

# **Investigation into the reportable cattle deaths on a sea voyage from Portland Victoria and Fremantle Western Australia to Turkey, June-July 2011**

## **1. Summary**

On 14 and 15 June 2011, 5,022 cattle and 2,914 sheep were loaded in Portland, Victoria. On 21 and 22 June 2011, a further 3,978 cattle and 43,596 sheep were loaded in Fremantle, Western Australia.

During the voyage to Turkey, 72 deaths occurred in the Portland cattle and 29 deaths occurred in the Portland sheep, equating to mortality percentages of 1.43% and 1.0% respectively.

There were 35 deaths in the Fremantle cattle and 342 deaths in the Fremantle sheep, equating to mortality percentages of 0.88% and 0.78% respectively.

The mortality percentage of the Portland cattle exceeded the reportable level of 1.0% prescribed by the *Australian Standards for the Export of Livestock* (ASEL). The mortality percentage of the Portland sheep and the livestock loaded in Fremantle did not exceed the reportable level and are therefore not discussed further in this report.

The consignment was accompanied by an AQIS-accredited veterinarian (AAV) who reported that the main or a significant contributing cause of cattle mortality was pneumonia.

A range of factors may have contributed to the high incidence of pneumonia including:

- Continuous cold, wet weather while in pre-export quarantine
- Some cattle were further stressed by being trucked from one registered premises to the other, having spent some time in water-logged paddocks
- Vaccination of cattle against bovine respiratory disease may not have been effective, because the manufacturer's directions (two separate inoculations) were not followed. Available data does not allow conclusions to be drawn regarding the effectiveness of the vaccine whether used according to manufacturer's directions or not.

These stressors are likely to have predisposed the cattle to pneumonia, the main cause or a significant contributing cause in the majority of diagnosed mortalities. Livestock with a compromised respiratory system were not able to tolerate hot and humid weather, particularly that between days 16 and 26.

Poor record-keeping by the AAV is unlikely to have contributed to cattle deaths, but has hindered analysis of voyage mortalities.

The report makes nine recommendations including that DAFF should work with industry to improve daily report templates and the exporter, AAV and registered premises should be audited by DAFF to establish if any potential breaches have occurred.

## **2. Information Reviewed**

DAFF investigated the deaths by reviewing the following information:

1. Report from the exporter
2. End-of-voyage and daily reports from the shipboard AAV who accompanied the consignment onboard the vessel
3. Statement from one of the Accredited Stockmen who accompanied the consignment onboard the vessel
4. Records from the AAVs who prepared the consignment
5. Report from the Master of the vessel
6. Report from the Australian Maritime Safety Authority (AMSA)
7. Report from the DAFF certifying officer
8. Records from the registered premises.

The exporter was unable to provide detailed information about any treatments administered to any of the livestock during the voyage, as the AAV did not keep such records. The exporter was able to identify which animals died, as well as the total number of animals which died due to each cause. However, the exporter was not able to specifically identify which animals died due to each cause.

## **3. Information Findings**

### **3.1. Pre-export preparation in the registered premises**

The cattle were assembled at two separate registered premises, identified in this report as A and B. Registered premises A received 2,150 head of cattle for this consignment between 31 May and 4 June 2011. Registered premises B received 2,923 head of cattle for this consignment between 2 June and 4 June 2011. All cattle were sourced according to ASEL requirements.

On 7 June 2011, 545 head of cattle were moved from registered premises A to registered premises B as high rainfall resulted in three paddocks and a large area of the premises becoming significantly waterlogged. No record could be found of advice from the exporter to DAFF that livestock were moved between registered premises. The cattle in both registered premises were being prepared to the same import requirements and were thus of the same health status.

There were no cattle deaths during the preparation period in registered premises A. There were three cattle deaths during the preparation period in registered premises B, which equates to a mortality rate of 0.10%. The registered premises operator recorded the deaths but did not advise DAFF as to their cause.

Turkey requires a period of at least 10 days pre export isolation for feeder cattle, and a number of additional vaccinations and/or treatments to be administered before export. As per these import requirements, all the cattle were treated with the broad-spectrum antibiotic oxytetracycline between 1 June and 9 June 2011. Between 31 May and 9 June 2011, all the cattle were treated once with a vaccine for infectious bovine rhinotracheitis, a viral respiratory infection implicated in bovine respiratory disease.

The consignment risk management plan (CRMP) submitted by the exporter to DAFF proposed the following additional risk management procedures for the consignment to manage the risk of bovine respiratory disease:

1. All cattle will be vaccinated against infectious bovine rhinotracheitis as per the importing country requirements
2. All cattle will also be vaccinated once with Bovilis MH®, a vaccine designed to reduce the incidence of bovine respiratory disease
3. Prophylactic treatment with Draxxin®, (an antibiotic [tulathromycin] specifically indicated for respiratory disease in cattle) for any groups which in the AAV's opinion, may benefit from this treatment
4. Daily monitoring of animal health
5. Cattle will be in the registered premises for 10 clear days
6. Any animals becoming ill and requiring treatment will be immediately removed from the consignment to minimise the risk of spread of disease. Tag numbers of rejected cattle will be recorded and will be removed from the final tag list
7. Cattle that become ill onboard will be treated appropriately by the AAV (eg antibiotic and anti-inflammatory drugs)

The exporter advised DAFF that none of the cattle prepared for export as a part of this consignment were treated with Draxxin® during the preparation period.

All the cattle were vaccinated against bacterial respiratory disease with a single dose of Bovillis-MH®. At registered premises A, 1,124 of the 2,150 cattle were vaccinated twice with Bovillis-MH® the vaccine manufacturer's directions are for two inoculations, not one.

Records provided to DAFF show that AAVs inspected the cattle during the 48 hours before loading. The AAVs were satisfied with the general health and welfare of the cattle; they were free from signs of disease and external parasites, and fit to travel.

The AAVs rejected 18 cattle from the consignment in registered premises A and rejected 16 at from registered premises B. Reasons for rejection included poor condition, skin and eye infections, lameness and the loss of identity tags. No cattle were rejected on the grounds of general ill health. In addition, all the cattle were examined in the registered premises on two occasions by the DAFF Veterinarian, once early in the preparation period and once following the inspection by the AAV.

The DAFF Veterinarian reported the cattle to be in good health and condition, noting that approximately one quarter of the cattle in registered premises A had thick winter hair coats. The shipboard AAV reported that all of the Angus and many of the Hereford cattle loaded in Portland has thick winter hair coats, in addition the majority of the cattle were liberally coated with faecal material.

A weather station near registered premises A reported rain on all 14 days during which cattle were being prepared for export. Registered premises B was recorded as experiencing rain or showers on nine of the 13 days of the preparation period.

### **3.2. Loading onto the vessel**

The loading records show that the stocking density of the cattle on the vessel was in accordance with the minimum pen area required by ASEL. The final heat stress risk assessment model indicated, at these stocking densities, the risk of a mortality incident due to heat stress complied with ASEL. The loading records also indicate that the amount of fodder and water loaded was in accordance with ASEL. After departure from Portland, the shipboard AAV and one of the Accredited Stockmen redrafted some lines of the cattle to take into account differences in size and weight. The AAV reported that this was done in difficult circumstances of rough sea conditions.

### **3.3. Cattle deaths during the voyage**

There were 72 deaths out of 5,022 cattle loaded in Portland, which is a mortality rate of 1.43%.

A summary of events based on the daily voyage reports to DAFF is set out in Table 1. The reportable mortality level for cattle is 1.0%. The reportable mortality level for the Portland cattle was triggered on day 28 of the voyage.

Table 1. Chronology of cumulative mortality (count and percentage) by day

Date	Day	Event	Daily mortality	Cumulative mortality	Cumulative mortality %
14–15 June 2011		5,022 cattle loaded in Portland.	0	0	0.00%
16 June	1		0	0	0.00%
16 June	2		1	1	0.02%
18 June	3		1	2	0.04%
19 June	4		0	2	0.04%

20 June	5		1	3	0.06%
21–22 June	6, 7	Loading in Fremantle	0	3	0.06%
23 June	8		2	5	0.10%
24 June	9		2	7	0.14%
25 June	10		1	8	0.16%
26 June	11		1	9	0.18%
27 June	12		0	9	0.18%
28 June	13		1	10	0.20%
29 June	14		2	12	0.24%
30 June	15		2	14	0.28%
01 July	16		2	16	0.32%
02 July	17		2	18	0.36%
03 July	18		0	18	0.36%
04 July	19		4	22	0.44%
05 July	20		4	26	0.52%
06 July	21		3	29	0.58%
07 July	22		4	33	0.66%
08 July	23		7	40	0.80%
09 July	24		3	43	0.86%
10 July	25		2	45	0.90%
11 July	26		2	47	0.94%
12 July	27		2	49	0.98%
13 July	28		3	52	<b>1.04%</b>
14 July	29		4	56	1.12%
15 July	30		5	61	1.21%
16 July	31		0	61	1.21%
17 July	32	Vessel arrived in Bandirma, Turkey and commenced unloading cattle	4	65	1.29%
18–19 July	33, 34		7	72	1.43%
20 July	35		0	72	1.43%
21 July	36	Unloading of cattle completed.	0	72	1.43%

### 3.4. Conditions during the journey and cattle health

#### Temperature, humidity and heat stress

The heat stress threshold (HST) is the maximum ambient wet bulb temperature at which an animal can control its deep body temperature using normal physiological mechanisms of heat loss, such as panting, sweating, and shunting blood to large skin areas such as the ears. The estimated HST is 30 °C for adult *Bos taurus* cattle.

The mortality limit (ML) is the wet bulb temperature at which the animals will start to die. The estimated ML is 33.2 °C for adult *Bos taurus* cattle (Maunsell Australia Pty Ltd 2003).

Figure 1 shows the wet bulb temperature for each cattle deck by day as well as the heat stress threshold (HST) and mortality limit (ML) for adult *Bos taurus* cattle. Deck temperatures were taken from the daily voyage reports submitted by the AAV. All cattle in the consignment were reported as being *Bos taurus*.

Figure 1 shows wet bulb temperature by deck and day:

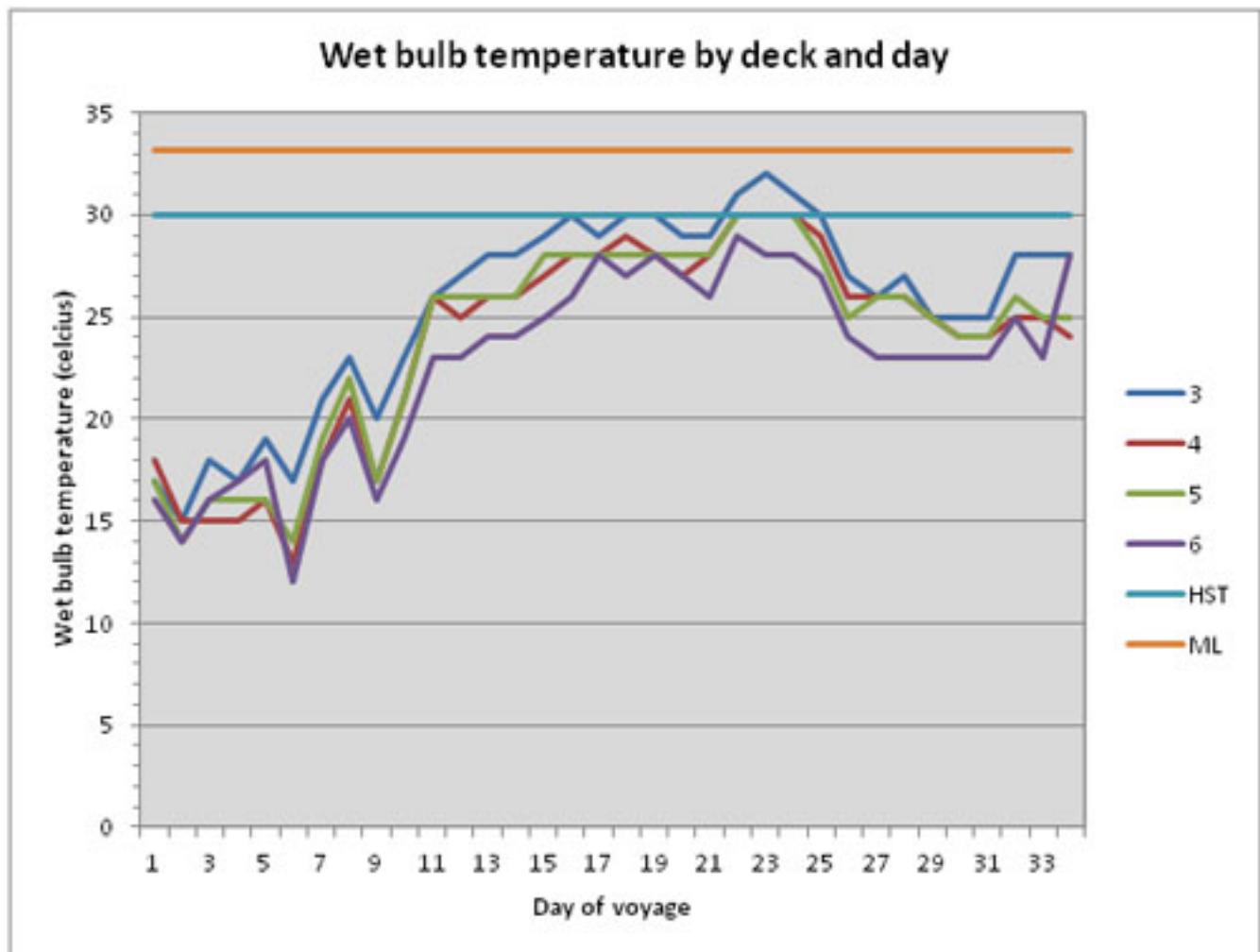


Figure 1. Wet bulb temperatures by deck and day, showing HST and ML for adult *Bos taurus* cattle.

For this consignment, the cattle were loaded on enclosed and mechanically-ventilated decks 3-6. The graph shows that the lower decks tended to record higher wet bulb temperatures than the upper decks.

The cattle on deck 3 were exposed to wet bulb temperatures at or above the HST on days 17, 19, 20 and 23–26. The cattle loaded on decks 4 and 5 were exposed to temperatures at or above the HST on days 23–25. The wet bulb temperatures did not exceed the ML on any deck on any day.

The cattle loaded on deck 6 experienced the highest percentage mortality despite consistently experiencing wet bulb temperatures lower than all other decks for the duration of the voyage. The cattle loaded on deck 3 experienced the next highest percentage mortality, with recorded wet bulb temperatures being consistently higher than those of other decks.

The AAV daily voyage reports show that the cattle displayed signs of mild heat stress on all decks during days 24–29 of the voyage. The AAV daily voyage reports did not record deaths related to heat stress during the voyage; however, the end-of-voyage report indicated that heat stress may have contributed to the some of the cattle found dead without previous signs of illness. The shipboard AAV also reported that some cattle suffering from pneumonia may have been ‘terminally reduced by heat and humidity’.

## Deck conditions

The daily AAV reports include information on deck conditions. Deck condition score definitions are provided in the *LiveCorp Stockman’s Handbook* (LiveCorp 2006) and are set out in Table 2.

Table 2: Deck condition score definitions

Score	Definition
1	Good, dry conditions
2	Wetter, but not serious conditions
3	Very wet conditions that need cleaning out

The daily AAV reports show that score 3 was recorded on all decks on day 28–29 of the voyage as the vessel was passing through the Suez Canal. The decks were cleaned the following day. The shipboard AAV and one of the Accredited Stockmen did not report that these conditions had a deleterious effect on the health and welfare of the cattle.

## Treatments administered

The end-of-voyage reports stated that antibiotic, anti-inflammatory and other treatments were administered to the cattle during the voyage. A list of the individual cattle that were treated during the voyage and the reasons for any treatments was not provided to DAFF. Detailed records of the veterinary medicines administered including the number of doses, dosages used or the total volumes administered during the journey were also not available.

The shipboard AAV later estimated that about 7.0% or 350 individual cattle loaded in Portland were treated during the voyage and of these, 70% or 245 were treated for respiratory diseases such as pneumonia. Other conditions that required treatment included lameness and eye infections. Little information was available as to the outcome of these treatments and it is not known whether or not treated animals subsequently died.

## 3.5. Cause of deaths

The shipboard AAV conducted post-mortem investigations where possible during the voyage, which included some of the days when the vessel was unloading livestock in port. Five cattle were euthanased on humane grounds due to prolonged recumbency and/or severe lameness.

The shipboard AAV diagnosed a cause of death based on a clinical examination and post-mortem examination in 48 of the 72 cattle that died during the voyage.

The shipboard AAV diagnosed the following causes of death:

- 24 (50%) due to pneumonia
- 10 (20.8%) due to septicaemia
- 9 (18.8%) due to inappetence
- 4 (8.3%) due to a combination of pneumonia and inappetence
- 1 (2.1%) due to a combination of pneumonia and septicaemia

These results are set out in Figure 2.

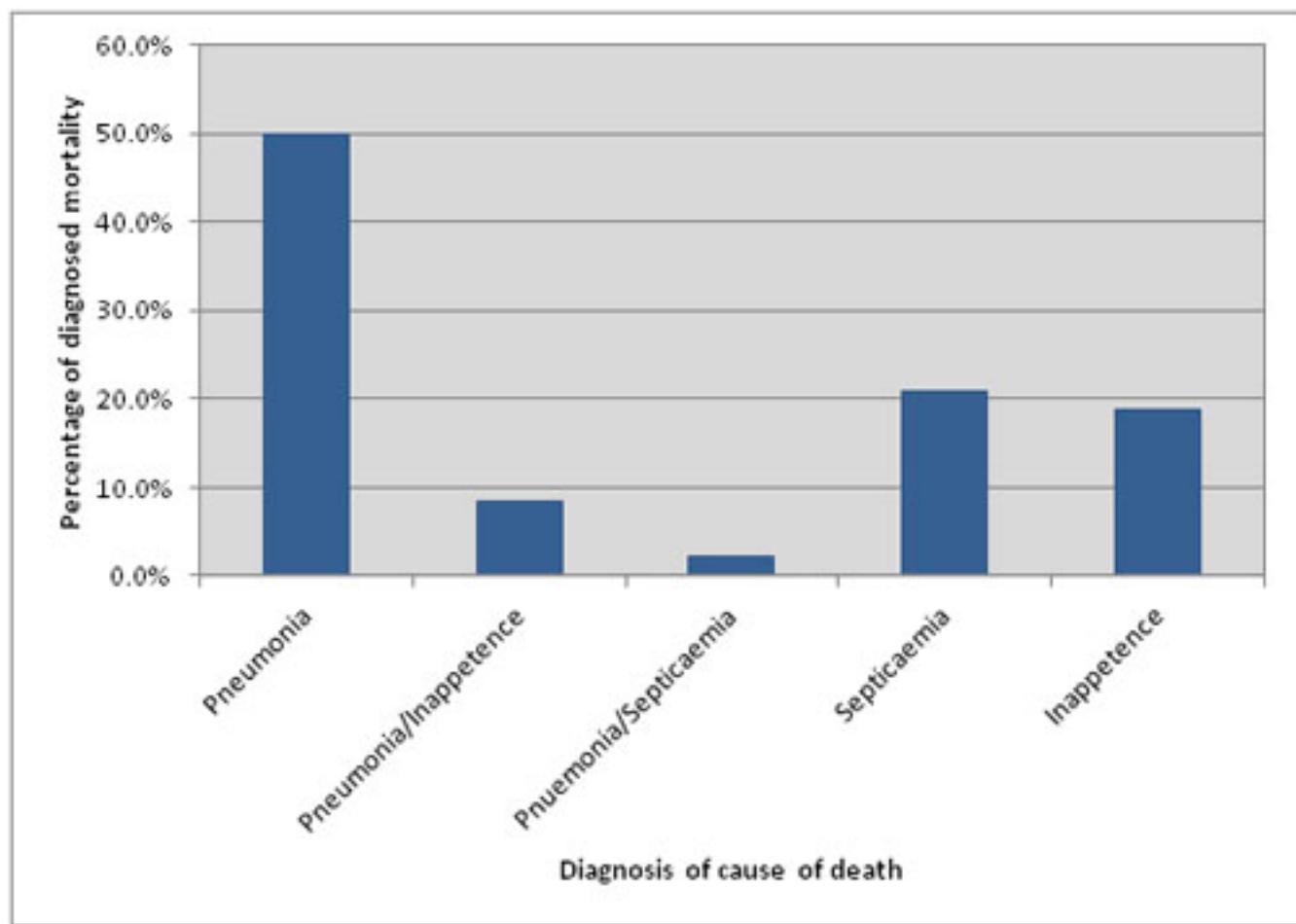


Figure 2: Percentage of deaths by cause

Pneumonia caused or contributed to 60.4% (29) of the diagnosed deaths that were recorded during the voyage.

### Deaths by day

Figure 3 shows the daily mortality percentage.

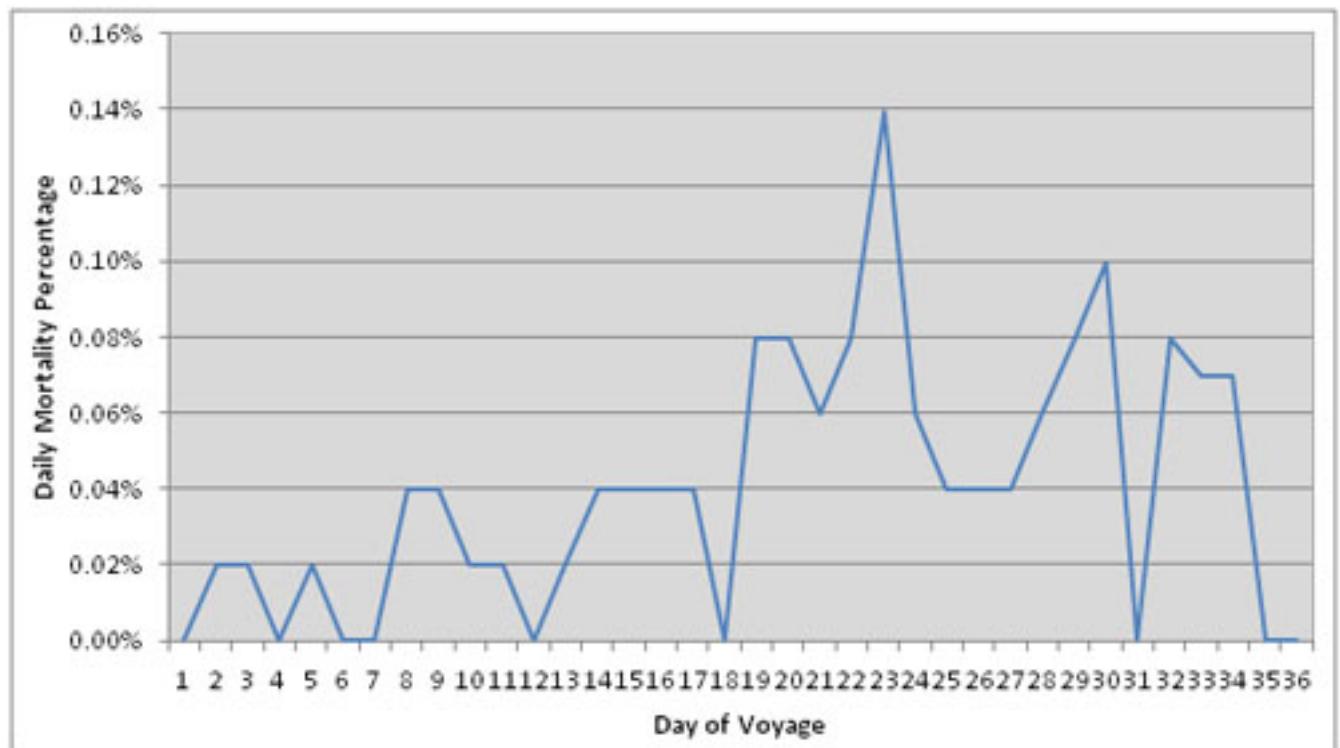


Figure 3: Daily mortality percentage. The blue line indicates the percentage of animals that died each day (not cumulative).

Figure 3 shows that the daily mortality percentage increased steadily from day 12 onwards, and this was accompanied by increased deck temperatures and humidity. The shipboard AAV diagnosed deaths as being due to pneumonia from day 12 until the voyage was completed.

### Deaths by commercial class

No conclusions can be drawn about the differences between the mortality percentages of different commercial classes, because the exporter advised that all 5,022 cattle loaded in Portland were assigned to a single commercial class.

The shipboard AAV and exporter were unable to provide detailed information about the breed of the cattle that died during the voyage. For this reason, no conclusions can be drawn as to the differences between the mortality percentages of different breeds.

All cattle exported from Portland were identified as *Bos taurus*. In the end-of-voyage report, the shipboard AAV commented on the high number of deaths of *Bos taurus* that had long winter hair coats and were exported from a Victorian winter through a Middle Eastern summer to Turkey.

### Deaths by property of origin

The property of origin is the property on which cattle were held before entering the registered premises for export preparation. For this consignment, the exporter sourced cattle from 70 properties of origin. Cattle that died were sourced from 27 properties of origin. The properties of origin from which more than one cattle death occurred during the voyage are set out in Table 3.

Table 3:Properties of origin from which more than one animal died during the voyage.

Property of origin	Number sourced for export	Number of deaths	Mortality %
1	13	3	23.08%

2	97	15	15.46%
3	49	3	6.12%
4	89	2	2.25%
5	120	2	1.67%
6	125	2	1.60%
7	1,720	23	1.34%
8	240	3	1.25%
9	849	3	0.35%

Table 3 shows that while 23.08% of the cattle sourced from property of origin 1 died, they represented only a very small proportion of the total consignment of 5,022 head.

Property of origin 2 represented a higher proportion of cattle in the consignment and 15.46% of these cattle died during the voyage.

### Deaths by deck

Figure 4 and Table 4 show mortality by deck based on the end-of-voyage report. The number of cattle per deck is based on a load plan submitted by the exporter. Decks 3 to 6 on this vessel are enclosed decks.

Figure 4: Mortalities by deck

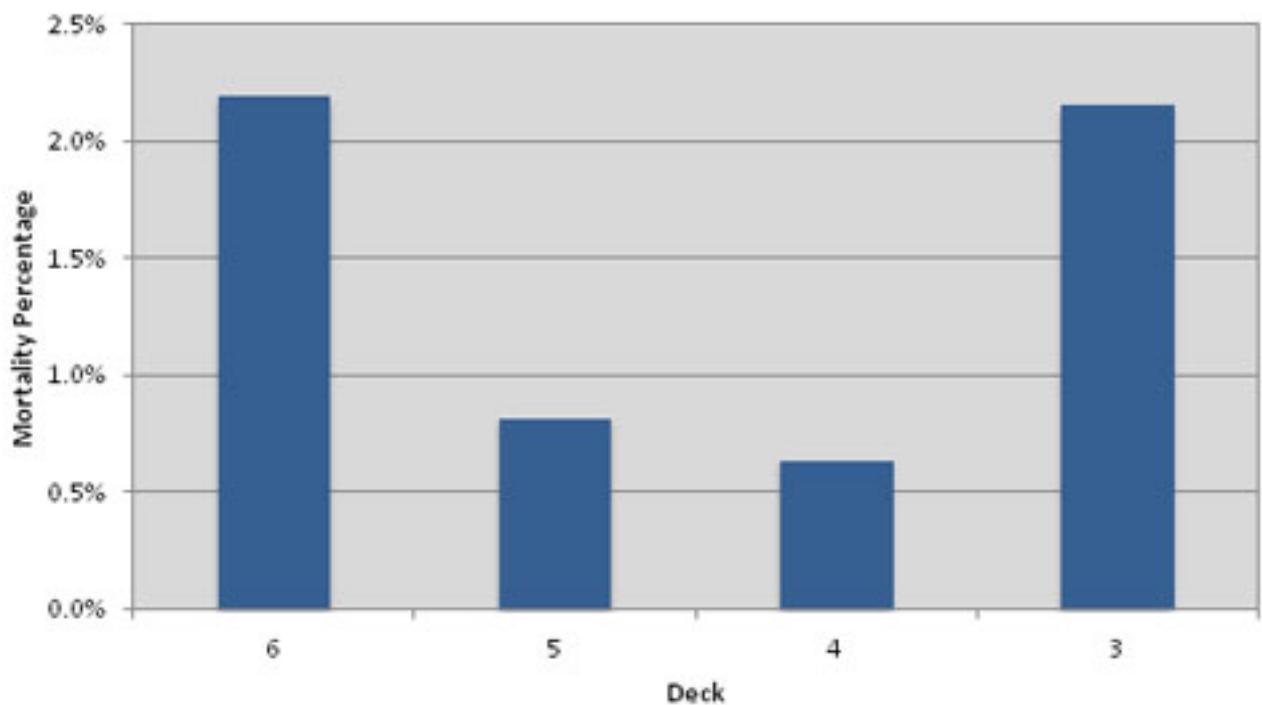


Table 4: Mortalities by deck

Deck	Number of cattle loaded	Deaths	Mortality %
3	511	11	2.15%

4	1,571	10	0.64%
5	982	8	0.81%
6	1,958	43	2.20%
<b>Total</b>	<b>5,022</b>	<b>72</b>	<b>1.43%</b>

The mortality percentage was highest on decks 3 and 6. Deck 3 experienced the highest recorded wet bulb temperatures during the voyage, whereas deck 6 experienced the lowest recorded wet bulb temperatures during the voyage. The lower the number of the deck, the closer to the keel.

### 3.6. Daily reports from the AAV

Section 4A.15 of the *Export Control (Animals) Order 2004* provides that the shipboard AAV must send a daily voyage report to DAFF, containing information on conditions on the vessel, and the health of the livestock. Under ASEL, ‘day one’ of the voyage is the first day at sea after leaving the port of loading. Combined daily reports were received for days 6 and 7 as well as days 33 and 34. The daily reports provided to DAFF did not consistently include all the information required by ASEL.

### 3.7. Discharge

Unloading of cattle occurred at Bandirma, Turkey during 17–21 July 2011. The shipboard AAV commented that unloading was at times delayed by a shortage of road transport but also the redrafting of cattle for commercial reasons and movement of cattle around the ship to facilitate the preferential unloading of sheep, again for commercial reasons.

### 3.8 AMSA evaluation of the vessel upon return to Australia

The AMSA evaluation of this vessel concluded that there was no breakdown or interruption of livestock services, equipment or machinery that contributed to the cattle deaths.

## 4. Evaluation

### 4.1. Cause of death

The shipboard AAV diagnosed pneumonia as the most common cause, or contributing cause of death in 60.4% of the deaths. Stress during the pre-export preparation period due to adverse weather conditions, lack of immunity to infectious pathogens, heat stress and stress of co-mingling and transport are likely to have contributed to the development of pneumonia in these cattle.

Other causes of mortality included septicaemia and inappetence. As the exporter was unable to provide detailed information about the deaths which occurred including treatments administered, breed or cause of mortality by property of origin, few conclusions can be made about predisposing factors. No diagnostic samples were taken so causative organisms were not able to be identified.

### Vaccination

The CRMP stated that cattle would be inoculated once with Bovilis MH®, a vaccine designed to reduce the incidence of bovine respiratory disease. According to technical information supplied by the vaccine manufacturer, two doses of the vaccine, three to four weeks apart are required for the vaccine to be effective.

Twenty-one cattle of the 1,124 head that were prepared in registered premises A, and that were vaccinated twice with Bovilis-MH®, died during the voyage, a mortality rate of 1.83%. Fifty-one of the remaining 3,877 cattle that were vaccinated once with Bovilis-MH died during the voyage, a mortality rate of 1.32%.

The exporter subsequently stated their belief that a single inoculation of Bovilis MH® is more effective than the manufacturer's instruction of two inoculations, but was unable to provide scientific evidence that a single dose of the vaccine provides protection against respiratory disease.

In most states and territories, it is an offence against the relevant legislation that regulates the use of veterinary medicines, to use the product contrary to manufacturer's directions (so-called 'off-label' use). A veterinary surgeon may prescribe 'off-label' use for a single animal only.

## **4.2. Property of origin factors**

The exporter was unable to provide information about the cause of death of each animal by property of origin. No further conclusions can thus be made about any property of origin factors which may have contributed to the high number of deaths in this consignment.

## **4.3. Registered premises factors**

Forty two cattle prepared for export in registered premises A died during the voyage, a mortality rate of 2.0%. Thirty cattle prepared for export in registered premises B died during the voyage, a mortality rate of 1.02%.

### **Weather in registered premises**

As stated above, a weather station near registered premises A reported rain on all 14 days during which cattle were being prepared for export. Registered premises B was recorded as experiencing rain or showers on nine of the 13-day preparation period.

It is likely that the wet and waterlogged conditions in registered premises A requiring cattle to be trucked to registered premises B contributed to the stress of the cattle during pre-export isolation, and may have been a predisposing factor in subsequent deaths.

## **4.4. Vessel and deck factors**

The proportion of deaths due to each of the causes set out in Figure 2 was generally similar on each deck. There is insufficient information available to determine if the differences in mortality rate between decks were driven by cattle factors, deck factors or a combination of the two.

Overall, it is unlikely that vessel or deck factors contributed to the mortality rate.

## **4.5. Weather during the voyage**

The wet bulb temperature approached or exceeded the HST between days 16 and 25. Figures 1 and 3 clearly show a correlation between increased cattle deaths and HST, starting from around day 19.

Livestock with a compromised respiratory system were not able to tolerate hot and humid weather particularly that experienced between days 16 and 26.

## **4.6. The shipboard AAV and the accredited stockmen**

Record keeping by the shipboard AAV was inadequate. As stated in section 2, the exporter was unable to provide detailed information about any treatments administered to any of the livestock during the voyage, because the shipboard AAV did not keep such records. The exporter was not able to specifically identify which animals died due to each cause.

Whilst the record keeping by the shipboard AAV was inadequate, there is no information to suggest that he did not properly perform his other duties of monitoring the health and welfare of the consignment as well as promptly treating or euthanasing sick or injured livestock.

There is no information to suggest that the accredited stockmen did not properly perform their duties.

## 4.7. DAFF

Record-keeping is a requirement for continuing registration for a veterinarian, and although s.4A.14(1)(a) of the *Export Control (Animals) Order 2004* requires AAVs to keep records of individual animal treatments. DAFF will work with industry to improve daily report templates.

## 4.8. Overall conclusions

The lack of a detailed treatment history for the cattle has hindered the analysis and the ability to draw specific conclusions. However what can be drawn from the analysis is as follows:

- The cattle are likely to have been stressed by continuous cold, wet weather while in pre-export quarantine. Some cattle were further stressed by being trucked from one registered premises to the other, having spent some time in water-logged paddocks. These stressors are likely to have predisposed the cattle to pneumonia, the main cause or a significant contributing cause in the majority of diagnosed mortalities.
- Vaccination of cattle against bovine respiratory disease may not have been effective, because the manufacturer's directions (two inoculations) were not followed.

## 5. Recommendations

As a result of the investigation, it is recommended the following actions be initiated by DAFF:

1. Reinforce to AAVs the requirement of s.4A.14(1)(a) of the Export Control (Animals) Order 2004 that they maintain detailed records of all treatments administered to cattle during a voyage, so that treated animals are identified and subsequently tracked from the property of origin, through the preparation period and voyage until discharge.
2. Require AAVs to submit the following information to DAFF as an attachment to the End of Voyage Report:

a) List of treatments:

Animal ID Visual / RFID	Location Deck / Pen	Date of treatment	Treatment(s) administered		Reason for treatment	Treatment outcome
			Drug	Dose		

Animals that become mortalities during the voyage will be recorded in a similar way.

b) List of mortalities:

Animal ID Visual / RFID	Location Deck / Pen	Date of mortality	Post mortem finding(s)	Cause(s) of mortality

3. Provide the outcomes of this investigation into the MLA / LiveCorp Export Research and Development Program research project titled W.LIV.0252: 'Investigating cattle morbidity and mortality to the Middle East.'  
This project includes standardised post mortem techniques as well as collection and return to Australia of samples from cattle so that a definitive diagnosis can be made.
4. To establish if any potential breaches have occurred, audit the operations manual of the exporter, with particular reference to:
  - livestock selection
  - livestock identification
  - onboard management.
5. To establish if any potential breaches have occurred, audit the shipboard AAV, with particular reference to record-keeping on this voyage and three subsequent voyages.
6. To establish if any potential breaches have occurred, audit other shipboard AAVs contracted by this exporter, with particular reference to record-keeping on three subsequent voyages.
7. To establish if any potential breaches have occurred, audit the registered premises with particular reference to:
  - suitability of certain paddocks during prolonged wet weather
  - the connections between registered premises A and registered premises B to determine whether animals may be legitimately transferred between them.
8. DAFF should refer the matter of the AAV's record-keeping to DAFF Investigations and Enforcement to assess whether there are grounds to issue a brief to the Director of Public Prosecutions (DPP) concerning compliance with s.4A.14(1)(a) of the *Export Control (Animals) Order 2004*.
9. When assessing CRMPs, disregard any proposed use of a registered veterinary medicine for the purposes of risk mitigation inconsistent with the manufacturer's recommendations.

## 6. References

Maunsell Australia Pty Ltd. 2003. LIVE.116 Development of a heat stress risk management model. Meat and Livestock Australia.

Ainsworth, R (2006). Stockman's Handbook Transportation of Cattle by Sea – Short & Long Haul Voyages. LiveCorp March 2006.

**Last reviewed:**

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