large, high superstructures are difficult to maneouvre at sea and that the ventilation system should not require change of direction and the use of prevailing winds.[54]

9.61 The DOT informed the Committee that the Marine Surveyor tested the mechanical ventilation each time a sheep carrier visited Australian ports.[55]

9.62 The revised Marine Orders that came into force in July 1983 included minimum air changes but not air velocity. Although no contravention of the regulation occurs, the air circulation may be extremely poor in the sheep pens after loading and the bulk of the air flow could be wasted.

9.63 Dr Grandin concluded that the only valid method for the evaluation of the air distribution characteristics of a ventilation system was when the pens were filled with sheep. She had evidence that the sheep acted as a solid wall and changed the air flow patterns. She cited wind tunnel research with models by Muirhead which indicated that air flow through a cattle truck became weak when the animals were put into it.[56]

9.64 The airflow at the face level of the animal is extremely important. The velocity of this airflow is one of the most important means of inhibiting the effect of carbon dioxide and ammonia in the pens. The ALEA commented that ammonia levels are over-emphasised. They are often an indicator of poor air movement which is a worse problem than ammonia fumes.[57] They also commented that wet litter on the deck due to spillage, hosing, rain and salt spray can cause increased ammonia and humidity levels but that after a number of days it forms a 'dung pad' of dry fecal material which will absorb a lot of moisture, particularly urine, and keep the ammonia level down.[58] Dr Napthine confirmed this. Aboard the 'Al Qurain' he found that sheep droppings dried out quickly and became powdery. The urine was absorbed by the powder.[59] He recorded ammonia levels which ranged from 0-50 ppm. The levels were higher at the beginning of the voyage but he recorded 35 ppm on day 13. He commented that

the tolerance of sheep to ammonia levels was unknown and needed to be the subject of further research.[60] Dr Willson also recorded ammonia levels up to 50 ppm and 'an obvious build up of foetid air was also noted in some areas'.[61] More importantly he stated that this build up of foul air was not necessarily confined to areas where air movement was minimal. Obnoxious levels were also recorded where there was good air movement. Both Dr Willson and the marine surveyor accompanying him on the M.V. 'Persia' noted that, by day six, the worst ventilated areas in the ship became more apparent by a failure of the pen floors to dry out adequately, becoming progressively wetter until the worst areas contained liquid faeces and urine which resulted in foul odours and an increase in relative humidity.

9.65 Lt Colonel Harries confirmed that the limit of tolerance of a sheep to ammonia levels in the atmosphere, expressed in parts per million was unknown.[62] He recorded ammonia levels in the range of 5-40 ppm. Dr Grandin interviewed a number of exporters some of whom were concerned about high ammonia levels and some of whom did not consider high ammonia levels detrimental.[63] She concluded that 'exposure of animals to ammonia may inhibit their ability to resist disease' and the 'ammonia levels over 50 ppm during the major portion of the voyage would probably be detrimental to the sheep'.[64] Grandin noted that the new ships were equipped with indicators on the bridge to warn the captain of ventilation problems.[65] Dr Tweddle reported that automatic environmental monitoring is feasible and that analysis of recorded data for the shipboard environment and correlation with animal performance should then identify optimum conditions.[66]

9.66 The Committee RECOMMENDS that the DOT, in consultation with the AAHQS, undertake, as a matter of priority, an investigation of the effectiveness of ventilation standards required for sheep carriers, and revise Marine Orders Part 43 accordingly.

Livestock Carrier Design and Specification

9.67 NSW Animal Liberation in its submission expressed concern about the soundness of ships in the trade, referring specifically to the loss of the Farid Fares, the ventilation problems suffered by the Persia and the breakdown of the Al Shuwaikh on its first voyage.

9.68 The DOT informed the Committee that:

> 'The age of the ship is an important factor when considering conversion. It is a recognised fact that corrosion of the structure of livestock carriers is a major problem, so the service life of a ship depends very largely on the degree of maintenance carried out. Some ships are now reaching the stage when their continued viability as livestock carriers is open to question.'[67]

9.69 The DOT report on the sinking of the 'Farid Fares' concluded that:

> 'The majority of converted livestock ships in this trade are of average age of 25/30 years or more and represent on a comparative basis (the) lowest standards of maintenance of any class of vessels currently trading to Australian ports. Evidence of this will be readily available from Central Office files relating to adverse reports resulting from increased surveillance of this type of vessel by Departmental surveyors ... I raise these matters here to emphasise the underlying nature of maintenance problems on these vessels, thereby highlighting the potential for accidents resulting in a casualty as occurred in this case.'[68]

9.70 Dr Napthine told the 1984 annual conference of the AVA that older ships had a much higher mortality rate owing to poor ventilation and increased breakdowns in feeding and watering systems. 'The loss of sheep on the older vessels is unacceptable and the ships should be banned.'[69]

9.71 Dr Grandin reported that many sheep carriers were converted oil tankers which were big and slow. She said that several companies were considering the conversion of container ships or car carriers as they had abundant space and were faster than tankers. The configuration of a container ship would require enclosing of the pens and the installation of an effective ventilation system.[70]

9.72 Dr Grandin reported that a sheep carrier had to be large enough to achieve economies of scale but small enough to ensure adequate preparation of the sheep. In addition, there were few ports at both ends of the voyage with facilities to handle large shipments of sheep.

9.73 The specification and design of the ships are scrutinised by the DOT for both structural and engineering requirements. When the livestock plans are first submitted for approval, they are examined for design and stress suitability in the Ship Safety Branch of the Department. When the ship docks at an Australian port, two marine surveyors, one a master mariner and the other an engineer, inspect the ship. The engineer examines the machinery, ventilation equipment and engine room, and the master mariner will examine such things as fire-fighting equipment, feed and water and stability for compliance with Marine Orders Part 43 and other regulations.

9.74 The ABAH report 'Sea Transport of Sheep' (1981) gave details of a number of areas where there were deficiencies in specifications and design of carriers, but the revised Marine

Orders issued in July 1983 dealt with many of these problems, such as drainage, watertight and non-slip decks, lighting and a secondary source of power for ventilation.

9.75 Section 18 of the revised Marine Orders applies to ships' ramps. It specifies the gradient of the ramp, fitting of side panels and deck battens. Grandin observed that most ships had wide loading ramps that could accommodate six to 10 sheep abreast and were a big improvement over the narrow ramps of the older ships.[71]

9.76 There is evidence that vessels with a stiff roll, that is, they resist rolling until the pressure is too great and then roll suddenly, may throw livestock off their feet in rough weather and increase stress and mortalities.[72] No regulations apply to this design feature and the DOT informed the Committee that 'it is not a thing we would normally investigate'. The master of the ship would probably try to ballast or de-ballast the ship to make the voyage more comfortable.

9.77 The Committee RECOMMENDS that all live sheep carriers be required to meet the revised standards recommended in this report or be withdrawn from the trade.

Mortalities Aboard Sheep Carriers

9.78 On completion of a voyage, the ship's master is required to forward to the DOT a report on animal mortalities during the voyage. The current revised form of report requires details of daily mortalities from the beginning of loading until the final discharge of sheep at the port of destination. A summary of mortalities, excluding the periods of loading and unloading, for five years is presented in Table 9.1. The average mortality for the voyage is two per cent and additional losses are suffered during loading and discharge of the sheep.

Table 9.1: Summary of Sheep Losses at Sea 1979 TO 1984

	SHEEP EXPORTED	DEATHS	%
1979	5,311,432	105,959	1.99
1980	6,125,637	150,722	2.46
1981	4,822,704	112,794	2.34
1982	5,887,315	131,691	2.24
1983	6,254,703	131,047	2.10
1984	6,963,314	135,841	1.95

Source: Evidence pp. S1535-46, S2941.

9.79 In its submission to the Committee, the Department stated:

> 'It will be apparent that the practical value of the Master's report on mortality is limited as it is not an independent record. However, in the absence of any independent observer at the port of discharge and the difficulties of ensuring a correct tally both in Australia and at the overseas markets, no other avenue of assessing performance is considered practicable.'[73]

9.80 The reservations of the DOT have been expressed more forcefully by critics of the trade and by some people in the industry itself. The Committee has received many allegations of false mortality statistics being included in the masters' reports. The only evidence of possible discrepancies in masters' reports has been information obtained by Dr Tweddle of the Victorian Department of Agriculture from one insurance company of claims made to it for sheep losses on several voyages. A comparison of the insurance claims made and the reported mortalities by the master is shown in Table 9.2. It should be noted, however, that the insurance claims were probably for a

longer period than just the duration of the voyage. To prove a discrepancy in the master's report, it would be necessary to match the identical period in the insurance claim. This information is not available.

Table 9.2: Sheep Shipments to the Persian Gulf
Comparison of Insurance Claims and Masters' Reports

MASTERS REPORTS Deaths %	INSURANCE REPORTS Deaths %
0.09	0.3
0.8	1.8
2.7	7.3
3.2	4.3
1.6	2.2
3.1	5.9
1.7	2.4
1.2	2.4
1.4	10.7
3.8	7.5
1.2	3.0
1.5	2.7
1.7	3.5
3.1	6.6

Source: Victorian Department of Agriculture.

9.81 Lloyd's of London underwrite a lot of the insurance on livestock shipments in many parts of the world and in most cases, Lloyd's underwrite insurance contracts for brokers such as Middle Eastern insurance companies. A few consignments are

underwritten by Australian insurers. The marine insurers market in Australia is fragmented and there is no unified approach to insurance for the live sheep exporters.

9.82 Mr R. Ludeking, Marine Underwriter for Phoenix Prudential, commented that mortality rates have improved considerably over recent years but underwriters have become wary of giving too much credence to published statistics on average mortality because individual shipments depend on specific circumstances which should not be generalised. Most sheep insurance cover commences at time of arrival on the wharf at the point of embarkation and ends when the sheep are put in sheds or on trucks at the port of disembarkation. The insured value was approximately US$80 per sheep in August 1983.[74]

9.83 Mr Ludeking stated that:

> 'present insurance underwriting loss expectancy is between a range of 2.5 per cent to 7 per cent for individual shipments ... Underwriters identify the loss figures from pre-shipment, on board ship, and at point of unloading in their estimations, whereas it is understood that the official figures only take into account the number of deaths during the overseas voyage.'[75]

9.84 Underwriters are also aware of incorrect tallies. 'Past experience relating to short tallying is also a decisive factor when assessing a risk.'[76] If the tallies are incorrect at either end, mortalities may be either completely obscured or conversely, grossly exaggerated. The Committee is aware of a tally dispute concerning 1.11 per cent of sheep loaded, a tally dispute of this size would make a severe dent in mortality statistics of two per cent. Tallies have also been discussed in Chapter 8.

9.85 Apart from the controversy over the average mortalities sustained by the trade, a few significant incidents have occurred since 1980.

9.86 The DOT reported that the ventilation system aboard the 'Mukairish Althaleth' broke down in February 1984 and for the 28 000 sheep aboard the losses rose from one head per day to 70 per day.[77] This ship has now been withdrawn from the trade.[78] The DOT also reported that the deaths on board the 'Persia' in September 1981 were due to ventilation breakdown and totalled 8764 of the 49 500 onboard.

9.87 Since 1970, one livestock carrier, the 'Farid Fares', has sunk, resulting in the loss of 40 605 sheep.

9.88 The South Australian Department of Agriculture reported that with the breakdown of the 'Khaleej Express' and its return to Outer Harbour, Adelaide, on 27 July 1981, the transfer of 20 000 sheep to the 'Al Shuwaikh' involved the death of 635 sheep or 3.175 per cent.[79]

9.89 Earlier, in June 1980, the 'Khaleej Express' was on passage from Adelaide to Jeddah when its cargo of sheep suffered from an outbreak of a 'virulent disease'. A total of 2713 sheep, or 13.4 per cent of the 20 133 loaded, died but the majority of this loss, 2275, occurred within the first ten days of the voyage.[80] The 'Al Shuwaikh' on her maiden voyage after conversion to a sheep carrier, broke down off Fremantle because of damage to her main engine.[81] Fortunately, no sheep were on board.

9.90 These incidents indicate the possible mortalities caused by machinery failures and other contingencies.

9.91 The level of mortality onboard a sheep carrier is an indicator of animal health and welfare in that, for a shipment in which, say, two per cent die, the deaths will have been preceded by sickness or other suffering, and other sheep which have not died, will presumably have also been sick or have

suffered in some way. The inadequacy of mortality as an indicator is that the causes of death have generally been unknown and consequently, not all of them can be attributed to shipboard conditions. Overall, however, high mortalities indicate health and welfare problems and low mortalities indicate tolerable conditions, but not necessarily free of stress or suffering.

9.92 Moreover, given data from a large number of shipments over a reasonable period of time, it is assumed that random variations or inaccuracies would cancel one another and therefore the mortality statistics may be indicative of changes for better or for worse in the industry. The rapid improvements in the 1970s have been replaced by a reasonably constant level of mortalities in the 1980s.

9.93 The understanding of the causes of mortality is as equally important as being able to measure the rate of mortalities. There is a litany of postulated causes of mortality. The Brennan Report lists confirmed causes as:

- hypocalcaemia
- acidosis
- heat stress
- polioencephalomalacia
- salmonellosis
- clostridial infections
- trauma
- copper poisoning
- haemorragic enteritis
- pulmonary failure.

9.94 Brennan listed a number of factors which have been subjectively related to sheep mortality on livestock vessels and observed that three trends have been observed in mortality patterns:

- steadily rising mortality throughout the voyage (March to August)

- initially high mortality which steadily declines throughout the voyage

- a combination of the former two.[82]

9.95 Although some causes of mortality aboard sheep carriers are known, many others are not. In addition, there has been no large scale assessment of the suffering involved with live exports as reflected in the mortality rates. Many company veterinarians have been aboard sheep carriers and monitored feedlots but there has been no sustained, industry-wide attempt to solve these problems. The AAHQS stated that up to one million Australian sheep have died between purchase for export and unloading overseas during the past five years. Many more have suffered illness or injury, and have been rejected for export prior to loading or have survived to slaughter.

9.96 In the last two years, government authorities and the industry have begun to do research into the cause of mortalities. However, it is only with the recently approved programme of government veterinarians accompanying shipments of sheep to the Middle East that information obtained from post mortems will be available for analysis and inclusion in the broader research programmes currently underway.