Ventilation of livestock transport vehicles

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Why bother about ventilation?

- Welfare considerations
  - one of the major causes of stress during transport is the thermal environment
  - conditions inside the vehicle can be very different from those outside the vehicle
  - animals generate heat AND moisture
Ventilation

- Ventilation is the best method of removing heat and moisture from the container

- Animals can lose sensible (dry) heat and latent (wet) heat
Ventilation

- Sensible heat loss needs a temperature gradient between the animal and its surroundings.

- Latent heat loss requires a moisture gradient between the animals “wet surfaces” (skin, respiratory tract) and its surroundings.
Air movement

- For air to move, it needs a difference in pressure
- Stationary vehicle - still conditions - little air movement
- Moving vehicle - motion produces pressure differences - air movement
Air movement - natural ventilation

On a moving vehicle where does the air flow?

We might think, in at the front and out at the rear
Air movement - natural ventilation

Sonic anemometers

Pressure measurement plates
THE LEGISLATION AFFECTS ALL VEHICLES THAT TRANSPORT ANIMALS OVER 8 HOURS
Air movement - scale model studies
Air movement - natural ventilation

On a moving vehicle where does the air flow?

Air out at the front and in at the rear
Natural ventilation

- Little control
- Depends on external conditions and/or vehicle movement
- May be insufficient in hot weather
- May be excessive in cold weather
Other vehicles

Difficult to predict internal airflow patterns
Fan ventilation

- Total control
- Independent of external conditions and/or vehicle movement
- Can be adjusted to suit needs of animals
- Appropriate ventilation for the prevailing weather conditions
Fan ventilation

- Fans fitted to vehicles
- Generally better to extract air from container
- Defined air inlets will optimise performance
- Better to mount extraction fans at regions of low pressure
Fan ventilation - research vehicle
Fan ventilation - research vehicle
Why bother about ventilation?

- EC Regulation 1/2005
  - specific ventilation requirement
  - equivalent to 600m³/h/tonne
THE E.U. REGULATION DEMANDS THAT ALL VEHICLES ON LONG JOURNEYS MUST BE ABLE TO MAINTAIN THE TEMPERATURE IN THE ANIMALS COMPARTMENT BETWEEN 0° AND 30°
EC Regulation 1/2005

- 600 m³/h/tonne
- typical 12” (24 volt) diameter fan
- per fan → 900 m³/h (0.25 m³/s)

- 20 tonnes of pigs require approx. 12 fans
Eddie ponders just how to load THAT bull!
Fan ventilation - commercial vehicle
DIFFERENT MANUFACTURER

DIFFERENT IDEA
VEHICLES (CONT)

- MECHANICAL VENTILATION

- TEMPERATURE MONITORING SYSTEM – TO INCLUDE IN CAB WARNING + DATA RECORDING SYSTEM.
Long distance road transport of farm animals

- Over 20 years research experience
- Multi-disciplinary approach
- Scientifically sound research under fully commercial conditions
- Extensive industry collaboration
Ireland to Spain

- Collaborators
  - Eddie Harper
  - Teagasc, Beef Research Centre, Ireland

- Livestock numbers
  - 52 cattle
  - Assorted breeds
  - Average liveweight 270 kg
  - SD = 52 kg/m²

- Journey details
  - Enniscorthy to Rosslare
  - Rosslare to Cherbourg
  - Cherbourg to Fougeres
  - 24 hours lairage (off vehicle)
  - Fougeres to Fuensalida
  - Total distance 2000 km
  - Total time 80 hours
Thermal conditions during RO-RO crossing
Rosslare to Cherbourg (17:00 to 16:00)

Temperature (°C)

Vapour density (g/m³)

Upper T
Lower T
Ambient T
Upper VD
Lower VD
Ambient VD

Time
DEFRA Policy requirement

- To protect the public’s interest in relation to environmental impacts and health, including the relation to diseases which can be transmitted through food, water and animals and to ensure high standards of animal health and welfare
Current research -
breeder pigs
Current research programme

- Research funded by Defra
- Current project value £1.2 million over 3 years
- Characterise the welfare consequences of journeys
- Define the acceptable ranges and limits for thermal conditions
- Provide the sound scientific basis for future welfare legislation
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