



# final report

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## Live Export Veterinary Disease Handbook

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## 1 Abstract

This project has developed a Live Export Veterinary Handbook in electronic format, suitable for dissemination as either a printed Handbook or as an electronic file. The Handbook is intended to serve as a concise reference source of practical information focused on conditions likely to be experienced across the live export supply chain, with a particular focus on the steps from arrival at an assembly feedlot in Australia to discharge at a destination port in an overseas country. The Handbook is intended to be used by veterinarians and stockpersons and any other individual with responsibility for animal health and welfare during the export supply chain. It is recommended that a process be developed to allow periodic review and updating of the Handbook to ensure that it remains current and useful for export industry stakeholders.

## 2 Executive summary

This project has delivered a completed version of the Live Export Veterinary Handbook. The Handbook has been provided to Meat and Livestock Australia as an electronic file in Microsoft Word®.

The project involved development of a draft Table of Contents that was then reviewed by several individuals with extensive experience in the live export industry. A draft Handbook was then written by the project team. Printed and electronic copies of the draft Handbook were then formally reviewed by a number of stakeholders with experience in the live export trade as well as expertise in food animal medicine and surgery. Feedback from this review process was then used to guide the final production of the completed Live Export Veterinary Handbook.

The Handbook is intended to serve as a concise reference source of practical information focused on conditions likely to be experienced across the live export supply chain, with a particular focus on the steps from arrival at an assembly feedlot in Australia to discharge at a destination port in an overseas country.

The Handbook is arranged in A5 format, intended to be printed on water-resistant paper with a ring binding. This option is suggested to provide a compact and portable reference source that can be carried on a voyage by animal health workers.

The Handbook is intended to be used by veterinarians and stockpersons and any other individual with responsibility for animal health and welfare during the export supply chain.

It is recognised that the information provided in this Handbook is likely to require periodic review to reflect advances in information and knowledge about conditions affecting livestock during the export process and changes in the monitoring of animal health and welfare during export.

It is recommended that the Live Export Veterinary Handbook be published and made available in either printed or electronic form to all relevant stakeholders with a responsibility for animal health and welfare during export.

In addition it is recommended that there be a process to facilitate regular review and updating of the Handbook. It is expected that AAVs and stockpersons and other individuals such as feedlot managers and third party veterinarians (people who may be using the Handbook as a reference source during routine export operations) will have various comments about changes that might improve the usefulness of the Handbook. One option for managing this process may be to have a brief message incorporated into the front of the Handbook (such as the end of the introduction) that provides a mechanism for feedback to be received (address or email). Over time this can be collected and then changes made. Alternative mechanisms include incorporation of discussion of the Handbook with stakeholders as part of regular meetings such as interaction with stakeholders over R&D and operations.

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### 3 Background

There is ongoing commitment within the Australian live export industry for continual improvement of management of animal health and welfare during the export process. An important underlying theme in recent R&D projects aligned with this commitment has been the development of standardised systems for assessing health, investigating disease and recording information that can contribute to industry quality assurance (monitoring) programs. This project provides an important contribution under this broader theme.

A number of recent projects have assisted in the development of systems designed to deliver standardised approaches to the monitoring of animal health in cattle during export voyages. A current research project (W.LIV.0252) has specifically developed standardised protocols for implementation on cattle voyages to the Middle East, including collection of data describing animal health status during voyages, description and investigation of sick animals, and post mortem procedures and sample collection from dead animals to determine cause of death. These activities have been developed as part of a multi-year research project with the intention that lessons learned from this process would inform development of modified systems intended to be sustained under routine industry operations. W.LIV0252 has developed a Veterinary Export Handbook which details common conditions in export cattle and provides detailed approaches and template forms for investigation of sick and dead animals and for monitoring of animal health. This handbook is currently used on long haul voyages under project protocols to collect data on causes of illness and death during long haul voyages.

Another project (W.LIV.0161) has produced training materials and delivered training courses for AQIS Accredited Veterinarians (AAVs) that provides resources and training in the standardised methods for health monitoring and disease investigation as outlined in the Veterinary Export Handbook.

This report describes the development of a ***Live Export Veterinary Handbook***.

The Live Export Veterinary Handbook is intended to extend the approaches described above by expanding the species coverage to include all major livestock species exported from Australia (beef cattle, dairy cattle, sheep and goats), incorporating additional material relevant to the management of animal health and welfare during export, and ensuring the outcome is a manual that is designed to be useful in routine voyages as opposed to the specific research project focus of the Veterinary Export Handbook produced for W.LIV.0252.

The Live Export Veterinary Handbook will provide a resource of information specifically written for export conditions. It will address the variable knowledge and experience of veterinarians and stockpersons charged with preventing, detecting and treating diseases and conditions of exported animals. It will provide best practice information and standardised approaches to ensure that veterinarians and stockpersons can achieve optimum and consistent animal health and welfare outcomes for exported animals, and is intended to cover the period from arrival at assembly feedlots to discharge at overseas destinations.

## 4 Project objectives

Delivery of the Live Export Veterinary Handbook as an electronic file (MS Word) suitable for publication and that will provide information on:

1. Incidence, causes, diagnosis, treatment and prevention of disease conditions known to occur in key export livestock species (sheep, goats, dairy cattle and beef cattle);
2. Diseases and conditions likely to occur in animals during the period from arrival at the assembly feedlot, during the export voyage and ending with discharge at the overseas destination port;
3. Particular emphasis will be placed on those conditions that are both common in export animals and that have the potential to result in significant morbidity and/or mortality (salmonella, inanition, heat stress, respiratory disease);
4. Treatment(s) for all conditions that utilise therapeutics described in the LiveCorp / MLA Best Practice Use of Veterinary Drugs Manual.

## 5 Methodology and content

### 5.1 Development and review of the draft

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A draft Table of Contents for the Live Export Veterinary Handbook was developed by the project team in consultation with a small number of veterinarians with experience in live export and was then sent to a number of industry stakeholders for review. Feedback was incorporated into a final Table of Contents.

The project team then proceeded to produce material under each of the headings in the finalised Table of Contents. Dr Tristan Jubb was responsible for producing the first draft of the material and this was then edited by the project team. Dr Tony Mellor was contracted to generate original drawings for a number of illustrations.

The completed draft Live Export Veterinary Handbook was printed in monochrome, A5 format, in a limited print run and copies were sent to selected reviewers. The format and paper and binding were selected to represent a likely appearance and size of the finished version. The reviewers were selected to include a range of stakeholder groups, including in particular individuals with export experience and expertise, and individuals for specialist training in food animal medicine and surgery. A list of reviewers is provided here:

- Dr Richard Norris, DAFWA
- Dr Bruce Twentyman, AVA Director
- Dr Michael McCarthy, AAV
- Dr Geoff Manefield, AAV
- Dr Peter Rosher, Cattle veterinarian and export consultant
- Dr Geoff Niethe, MLA veterinary advisor

- Dr Tony Brightling, Export manager
- Dr David Jarvie, Export manager
- Dr John Creeper, DAFWA – Veterinary pathologist
- Dr Matt Izzo and Dr John House, University of Sydney, Livestock Veterinary Service (food animal medicine and surgery)
- Dr Jo Moore, PhD candidate involved in W.LIV.0252
- Dr David Beatty

Reviewers were all contacted by email and asked if they would provide feedback on the draft. They were then posted a printed and bound copy of the draft Live Export Veterinary Handbook, along with a brief background to the project and also a summary of the purpose and objectives of the project. Reviewers were asked to submit feedback in a format of their choice and an offer was made to send an electronic file (word document) of the draft Live Export Veterinary Handbook to allow reviewers to make editorial comments using the *track-changes* facility in word.

Responses were received from reviewers, and were assessed by the project team. Detailed reviews were received from five of the review panel and briefer comments were submitted from other reviewers. Feedback was received as hand-written comments on the printed copy of the draft Live Export Veterinary Handbook, as electronic comments inserted using *track-changes* into a word file version of the draft Live Export Veterinary Handbook, and as separate word files or emails.

All feedback was received and reviewed and changes were then made to the draft to develop the final version of the Live Export Veterinary Handbook. The feedback resulted in substantive changes being made to the order and content of the Live Export Veterinary Handbook and the reviewers are gratefully acknowledged for their effort in reading the draft Live Export Veterinary Handbook and providing this feedback. While every comment and issue raised was considered, there were a small number of issues raised by individual reviewers that were considered for inclusion into the final version and were ultimately not incorporated. These decisions were made by the project team and were based on the need to produce a Handbook that met the objectives while not attempting to be all things to all stakeholders.

## 5.2 Table of Contents

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The following section presents the Table of Contents from the completed Live Export Veterinary Handbook.

1. Introduction
2. Investigating a disease event
  - 2.1. Introduction
  - 2.2. Conceptual framework
  - 2.3. Investigation steps
  - 2.4. Collecting information

3. Detecting sick animals
  - 3.1. Introduction
  - 3.2. Inspection methods
  - 3.3. Specific observations and measurements
4. Diseases and conditions of exported cattle, sheep and goats
  - 4.1. Introduction
5. Specific diseases and conditions (*see subsequent pages for detailed list of conditions*)
6. Management of feeding at sea
  - 6.1. Introduction
  - 6.2. The importance of rumen fermentation
  - 6.3. Characteristics of export diets
  - 6.4. Feed adaptation problems
  - 6.5. Feed quality problems
  - 6.6. Feed supply problems
  - 6.7. Management of inappetence
7. Management of drinking water at sea
  - 7.1. Introduction
  - 7.2. Water adaptation problems
  - 7.3. Water quality problems
  - 7.4. Water supply problems
  - 7.5. Detection of watering problems
  - 7.6. Intervention and prevention of watering problems
8. Decision making for seriously sick or injured livestock
  - 8.1. Introduction
  - 8.2. Management options
9. Euthanasia
  - 9.1. Introduction
  - 9.2. Issues for euthanasia
  - 9.3. Confirming death
  - 9.4. Methods for euthanasia
10. Introduction to field necropsy
  - 10.1. General introduction
  - 10.2. Equipment
  - 10.3. Methods for sample collection
11. Field necropsy of ruminants
  - 11.1. Stages of the ruminant necropsy
  - 11.2. After the necropsy
12. How to recognise non-lesions at necropsy
  - 12.1. Introduction
  - 12.2. Normal physiological changes and structural variation
  - 12.3. Agonal changes
  - 12.4. Postmortem autolytic and decomposition changes
13. Further reading
14. Appendix 1: Assessing heat load risk
  - 14.1. Wet bulb temperature rise (HotStuff)
  - 14.2. Temperature humidity index (THI)
  - 14.3. Heat load index (HLI)



- 14.4. Effective temperature index (ETI)
- 14.5. Calculating wet bulb temperature rise
- 15. Index

### 5.3 Clinical syndromes and specific diseases of livestock

Specific diseases of sheep and goats, and cattle were then listed in tables and arranged in alphabetic order under syndromes. A syndrome is a common set of signs that may be displayed by animals suffering from one or more conditions. When animals present with a syndrome, the animal could be suffering from one or more of the specific conditions that may be associated with that syndrome.

Each of the specific disease headings listed in this table was then accompanied by a page reference to the following section of the Live Export Veterinary Handbook where detailed information is presented on each disease or condition.

It was recognised that a relatively large number of diseases and conditions are mentioned including some that are rarely seen. Less common conditions are included for completeness, because they are differential diagnoses for syndromes that have other more common causes and to help users make accurate diagnoses for insurance, disease reporting and exotic disease exclusion purposes.

The major conditions that can cause increased mortality and that have triggered disease investigations in the past were highlighted by being underlined in the table and being marked with an asterisk: salmonellosis, inanition, heat stress, pneumonia and trauma in sheep, and respiratory disease or pneumonia, heat stress and trauma in cattle. This approach was implemented to ensure that people unfamiliar with conditions in exported livestock may receive guidance on those conditions that may be considered more important. It is noted that on any individual voyage, a range of conditions may occur and other conditions may actually be more important on any one voyage. However, the diseases that were highlighted are considered to represent important conditions over many voyages and therefore it was considered useful for these specific conditions to be highlighted for readers.

**Table 1: Syndromes and specific diseases of sheep and goats. Reproduced from Table 4.1 in the Live Export Veterinary Handbook.**

| Syndrome               | Specific disease topics in Handbook  |
|------------------------|--|
| Abdominal distension   | Abdominal distension<br>Abdominal hernia<br>Bloat<br>Gastrointestinal obstruction<br>Pregnancy – advanced<br>Urinary tract obstruction |
| Colic (abdominal pain) | Abdominal distension   |

|             |   |
|-------------|---|
|             | <p>Diarrhoea</p> <p>Enterotoxaemia</p> <p>Peritonitis</p> <p>Rumen acidosis</p> <p>Urinary tract obstruction</p>  |
| Diarrhoea   | <p>Coccidiosis</p> <p>Copper deficiency</p> <p>Enterotoxaemia</p> <p>Gastronintestinal parasitism</p> <p>Indigestion</p> <p>Rumen acidosis</p> <p><u>Salmonellosis*</u></p>   |
| Eye disease | <p>Eye discharge</p> <p>Eye foreign body</p> <p>Pinkeye</p>   |
| Illthrift   | <p>Bulling</p> <p>Caseous lymphadenitis (Cheesy gland)</p> <p>Gastronintestinal parasitism</p> <p>Illthrift</p> <p><u>Inappetence / inanition*</u></p> <p>Johne's disease</p> <p>Ketosis</p> <p>Abscess</p> <p>Malnutrition</p> <p>Monensin poisoning</p> <p><u>Salmonellosis*</u></p> <p>Shy feeders</p> |
| Lameness    | <p>Arthritis</p> <p>Bulling</p>   |

|                        |   |
|------------------------|---|
|                        | <p>Foot abscess</p> <p>Footrot</p> <p>Knuckling</p> <p>Lacerations</p> <p>Lameness</p> <p>Laminitis</p> <p>Nutritional myopathy</p> <p>Overgrown hooves</p> <p>Sole bruising</p> <p>Swollen legs</p> <p><u>Traumatic injuries*</u></p>  |
| <p>Nasal discharge</p> | <p>Nasal bots</p> <p>Nasal discharge</p> <p>Oesophageal obstruction</p> <p><u>Pneumonia*</u></p> <p>Respiratory distress</p>  |
| <p>Nervous disease</p> | <p>Annual rye grass toxicity</p> <p>Copper deficiency</p> <p>Downer</p> <p>Enterotoxaemia</p> <p>Hepatic encephalopathy</p> <p>Hypocalcaemia</p> <p>Ketosis</p> <p>Listeriosis</p> <p>Middle ear abscess</p> <p>Meningitis</p> <p>Nitrate – nitrite poisoning</p> <p>Poisoning</p> <p>Polioencephalomalacia</p> |

|                      |  |
|----------------------|--|
|                      | <p>Salt poisoning</p> <p>Spinal cord injury</p> <p>Transit tetany</p>  |
| Respiratory distress | <p>Asphyxiation</p> <p><u>Heat stress*</u></p> <p><u>Pneumonia*</u></p> <p>Respiratory distress</p>  |
| Skin lesions         | <p>Abdominal hernia</p> <p>Abscess</p> <p>Actinobacillosis</p> <p>Alopecia</p> <p>Dermatophilus</p> <p>Fleece rot</p> <p>Flystrike</p> <p>Itch mite</p> <p>Lacerations</p> <p>Lice</p> <p>Photosensitisation</p> <p>Pizzle rot</p> <p>Ringworm</p> <p>Scabby mouth</p> <p>Skin swellings</p> <p>Squamous cell carcinoma</p> <p>Warts</p> |
| Sudden death         | <p>Acidosis</p> <p>Annual ryegrass toxicity</p> <p>Asphyxiation</p> <p>Blackleg/malignant oedema</p> <p>Bloat</p>  |

|                                 |   |
|---------------------------------|---|
|                                 | <p>Copper poisoning</p> <p>Cyanide poisoning</p> <p>Electrocution</p> <p>Enterotoxaemia</p> <p>Hypocalcaemia</p> <p>Lupinosis</p> <p>Nitrate – nitrite poisoning</p> <p><u>Pneumonia*</u></p> <p>Polioencephalomalacia</p> <p>Rumen acidosis</p> <p><u>Salmonellosis*</u></p> <p>Smothering</p> <p>Sudden death</p> |
| Straining                       | <p>Coccidiosis</p> <p>Constipation</p> <p>Gastrointestinal obstruction</p> <p>Pizzle rot</p> <p>Prolapse of rectum, uterus, vagina</p> <p>Urinary tract obstruction</p>   |
| Swellings on the body and limbs | <p>Abdominal hernia</p> <p>Arthritis</p> <p>Blackleg</p> <p>Bloat</p> <p>Caseous lymphadenitis</p> <p>Haematoma</p> <p>Mastitis</p> <p>Pizzle rot</p> <p>Prolapsed rectum</p> <p>Prolapsed vagina</p>   |

|                               |   |
|-------------------------------|---|
|                               | Urinary tract obstruction/rupture   |
| Swelling of the head and neck | <ul style="list-style-type: none"> <li>Abscess</li> <li>Actinobacillosis</li> <li>Bighead</li> <li>Bluetongue</li> <li>Bottle jaw</li> <li>Goiter</li> <li>Iodine deficiency</li> <li>Retained cud</li> </ul> |

**Table 2: Syndromes and specific diseases of cattle. Reproduced from Table 4.2 in the Live Export Veterinary Handbook.**

| <b>Syndrome</b>      | <b>Specific disease sections in Handbook</b>  |
|----------------------|---|
| Abdominal distension | <ul style="list-style-type: none"> <li>Abdominal distension</li> <li>Abdominal hernia</li> <li>Abomasal displacement</li> <li>Bloat</li> <li>Gastronintestinal obstruction</li> <li>Oesophageal obstruction</li> <li>Pregnancy - advanced</li> <li>Vagus indigestion</li> </ul>           |
| Diarrhoea            | <ul style="list-style-type: none"> <li>Acidosis</li> <li>Bovine virus diarrhoea (Pestivirus)</li> <li>Coccidiosis</li> <li>Copper deficiency</li> <li>Diarrhoea</li> <li>Gastronintestinal parasitism</li> <li>Indigestion</li> <li>Monensin poisoning</li> <li>Rumen acidosis</li> </ul> |

|             |   |
|-------------|---|
|             | Salmonellosis   |
| Downer      | Asphyxiation<br>Decubital ulcers<br>Downer<br>Ephemeral fever<br>Exhaustion<br>Footrot<br>Monensin poisoning<br>Sole bruising<br>Spinal cord injury<br>Swollen legs<br><u>Traumatic injuries*</u> |
| Eye disease | Eye cancer<br>Eye discharge<br>Eye foreign body<br>Infectious bovine rhinotracheitis<br>Malignant Catarrhal Fever<br>Pinkeye  |
| Illthrift   | Abomasal displacement<br>Abomasal ulcer<br>Actinbacillosis<br>Heart failure<br>Inappetence<br>Illthrift<br>Ketosis (acetoaemia)<br>Malnutrition<br>Monensin poisoning<br>Shy feeder<br>Tick fever |

|                 |   |
|-----------------|---|
|                 | Vagus indigestion   |
| Knuckling       | Asphyxiation<br>Bulling<br>Downer<br>Gastrocnemius rupture<br>Ketosis<br>Knuckling<br>Nervous disease<br>Spinal cord injury<br>Transit tetany<br><u>Traumatic injuries*</u>   |
| Lameness        | Arthritis<br>Bulling<br>Foot abscess<br>Foot rot<br>Gastrocnemius rupture<br>Haematoma<br>Lacerations<br>Lameness<br>Laminitis<br>Mastitis<br>Nutritional myopathy<br>Overgrown hooves<br>Sole bruising<br>Swollen legs<br><u>Traumatic injuries*</u> |
| Nasal discharge | Bovine virus diarrhoea (Pestivirus)<br>Gastronintestinal obstruction<br>Infectious bovine rhinotracheitis   |



|                      |   |
|----------------------|---|
|                      | <p>Malignant catarrhal fever</p> <p>Nasal discharge</p> <p>Oesophageal obstruction</p> <p><u>Pneumonia*</u></p>   |
| Nervous disease      | <p>Acidosis</p> <p>Annual ryegrass toxicity</p> <p>Copper deficiency</p> <p>Enterotoxaemia</p> <p>Hepatic encephalopathy</p> <p>Hypocalcaemia</p> <p>Ketosis</p> <p>Listeriosis</p> <p>Meningitis</p> <p>Middle ear abscess</p> <p>Nervous disease</p> <p>Nitrate – nitrite poisoning</p> <p>Poisoning</p> <p>Polioencephalomalacia</p> <p>Salt poisoning</p> <p>Transit tetany</p> |
| Respiratory distress | <p>Asphyxiation</p> <p>Bloat</p> <p>Exhaustion</p> <p>Heart failure</p> <p><u>Heat stress*</u></p> <p><u>Pneumonia*</u></p> <p>Poisoning</p> <p>Respiratory distress</p>  |
| Skin lesions         | <p>Alopecia</p>   |

|              |  |
|--------------|--|
|              | <p>Decubital ulcers</p> <p>Dermatophilosis</p> <p>Haematoma</p> <p>Lacerations</p> <p>Lice</p> <p>Photosensitisation</p> <p>Pseudolumpy skin disease</p> <p>Ringworm</p> <p>Skin swellings</p> <p>Squamous cell carcinoma</p> <p>Stephanofilariasis</p> <p>Warts</p> |
| Straining    | <p>Abortion</p> <p>Coccidiosis</p> <p>Constipation</p> <p>Diarrhoea</p> <p>Metritis</p> <p>Pregnancy - advanced</p> <p>Prolapse of rectum, uterus, vagina</p> <p>Retained foetal membranes</p> <p>Urinary tract obstruction</p>                                      |
| Sudden death | <p>Abomasal ulcer</p> <p>Acidosis</p> <p>Annual ryegrass toxicity</p> <p>Asphyxiation</p> <p>Blackleg / malignant oedema</p> <p>Bloat</p> <p>Copper poisoning</p> <p>Cyanide poisoning</p>   |

|                                 |  |
|---------------------------------|--|
|                                 | <p>Electrocution</p> <p>Enterotoxaemia</p> <p>Heart failure - congestive</p> <p><u>Heat stress*</u></p> <p>Lupinosis</p> <p>Monensin poisoning</p> <p>Nitrate – nitrite poisoning</p> <p>Pneumonia – embolic</p> <p>Poisoning</p> <p>Polioencephalomalacia</p> <p>Rumen acidosis</p> <p>Salt poisoning</p> <p>Sudden death</p> <p>Traumatic reticulopericarditis</p> |
| Swellings on the body and limbs | <p>Abdominal hernia</p> <p>Abscess</p> <p>Blackleg</p> <p>Bloat</p> <p>Decubital ulcers</p> <p>Haematoma</p> <p>Heart failure - congestive</p> <p>Mastitis</p> <p>Prolapsed rectum</p> <p>Prolapsed vagina</p> <p>Urinary tract obstruction/rupture</p>  |
| Swelling of the head and neck   | <p>Abscess</p> <p>Actinobacillosis</p> <p>Bluetongue</p> <p>Bottle jaw</p>   |

|  |                        |
|--|------------------------|
|  | Goiter                 |
|  | Lumpy jaw              |
|  | Retained cud           |
|  | Salivary duct blockage |
|  | Woody tongue           |

#### 5.4 Disease specific entries

Each of the specific diseases and conditions presented in the above tables were then presented as headings in the following section of the Live Export Veterinary Handbook. A standardised approach was then taken with brief outlines of material presented for each disease under the following sub-headings:

- Heading – name of the disease or condition
- Subheadings
  - Other names
    - common names or other names that may be used to describe the same condition
  - Species
    - indicates whether the condition affects sheep, goats or cattle
  - Description
    - brief description of the disease
  - Clinical signs and diagnosis
  - Treatment
  - Prevention

This approach ensured that a consistent outline of information was provided in the same structure for each disease or condition.

Diseases were presented in alphabetic order based on the principal name for the condition (as presented in the tables of syndromes and specific conditions).

The major conditions identified in the tables as having been associated with either mortality events or that have triggered disease investigations at times in the past, were generally associated with larger specific disease entries, providing more detailed information on each of the subheadings for those conditions. This approach ensured that more important or common conditions were covered with more detail than less important conditions.

#### 5.5 Information on feeding and watering at sea

Specific chapters were developed for managing feed and water problems at sea. Again the approach involved developing a standardised set of sub-headings for each chapter and then providing information under these headings.

Material was intended to be brief and to be focused on practical outcomes including awareness of common problems, how to detect them early and how to manage and prevent them.

## **5.6 Decision making for seriously sick or injured livestock**

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This chapter provides information to assist animal health workers to make effective decisions for seriously compromised livestock under the constraints imposed by shipboard conditions.

## **5.7 Euthanasia**

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This chapter provides detailed guidance on options for euthanasia, with particular attention to constraints associated with the shipboard environment while still ensuring compliance with Australian guidelines for the welfare of animals.

## **5.8 Field necropsy**

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The introductory section provides background information contributing to the practical recommendation that while it may be theoretically useful to try and perform a comprehensive necropsy on every dead animal, the practical constraints of real world situations mean that this is not likely to be achievable and a compromise approach is required that generates maximal value from a partial necropsies applied to a sample of dead animals.

Advice is provided on selection of animals and the number of animals to necropsy under different situations in order to generate useful information that can help the veterinarian characterise the condition(s) contributing to death and identify the specific causes where possible.

Advice is also given on a partial necropsy approach that concentrates on the musculoskeletal system, chest and abdomen in order to minimise the time spent on any one individual necropsy while maximising the likelihood of identifying the major causes that are likely to be contributing to risk of death on most voyages (traumatic injuries and other conditions affecting the musculoskeletal system, respiratory disease and selected abdominal diseases).

Information is also provided on selection and management of necropsy equipment and strategies for sampling sick or dead animals to generate biological samples that can be submitted to pathology laboratories for more detailed examination to assist in determining the cause of death. It is recognised that in many situations necropsy examination is likely to be limited to gross necropsy alone (particularly during an export voyage) but there may be situations where opportunities do exist for collection and submission of samples.

A detailed description is then provided for a comprehensive necropsy procedure, set out in a logical and systematic way.

It is noted that this approach is consistent with the approach developed for application in the related project W.LIV.0252 and also is the same approach used in development of training material under W.LIV.0161 including the production of a training DVD.

## 5.9 Additional reading

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The Live Export Veterinary Handbook includes a detailed section outlining a range of additional reference sources including web mounted material, textbooks, MLA reports, scientific articles and fact sheets.

## 5.10 Appendix on assessing heat load risk

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The Live Export Veterinary Handbook contains an appendix that presents a range of information relevant to understanding and assessing heat load risk under various conditions. This reflects the importance of heat load and heat stress in export conditions and the need for animal health personnel to understand the issues and be able to recognise early warning signs and take precautionary actions to minimise risk.

The material begins with a brief summary and introduction to terminology and concepts.

Specific information on heat stress is presented in the disease sections. The appendix provides additional information on parameters that may be measured to assist in monitoring heat load and identifying indicators of excessive heat load or heat stress.

Information on several indices is provided here because these indices have been used for assessing heat stress conditions for livestock either in land-based feedlots or on export vessels.

## 5.11 Index

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A detailed index has been generated to allow readers to rapidly locate specific information throughout the Live Export Veterinary Handbook.

# 6 Conclusions and recommendations

This project has delivered a completed version of the Live Export Veterinary Handbook. The Handbook has been provided to Meat and Livestock Australia as an electronic file in Microsoft Word®.

The Handbook is intended to serve as a concise reference source of practical information focused on conditions likely to be experienced across the live export supply chain, with a particular focus on the steps from arrival at an assembly feedlot in Australia to discharge at a destination port in an overseas country.

The Handbook is presented as an A5 format document, intended to be printed on water-resistant paper with a ring binding. This option is suggested to provide a compact and portable reference source that can be carried on a voyage by animal health workers.

The Handbook is intended to be used by veterinarians and stockpersons and any other individual with responsibility for animal health and welfare during the export supply chain.

It is recognised that the information provided in this Handbook is likely to require periodic review to reflect advances in information and knowledge about conditions, changes over time in the relative importance of different conditions and emergence of conditions not yet

described in the current version. It is also recognised that the Australian export industry is undergoing reform of systems and procedures as part of the commitment to changes identified in the Independent Review into the Live Export Trade<sup>1</sup> and the Australian government commitment to reform<sup>2</sup>.

It is recommended that the Live Export Veterinary Handbook be printed and made available in either printed or electronic form to all relevant stakeholders with a responsibility for animal health and welfare during export.

In addition it is recommended that there be a process to facilitate regular review and updating of the Handbook. It is expected that AAVs and stockpersons and other individuals such as feedlot managers and third party veterinarians (people who may be using the Handbook as a reference source during routine export operations) will have various comments about changes that might improve the usefulness of the Handbook. One option for managing this process may be to have a brief message incorporated into the front of the Handbook (such as the end of the introduction) that provides a mechanism for feedback to be received (address or email). Over time this can be collected and then changes made. Alternative mechanisms include incorporation of discussion of the Handbook with stakeholders as part of regular meetings such as interaction with stakeholders over R&D and operations.

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<sup>1</sup> <http://www.livestockexportreview.gov.au>

<sup>2</sup> <http://www.liveexports.gov.au>