

Impact of sea transport on welfare of livestock exported from Australia

Clive Phillips

Centre for Animal Welfare and Ethics,
University of Queensland



Australian trade

- 6 million sheep
- 1 million cattle
- 0.1 million goats

- 18 Australian ports
- Over 40 overseas destinations

- Most by ship, but air freight increasing

Sheep mortality

- On ship deaths 77%
- Depot 4%
- Discharge port 19%

	Onship %	Depot %
Inanition	43	10
Salmonellosis	20	43
Disease	6	24
Trauma	11	13
Undiagnosed	19	3
Overfeeding	1	7

Cattle mortality

- Mostly on ship deaths
 - Heat stroke
 - Trauma
 - Respiratory distress

Preparation

- On-farm management
 - Body conditioning
 - Exposure to pellets
 - Regular handling
- Mustering
- Shearing of sheep
- Inspection and selection of fit animals
- Curfewing

Cattle transport by 'road-train'



Holding in a pre-embarkation assembly depot

Purpose

- Aggregate animals
- Check health and fitness
- Exposure to ship type conditions
- Rest

Risks

- Disease exposure
- Mixing of stock
- Failure to adjustment to pellet feeding
- Climatic changes, especially cold, wet weather
- Contact with faeces



Loading

Main risks

Traumatic injury/slipping on loading ramp

Rough handling

Use of jigger

Mixing of stock

The ship journey

Sporadic high risk events
e.g. the Cormo Express
incident 5800 dead

Main risks

Heat/humidity

Inappetence/shy feeding

Faeces/urine, ammonia

Humidity

Ship motion

Space availability



Heat stress

- Temperature/humidity
- Ventilation rate
- Emergency wetting
- Heat Stress Risk Management Model



Temperature/humidity

- Heat stress threshold 26-28°C
- c. 2°C less for shorn ewes
- Greatest risk when cold-adapted animals from southern ports enter summer temperatures in Middle East
- Humidity increases with wet faecal pad
- If ambient temperature > body temperature, ventilation less effective

Ventilation rate

- Orientation of ship important if naturally ventilated
- Stocking density critical
- Affects ammonia accumulation

Emergency wetting

- Useful for cattle but probably not sheep

Heat Stress Risk Management Model

Estimates risk of livestock mortality due to heat stress in closed decks on voyages from Australia to the Middle East

Modelling input

- Weather at destination and on route
- Acclimatisation
- Coat and condition
- Ventilation characteristics of ships

Social stress – stocking density

- Feedlot preparation important
- Difficulty in accurately loading ship
- Determines
 - ventilation requirements
 - lying time?
 - feeding time?

Shy feeding

- Chaff more palatable than pellets
- Trough space
- Learn from mothers
- Stocking density
- Linked to salmonellosis
- Social stress

Motion sickness in sheep

- Anecdotal evidence of stress to sheep caused by high seas
- Anti-emetics attenuate toxin-induced malaise in sheep
- Evidence of motion sickness in trucked pigs and other quadrupeds
- Rats show *pica* not *vomiting* during motion sickness

Salmonellosis

Feedlot related
salmonellosis

– (not shed-based)

Persistent inappetence
salmonellosis inanition
c. 0.6% mortality



Low ceiling height

- Some ships only
- Risks unknown
- May inhibit mounting behaviour

Lighting

- Change from natural daylight to constant low lighting level
- Colour change

Noise

- Ventilation systems
- Workshop activity

Live export stakeholder survey – welfare measures

Health Based Measures

Proportion of animals with debilitating injuries: 0% → 0.1%

Proportion of animals passing through the hospital pen: 0% → 1%

Mortality rate: 0% → 2%

Proportion of animals with clinical signs of disease: 0% → 10%

Spaced Based Measures

Space allowance per head: area equivalent to that in which an animal physically occupies → area equivalent to that in which an animal can lie down and turn around

Proportion of animals lying down during the first week on the ship: 0% → 40%

Proportion of animals that can access troughs at any one time: 10% → 30%

Welfare measures

Environmental Based Measures

Wet bulb temperature: 25 → 35 degrees Celsius

Ammonia levels: negligible → causing the animals irritation

Noise levels: 60 dB → 90 dB

Daily amount of light: 24 hours of light → 12 hours of light/12 hours of dimness

Feeding Based Measures

Proportion of troughs utilised by animals feeding: 0% → 100%

Fodder intake: 75% → 125% of that necessary to maintain the animal in its normal condition

Welfare measures

Physiological Based Measures

Cortisol concentration: normal levels → four-fold increase above normal levels

Other stress related metabolites: low levels → high levels

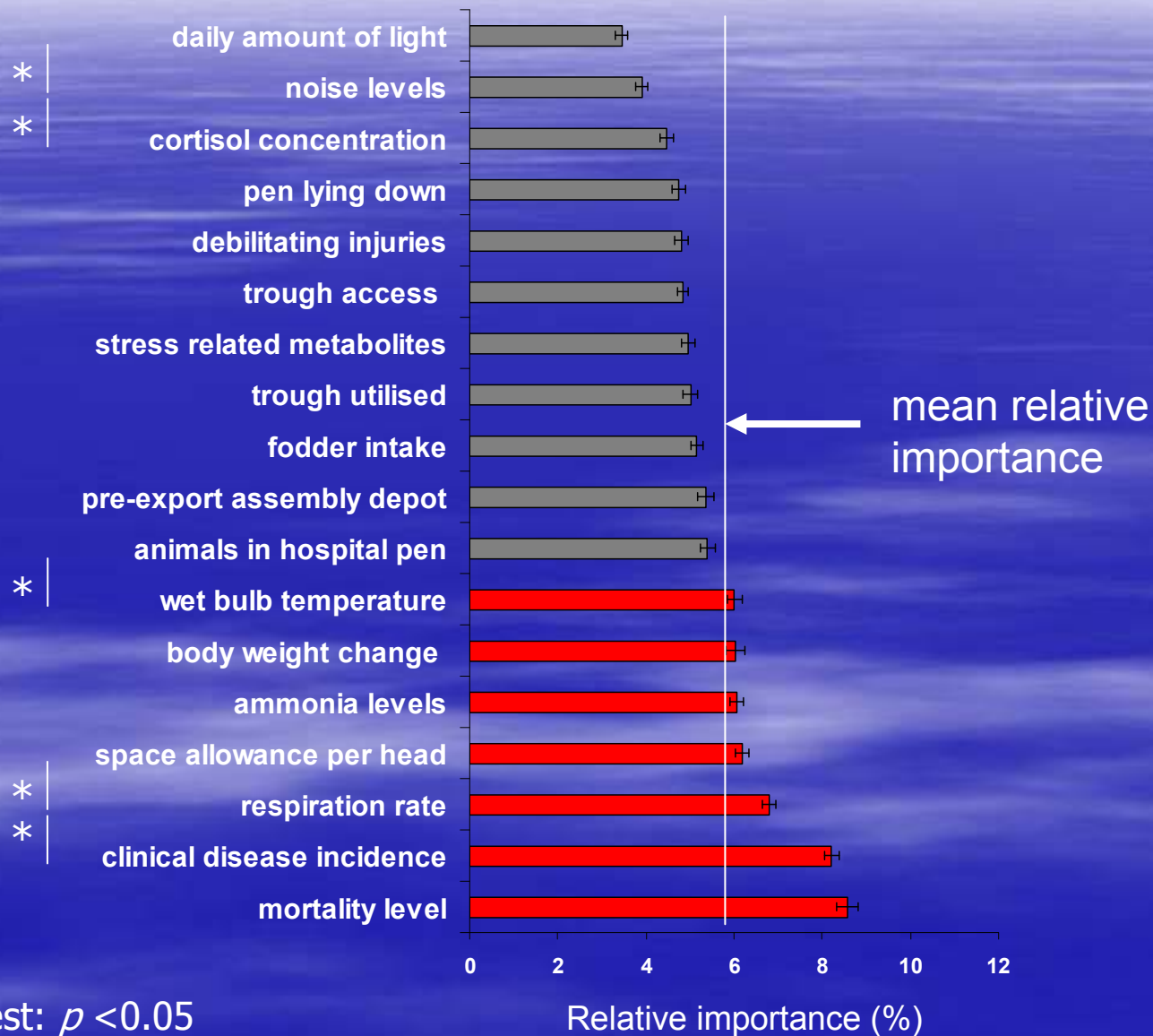
Respiration rate: normal levels → three-fold increase above normal levels

Other Measures

Body weight change over the sea voyage: 5% decrease → 5% increase

Time spent in the pre-export assembly depot: 0 days → 10 days

Survey results



* Paired t -test: $p < 0.05$

Key indicators identified by stakeholders

- Mortality
- Clinical disease incidence
- Wet bulb temperature/respiration rate
- Ammonia
- Stocking density
- Body weight change

- Pines et al. 2007, *Animal Welfare*, 16, 489-498.

Livecorp funded cattle review

- Clinical signs of inflammation at 22 ppm atmospheric ammonia
- Insufficient information on the impact of long-term exposure to establish standards

Stacey 2003

– cattle deck measurements

- Typical levels below decks → 15ppm
- Readings commonly 20 - 30ppm

Other research

- Pigs and poultry show preference for fresh air compared with 10 ppm ammonia
(Wathes et al., 2002)
- Welfare adversely affected below 25 ppm
(Kristensen et al., 2000; Kristensen and Wathes, 2000)

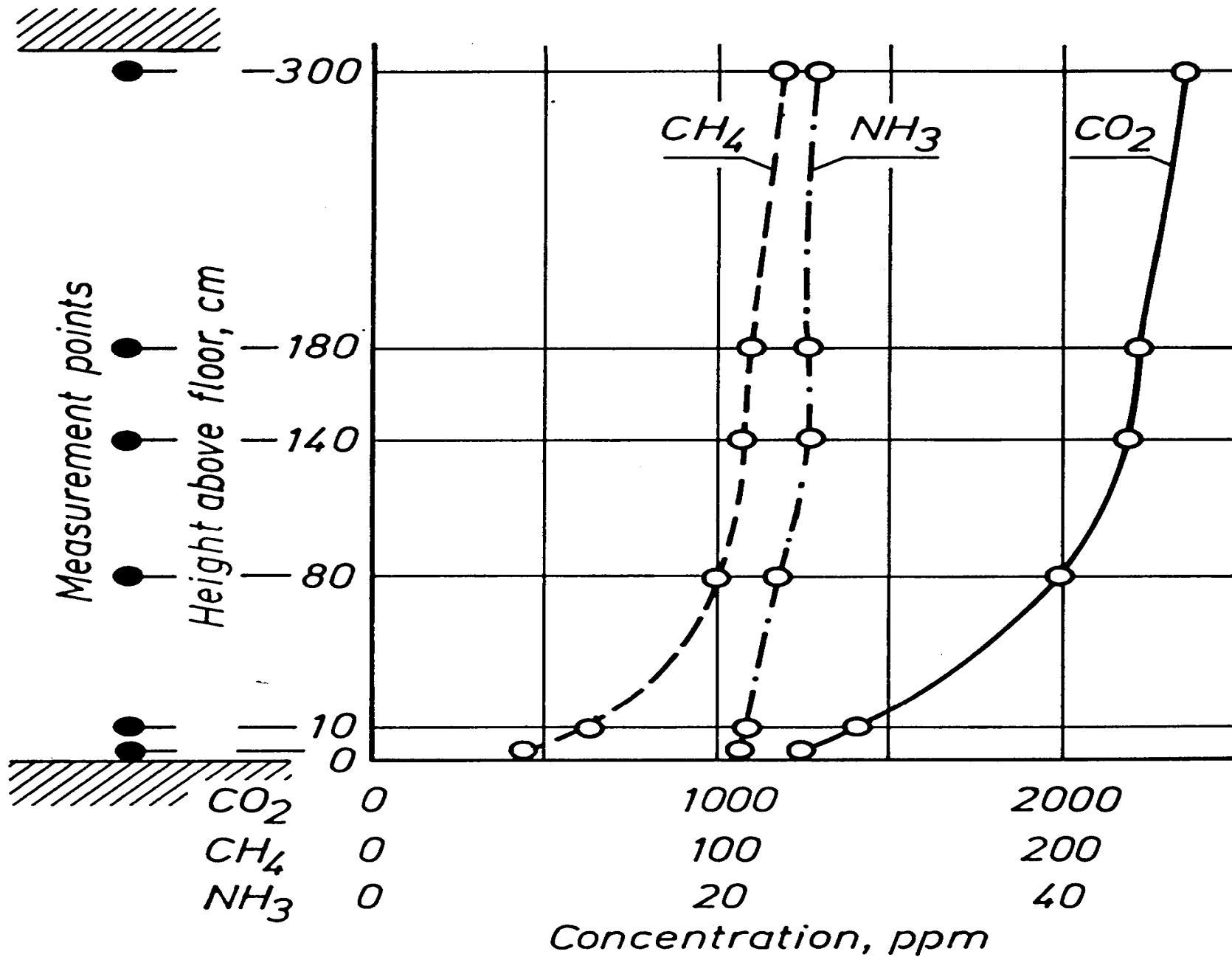


Fig. 1.4. Distribution of gases between floor and ceiling in a cow handling.

Human exposure

- Current maxima
 - 5 weekly 8 h exposure to 25 ppm
 - Short term exposure limit 35 ppm
 - No-go 50 ppm

Disembarkation and subsequent management

- Risks at off-loading port
 - Temperature/humidity
 - Offloading speed/truck availability
 - Handling skills
 - Animals remaining on ship
- Risks at abattoir
 - Handling skills
 - Stunning procedures

Dairy heifer trade

- Risks to dairy stock
 - Low forage quantity/quality
 - Disease challenges - ticks, flies, metabolic disorders
 - Climatic challenges
 - Poor management skills
 - Infrastructure and enterprise size
- Consequences
 - Low milk production
 - Infertility
 - High mortality
 - Poor calf production

When does our responsibility end?

Acknowledgements

- Coworkers: Carol Petherick, Mat Pines, John Gaughan and Scott Norman
- Livecorp/MLA – funding and advice
- CSIRO – use of climate chambers
- Ship owners, exporters, ship veterinarians, stockmen and crew