

Better Training for Safer Food Initiative

Training course on "Animal Welfare during transport"

Animal-based measures in the framework of animal welfare during transport
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Type of parameters

- Physiological measures
- Hormones
- Blood composition
- Electrolytes, metabolites, enzymes...
- Performance
- Clinical measures
- Behaviour

Physiological measures

- Heart rate
- Respiration
- Temperature

Heart rate

Heart rate

Loading

Pigs

Ruminants

Hormones

- Adrenaline in blood
- Cortisol/corticosterone in blood/saliva/faeces
- Glucagon/Insuline
- Vasopressin

Adrenaline in blood

- Appears and disappears very quickly

Cortisol/corticosterone in blood

- Restraining animals can interfere

Cortisol in saliva

- Less interference with handling.
- Takes longer in being affected (around 10 minutes)

Cortisol/corticosterone metabolites in faeces

Good measure for very long transports (chronic stress)

No suitable for pigs

Glucagon

Increases when blood glucose decreases



6

Insuline

Decreases when blood glucose decreases

Vasopressin

It is an indicator of nausea and vomiting

Specially important in pigs



7

Blood composition

Packed-cell volume

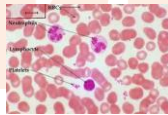
Heterophil:lymphocyte ratios

White blood count

Neutrophils

Lymphocytes

Neutrophils/Lymphocytes ratio



8

Packed-cell volume

Related to dehydration... (Effect of the spleen?)

Other no useful parameters for dehydration:

Capillary refill time, mucous membrane scor and skin turgor

White blood count

Specially used for horses subjected to a continuous movement



9

Electrolytes, metabolites, enzymes...

Glucose

Lactate or lactate dehydrogenase (LDH)

Creatine Kinase (CK)

APP's

Total protein

Albumine

Sodium/osmolality

Non-sterified fatty acids or free fatty acids

B-hydroxybutirate

Urea



10

Glucose

Increases during the stress response

Decreases if the animals is not fed for a long time

Lactate and LDH

Lactate is associated with anaerobic metabolism of glucose in the organism

LDH is associated with tissue damage

Creatin Kinase (CK)

The presence in blood is associated with muscle damage or vigorous exercise

It is a little bit more specific than LDH



11

APP's

Non-specific reaction to tissue damage (infection, inflammation, neoplasia...)
Haptoglobin, pig-MAP, C-reactive protein, SAA

Total protein/albumine/osmorality

Used to detect states of dehydration

Free fatty acids (FFA)

Released in blood when glucose is lacking
Sign of hunger

12

B-hydroxybutirate

It is a ketone produced whe the animal is using fatty acids as source of energy. Related with hunger

Urea

It is related with the use of protein as source of energy. Related with hunger

13

Body weight
Carcass weight
Liver weight



14

Body weight

Related to long periods of fasting
18-24 hours → 7% of lost in ruminants
→ 4% of lost in pigs
Mainly due to gut fill

Carcass weight

Related to dehydration and use of body reserves

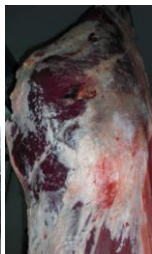
Live weight

If the animal has used the glycogen reserves from the liver it will be seen in the weight

It is also possible to do a biopsy to assess glycogen concentration in the liver

15

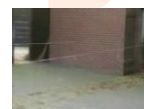
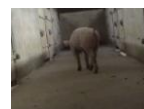
Lesions
Diseases
Death



16

Lesions

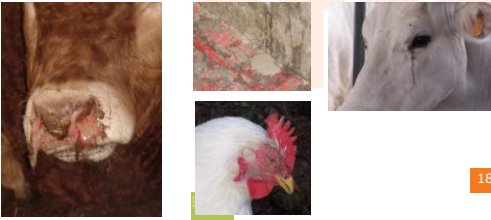
Lameness
Scrtaches, abrasions, lacerations, deep wounds
Trauma (Osteoporosis in hens)
Bruising of legs, (breast or wings →poultry)
Broken horns



17

Porcine stress syndrome (dyspnoea, cyanosis, hyperthermia → rigor in the muscles → death)

Shipping fever → respiratory disease



18

Behavioural measures

- Fatigue
- Fear
- Sexual behaviour
- Aggressive behaviour
- Urination, defecation
- Exploration
- Vocalisation
- Shivering/panting

19

Fatigue

Must be seen during unloading

Fear

General fear produces more reactivity in front of different challenges

Can produce immobility or animals flying



Can produce lesions due to mounts or 'chin resting'

As better the general transport conditions higher is the probability of this behaviour in appearing

20

Agressive behaviour



Urination, defecation, Exploration

Very difficult to assess

Vocalisations

In some species is more valid than in others

21



22

Conclusions

Stressor	Physiological variable
Measured in blood	
Food deprivation	FFA, B-OHB, Glucose, urea
Dehydration	Osmolality total protein albumin PCV
Physical exertion	CK lactate LDH
Fear/arousal	Cortisol PCV
Motion sickness	Vasopressin
Other measures	
Fear/arousal and physical exertion	Heart rate respiration rate
Hypothermia/hyperthermia	Body temperature skin temperature

23

Conclusions

Example of cattle transported 24 h

	STOCKING DENSITY		
	Low	Medium	High
Shifts	153	142	26
Struggles	5	4	10
Falls	1	1	8
Plasma cortisol (ng/ml)	0.1	0.5	1.1
Plasma CK (units/l)	132	234	367
Carcass bruise score	3.7	5.0	8.5

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Try to combine always different measures!!!

Tarrant et al., 1992

24





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