Monitoring the stress of light suckling lambs transported over short journeys

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Introduction

Regulation: Transport of animals for long duration (8-14 h)

5.1.2005 | EN | Official Journal of the European Union | L 3/1

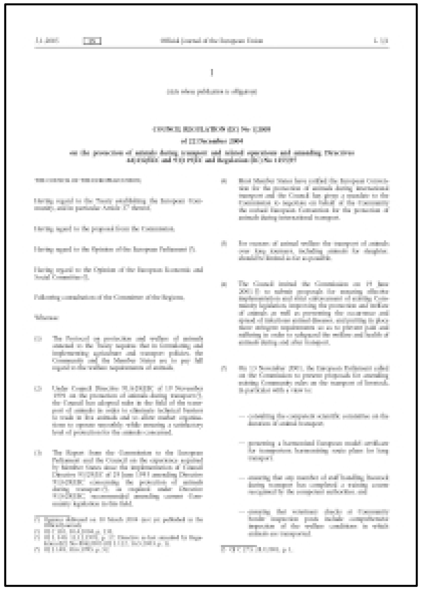
COUNCIL REGULATION (EC) No 1/2005

of 22 December 2004

on the protection of animals during transport and related operations and amending Directives 64/432/EEC and 93/119/EC and Regulation (EC) No 1255/97

Specifications:

- Authorized vehicles.
- Trained drivers.
- Temperature: 5-30ºC (± 5ºC).
- Space: According to Species, age, weight...



Missing in the Regulation:

- Short duration trips.
- Light lambs (<20 kg LW) “Suckling lambs”.

Introduction

- Space allowances for for sheep transported by road

Category	LW, kg	m^2/animal
Shorn sheep and lambs > 26 kg	< 55	0.2 - 0.3
	> 55	> 0.3
Unshorn sheep	< 55	0.3 - 0.4
	> 55	> 0.4
Heavily pregnant ewes	< 55	0.4 - 0.5
	> 55	> 0.5
Small lambs*		

Equivalent to 0.01 m^2/kg

* **Regulation EC 1/2005**: *"As an indication: for small lambs, an area of under 0.2 m² per animal may be provided"*.

Objective

- Evaluate the effect of 2 space densities for transporting suckling lambs by road over a short journey (2 h).

The parameters measured were:

- Body weight
- Temperature:
  - Rectal (digital thermometer)
  - Iris & Lacrimal (IR thermometer)
- Metabolic indicators in serum
  - Creatinine kinase (CK)
  - Lactate dehydrogenase (LDH)
  - Free fatty acids (FFA)
  - Cortisol
  - Glucose
  - Urea

- Time:

Transport Rest

0 2 24 h

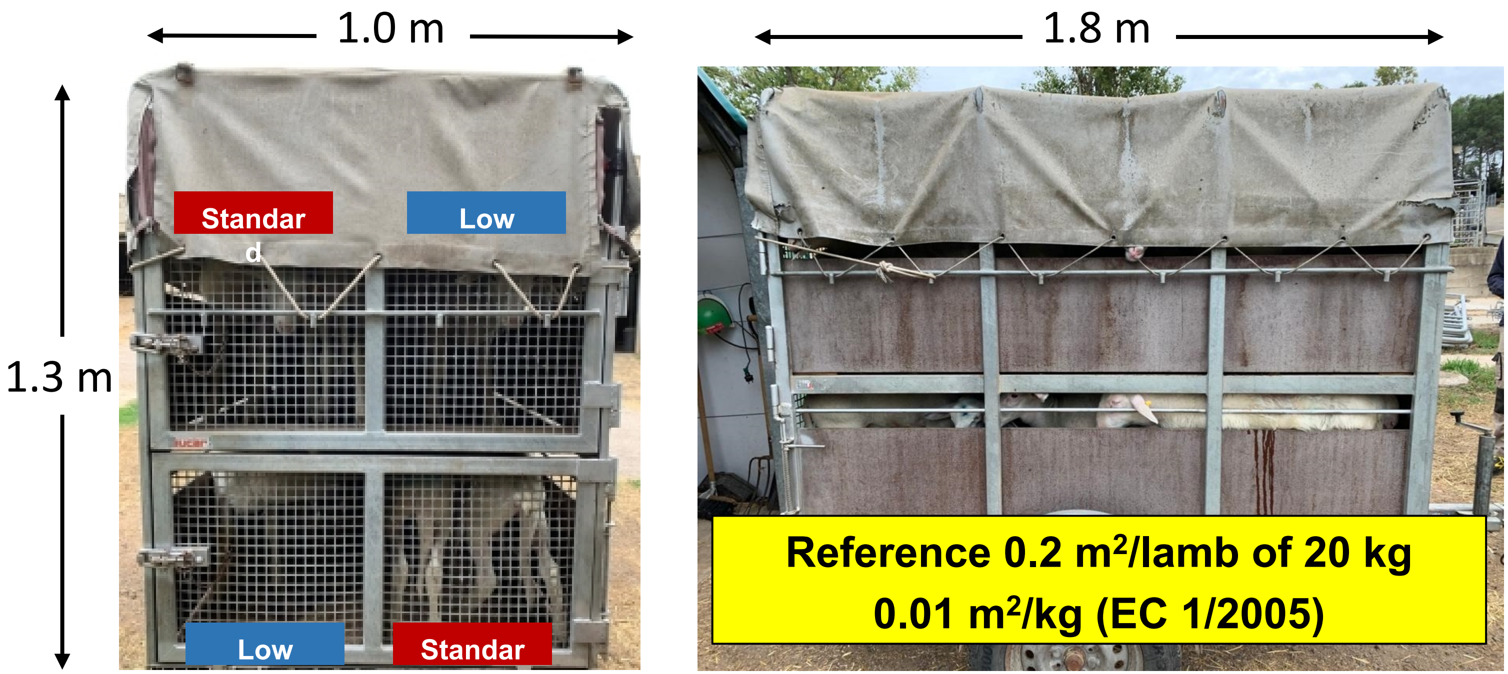
Material & methods: Animals

- Lambs in artificial lactation at the UAB

Lambs: 10 Manchega (MN) + 10 Lacaune (LC)

Material & methods: Experimental design

- Transport of lambs at the UAB



Density	Standard	Low
Lambs, n	**12** (6♀+6♂)	**8** (4♀+4♂)
LW, kg	13.8 ± 0.5	14.0 ± 0.3
Space, m^2/kg	**0.011**	**0.016**
Space, m^2/animal	0.15 (100%)	0.23 (153%)

Material & methods: Trip description

- Route and trip description

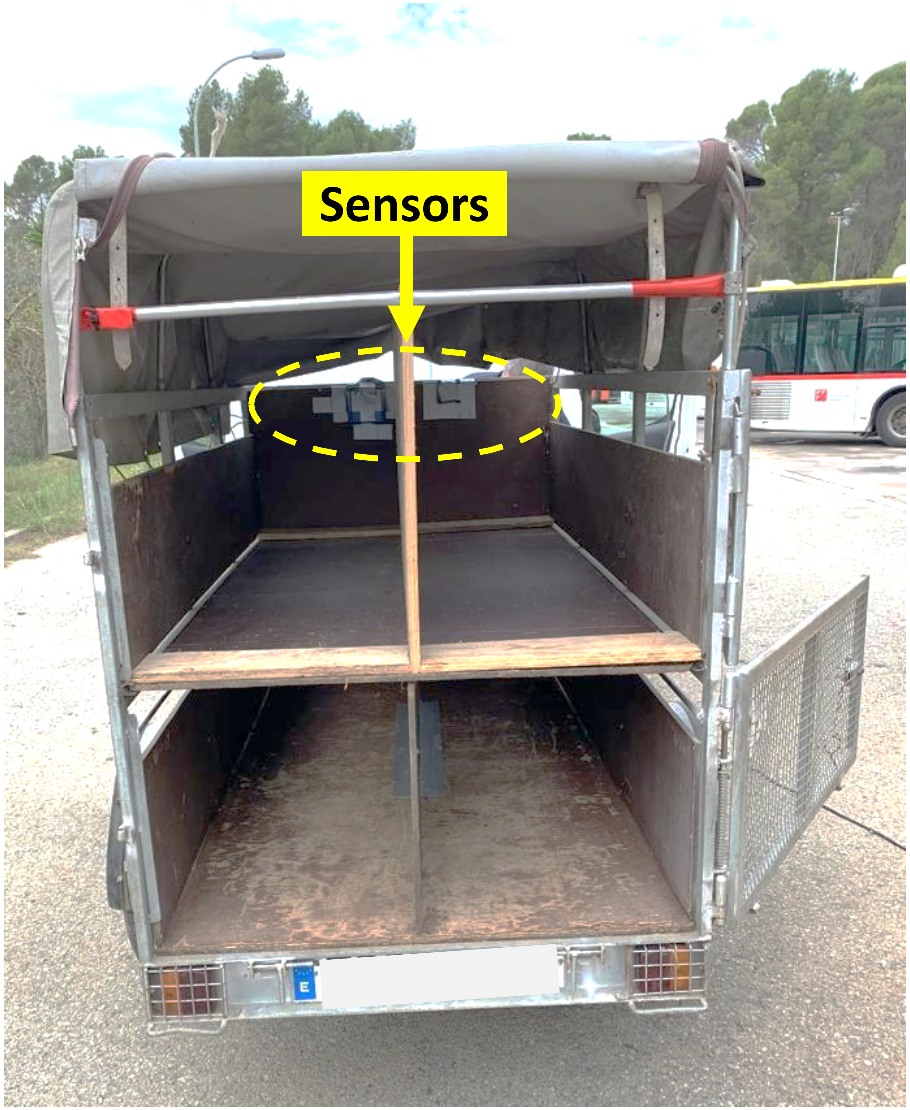
Duration	2 h 13 min
Distance, km	116.6
Speed, km/h	58.7
Altitude, m	581

Material & methods: Sensors

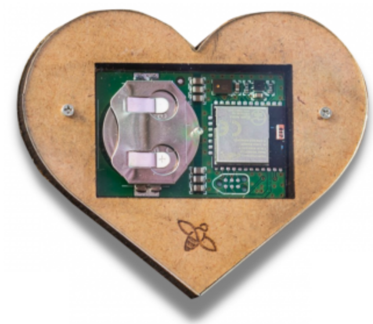
- Trailer compartments and sensors

Driver's cab
vs.
Trailer

2x Accelerometers of 3 axes



Data logger (T & RH)



Noise sensor

Material & methods

- **Carcass quality:**

- The MN lambs were marked with transponders (Datamars, 12 mm) and sacrificed after 12 h of rest.
- The LC were destined to replacement and weighed after a 24 h of rest.

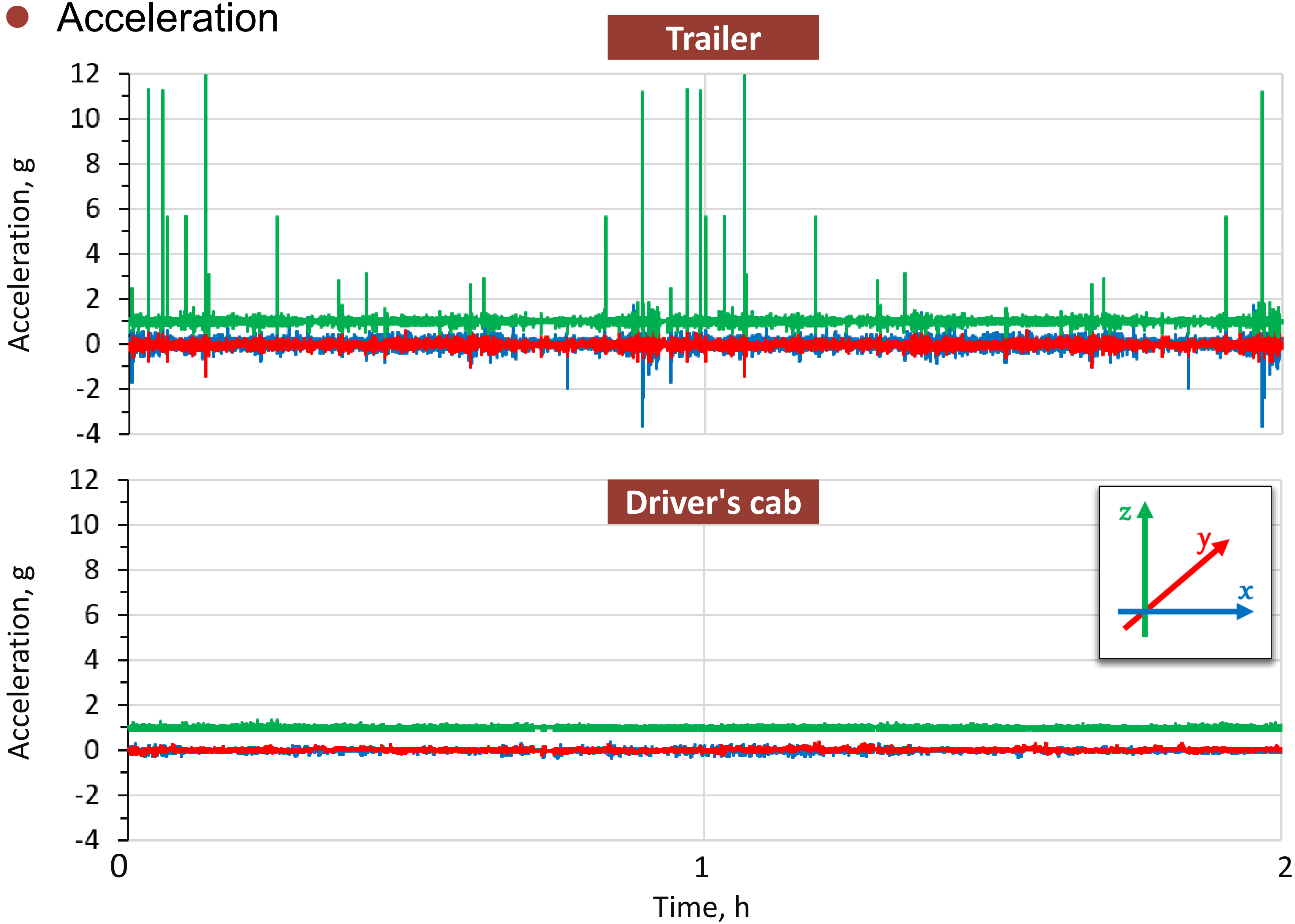
- The carcasses were assessed and the transponders were removed.

- **Statistics:**

- PROC MIXED for repeated measures (SAS v. 9.4)
- **Fixed effects:** density, breed, sex, time and interaction.
- **Random effects:** animal and residual error.
- Difference between variables using PDIFF (*P* < 0.05).

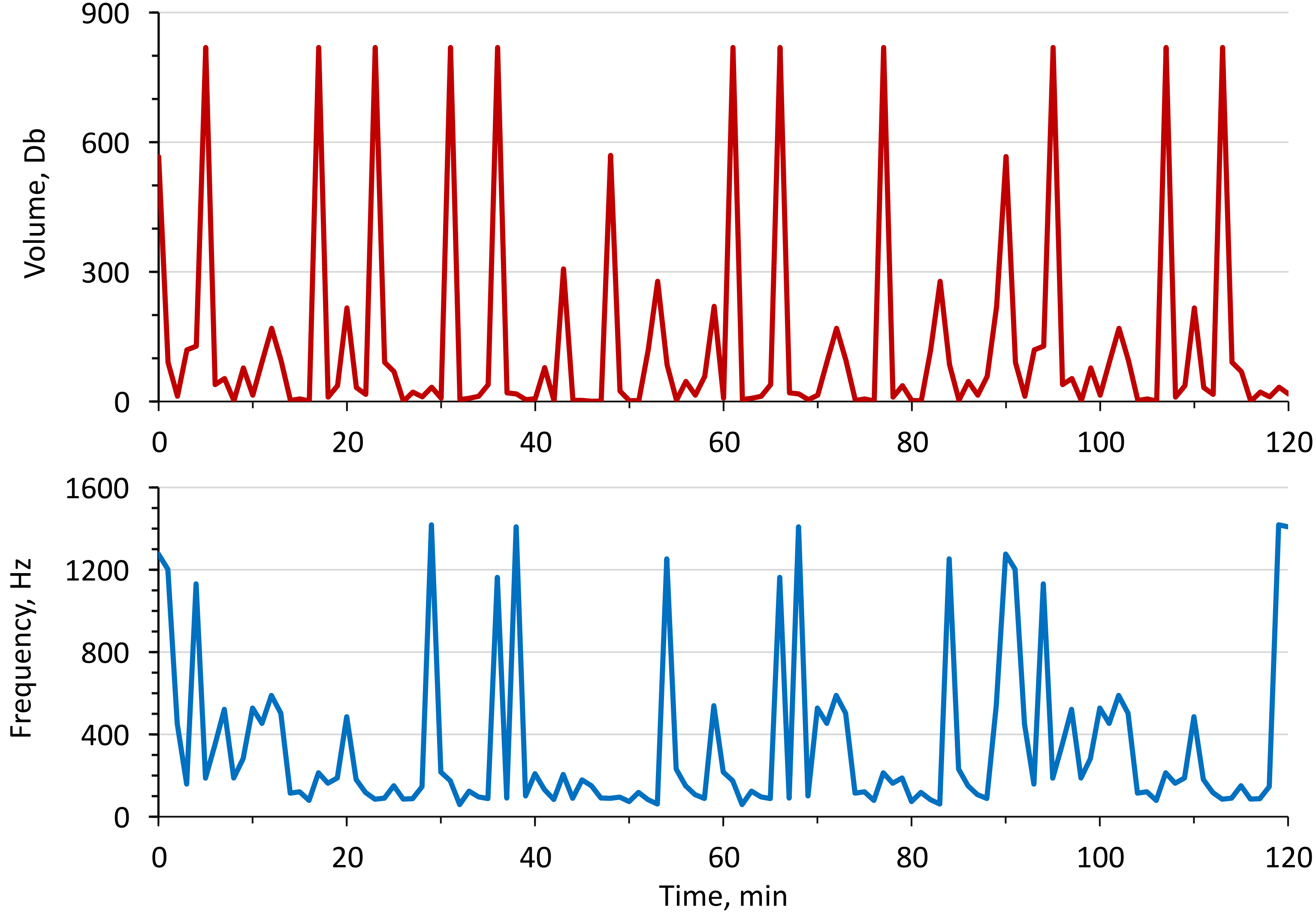
Results: Transport conditions

- Acceleration



Results: Transport conditions

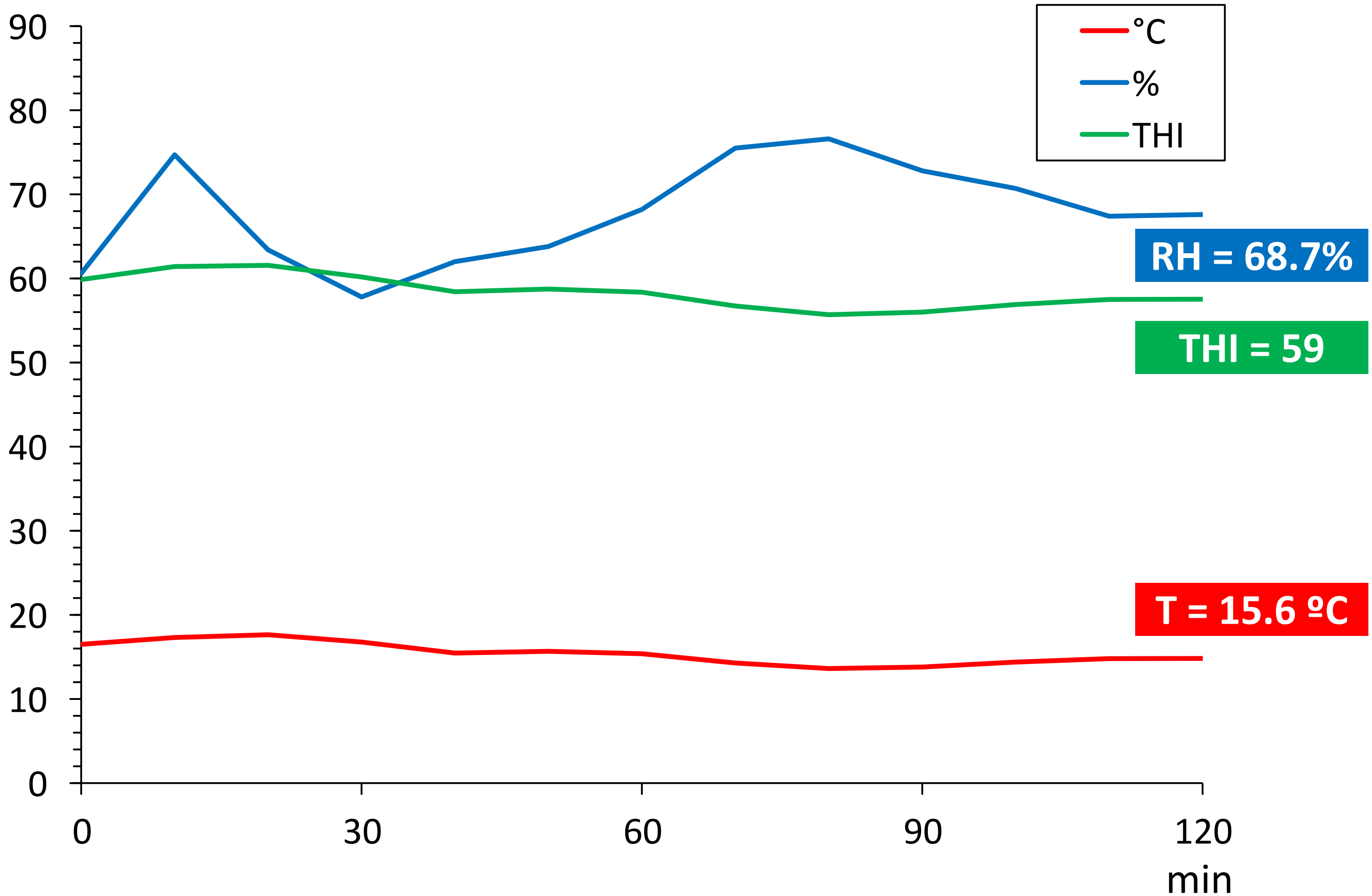
- Noise



Results: Transport conditions

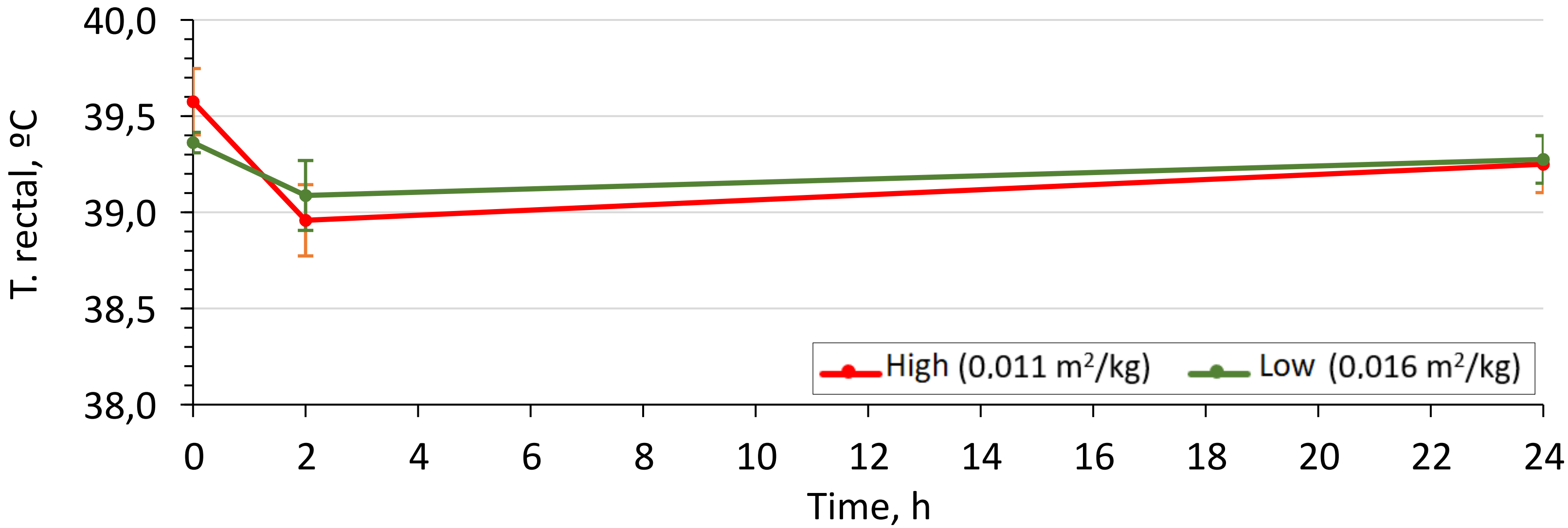
- Temperature (T), humidity (RH) & THI index according NRC (1971):

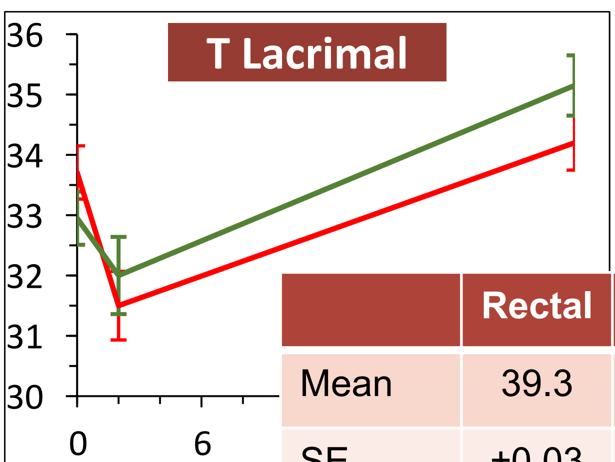
$$THI = 0.8 \cdot T + (RH/100) \cdot (T - 14.41) + 45.4$$

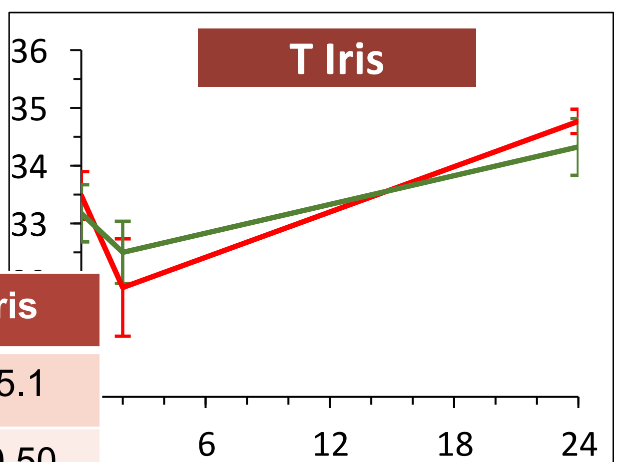


Results: Temperature

- Rectal temperature



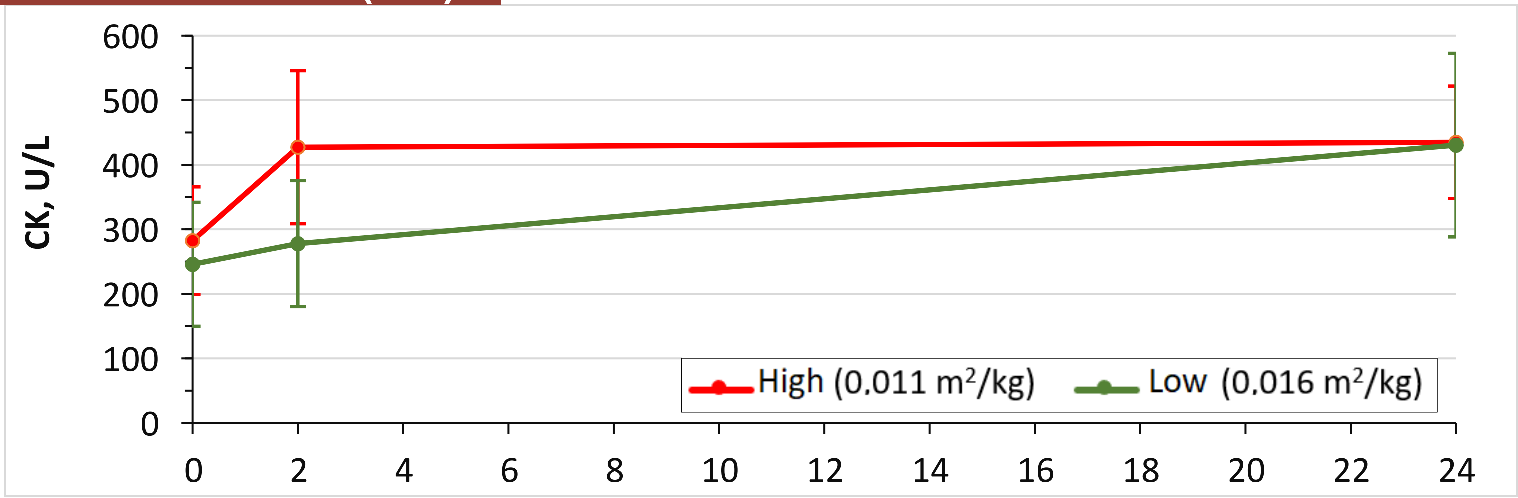




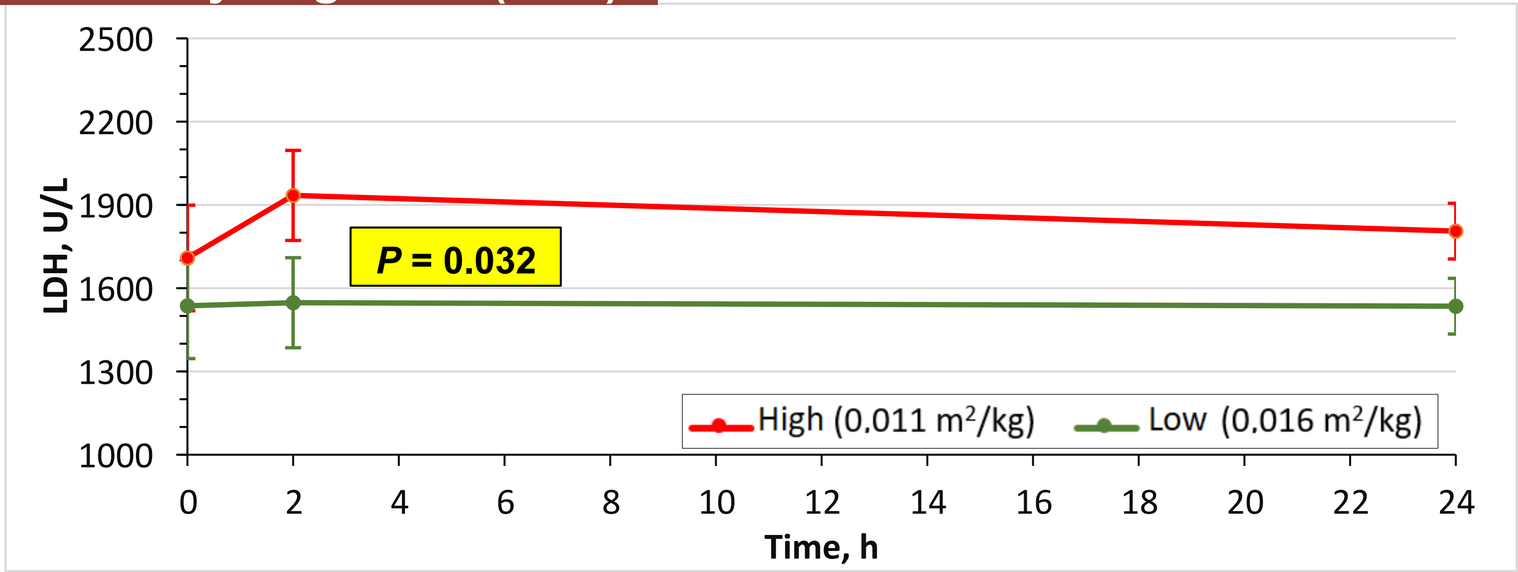
	Rectal	Lacrimal	Iris
Mean	39.3	35.1	35.1
SE	±0.03	±0.51	±0.50
R^2 rectal	-	0.0004	0.0007

Results: Metabolic indicators

Creatinine kinase (CK)

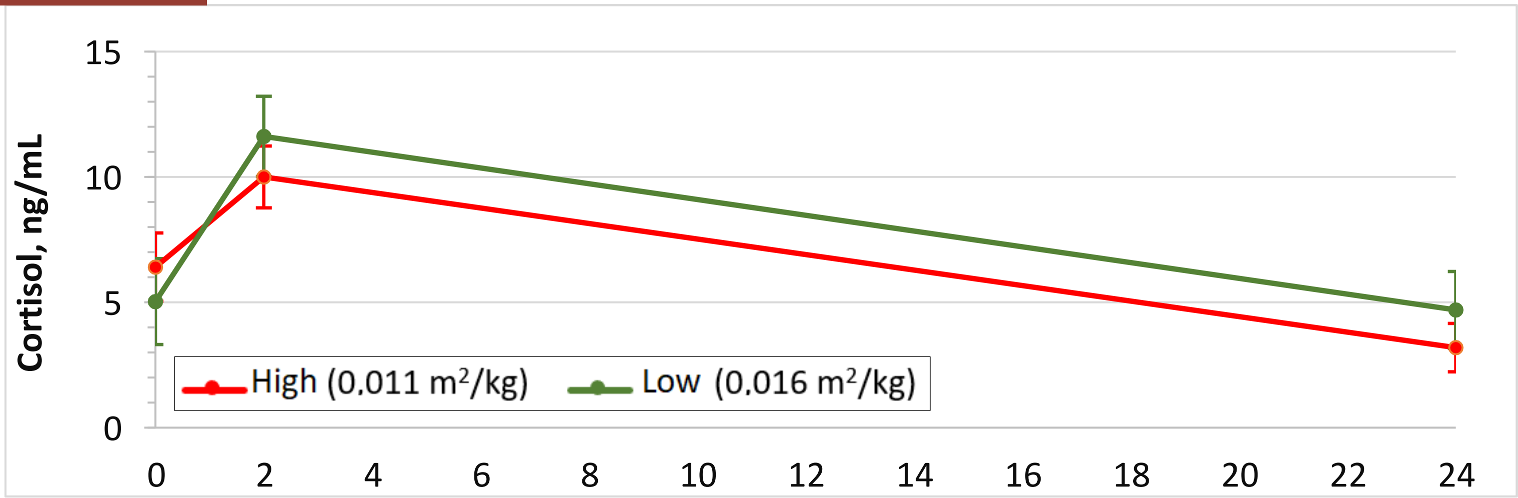


Lactate dehydrogenase (LDH)

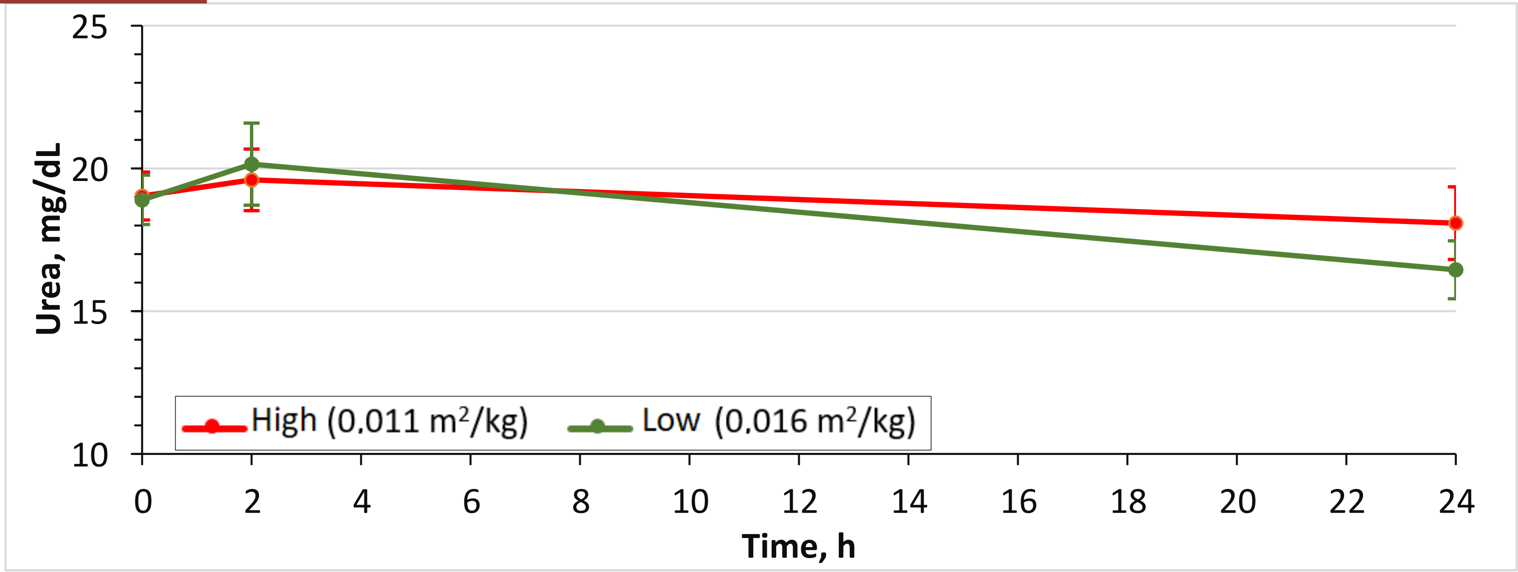


Results: Metabolic indicators

Cortisol

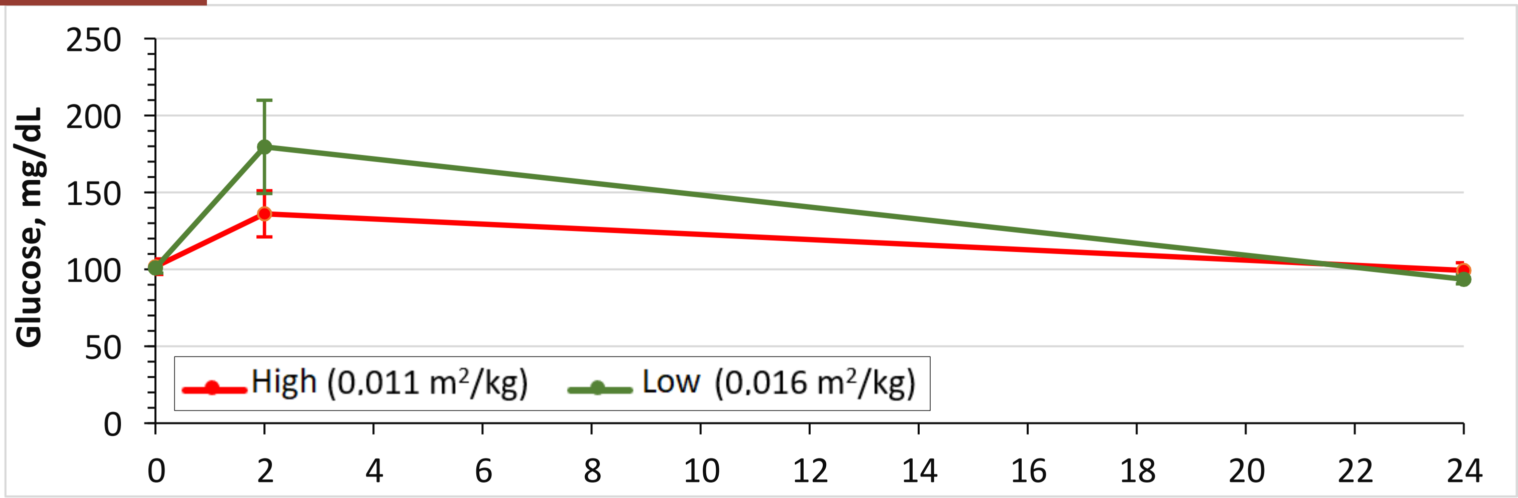


Urea

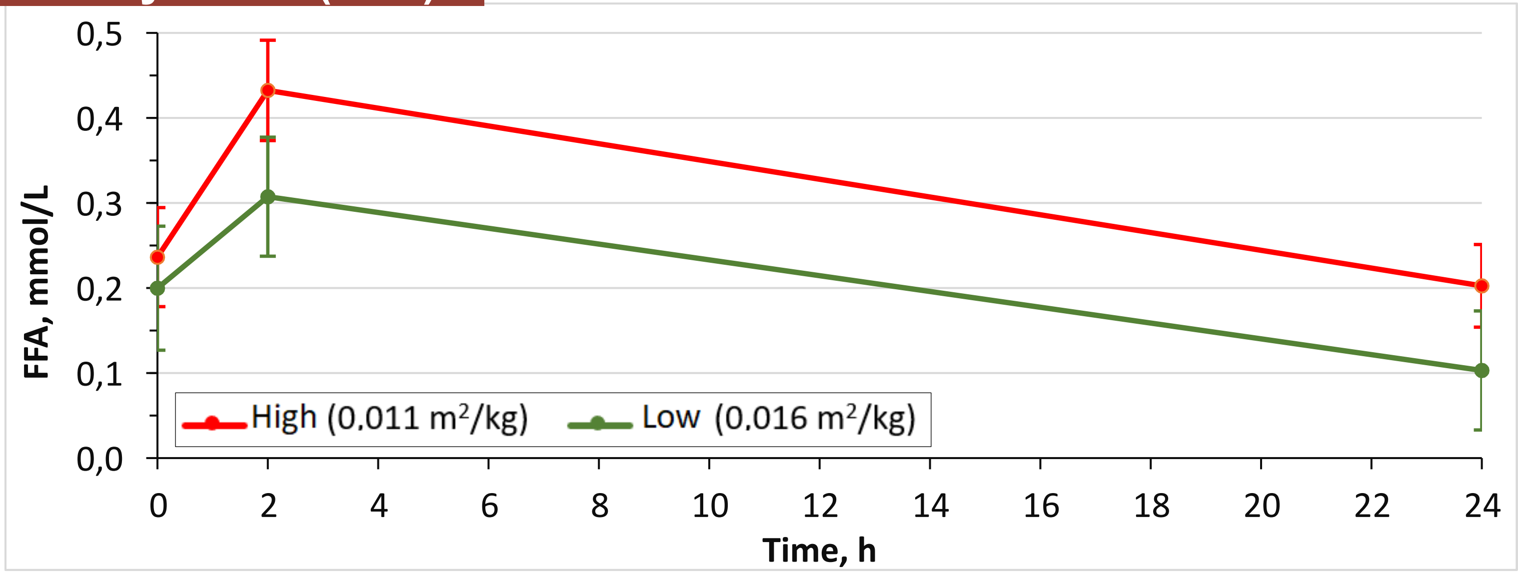


Results: Metabolic indicators

Glucose



Free fatty acids (FFA)



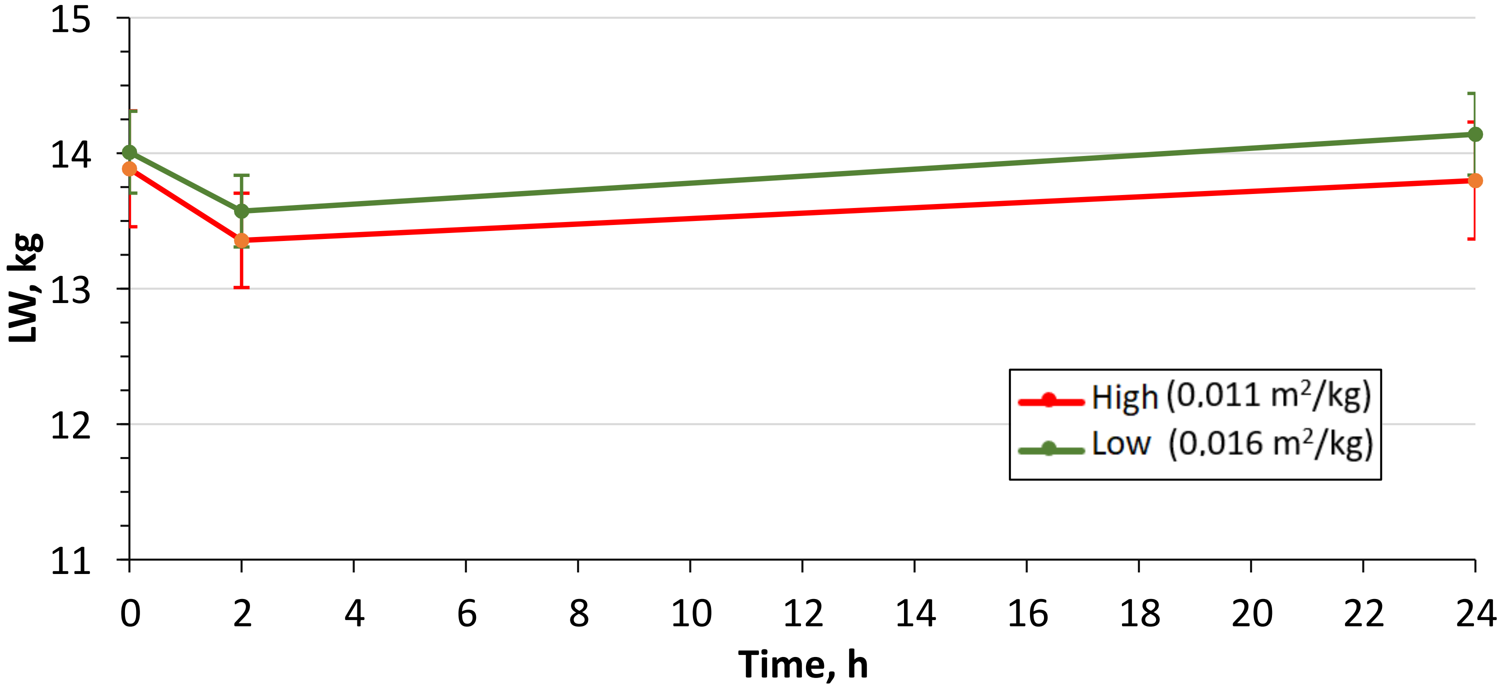
Results: Metabolic indicators

	Low (0.016 m²/kg)	Standard (0.011 m²/kg)	± SE	Effect (P <)		
				Density	Breed	Sex
LW, kg	13.9	13.6	0.5	0.75	0.53	0.62
T_{Rectal}, °C	39.3	39.3	0.2	0.90	0.031	0.63
Blood serum						
CK, U/L	299	324	115	0.35	0.13	0.07
Cortisol, ng/mL	7.0	5.9	1.80	0.98	0.64	0.014
Glucose, mg/dL	130	116	7	0.55	0.85	0.83
LDH, U/L	1548	1763	226	0.032	0.76	0.022
FFA, mmol/L	0.220	0.299	0.075	0.25	0.14	0.47
Urea, mg/dL	18.5	18.8	1.5	0.78	0.21	0.42

- Rectal T decreased 1% by breed (LC)
- CK tended to increase according to sex (F)
- Cortisol increased 122% by sex (M)
- LDH increased 14% with density (high) and 19% by sex (F)

Results: LW & Carcass quality

- **Weight**



- **Meat quality**

The carcass of the MN lambs only presented differences in color, which was darker (2.8 vs. 1.8; $P < 0.05$) in low transport density.

Conclusions

- Transport stress despite the short journey (2 h).
- Cold stress despite good weather (THI = 59).
- Differences in LDH were detected in space less than 0.2 m^2/lamb.
- Solutions for the differences between driver's cab and trailer (i.g. improve suspension system).
- Need to study the noise's effects.
- Complete the study with the largest number of animals and different types of transport.

Thank you !!

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