Can biomarkers for oxidative stress early predict BRD in calves?

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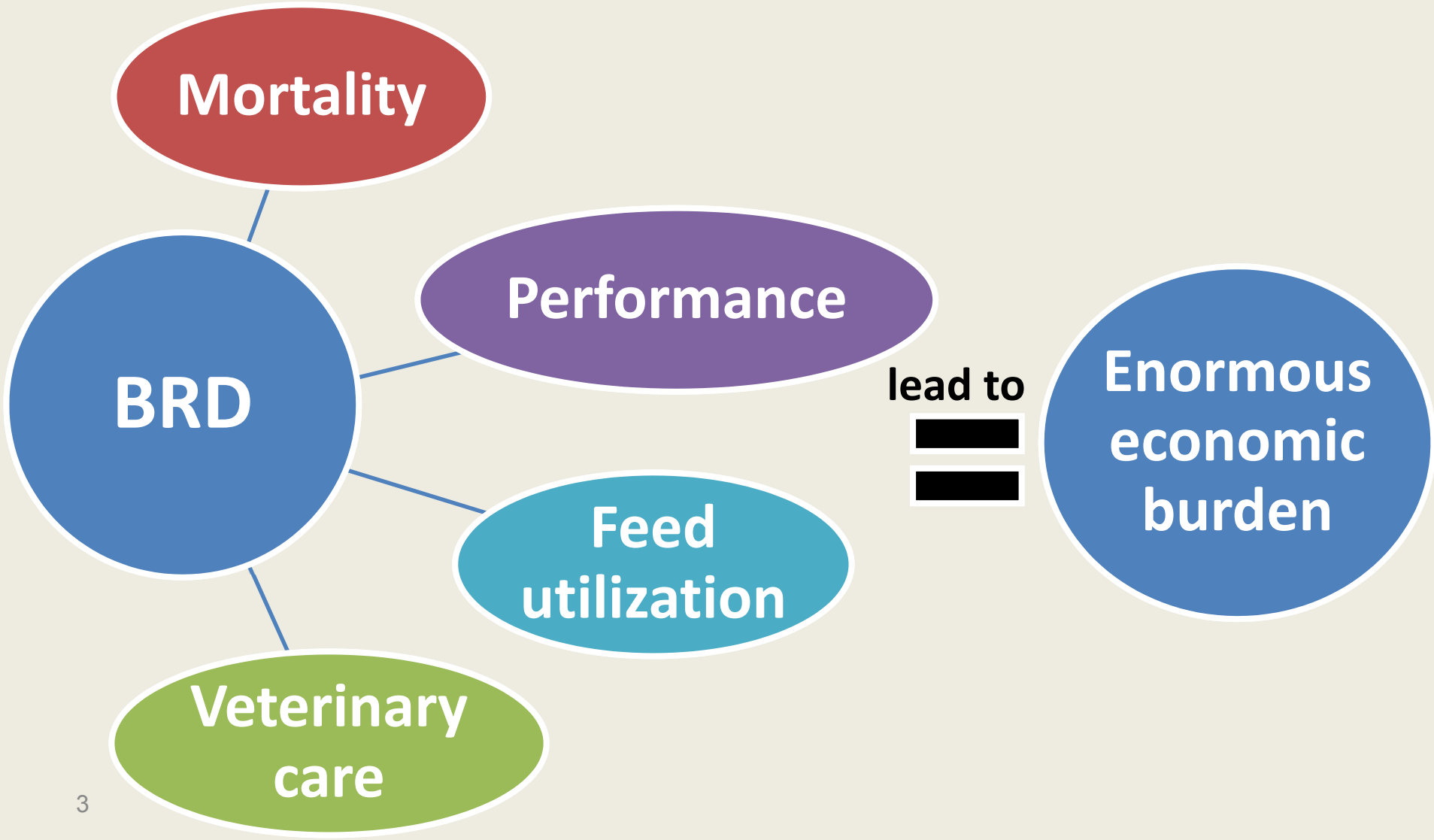
Bovine Respiratory Disease

- Complex of diseases characterized by many types of infections
- The most commonly and costly disease of feedlot cattle
- Causes the main morbidity and mortality of feedlot cattle

Economic implications of BRD

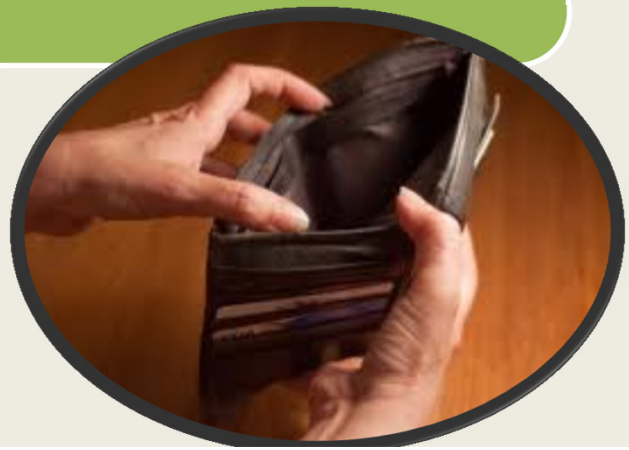


Economic implications of BRD

In Israel annual losses are estimated to

10 million $

In the United States annual losses are estimated to 1 billion $

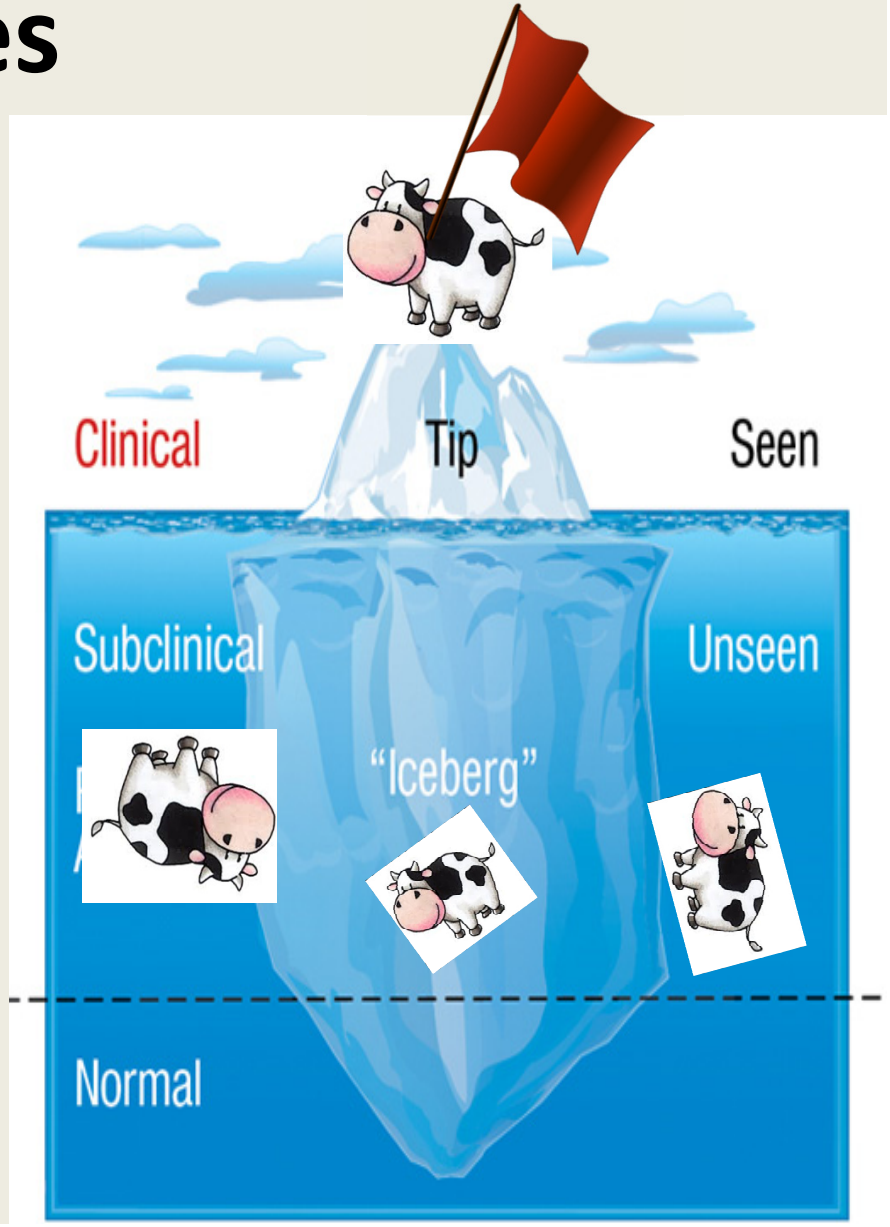


Stress and BRD

- Combination with **stress** cause to sever disease

The problem in identifying sick calves

- Subjective identifications
- The clinical signs are vary widely
- **“Tip of the iceberg”- asymptomatic calves**



The aims of this study

1. To identify the **individual** physiological response to transportation using physiological and biochemical biomarkers

The aims of this study

2. To examine the effectiveness of these biomarkers in objective **prediction of BRD** in young calves at early life stage

The experimental design

- 32 Holstein-Friesian bull calves were transported 20 km (half hour) at the age of 8±2 days

The experimental design

- Blood samples were collected from each calf at the following time points **relatively to transportation:**
- **Pre-transportation (0D) and, 1 hour (1H), 4 hour (4H), 1 day (1D), 3 days (3D) and 7 days (7D) post- transportation**

Materials and Methods

Immunology

- IgG
- Acute phase protein
- Hsp 72
- NQO1
- ProInflammatory genes

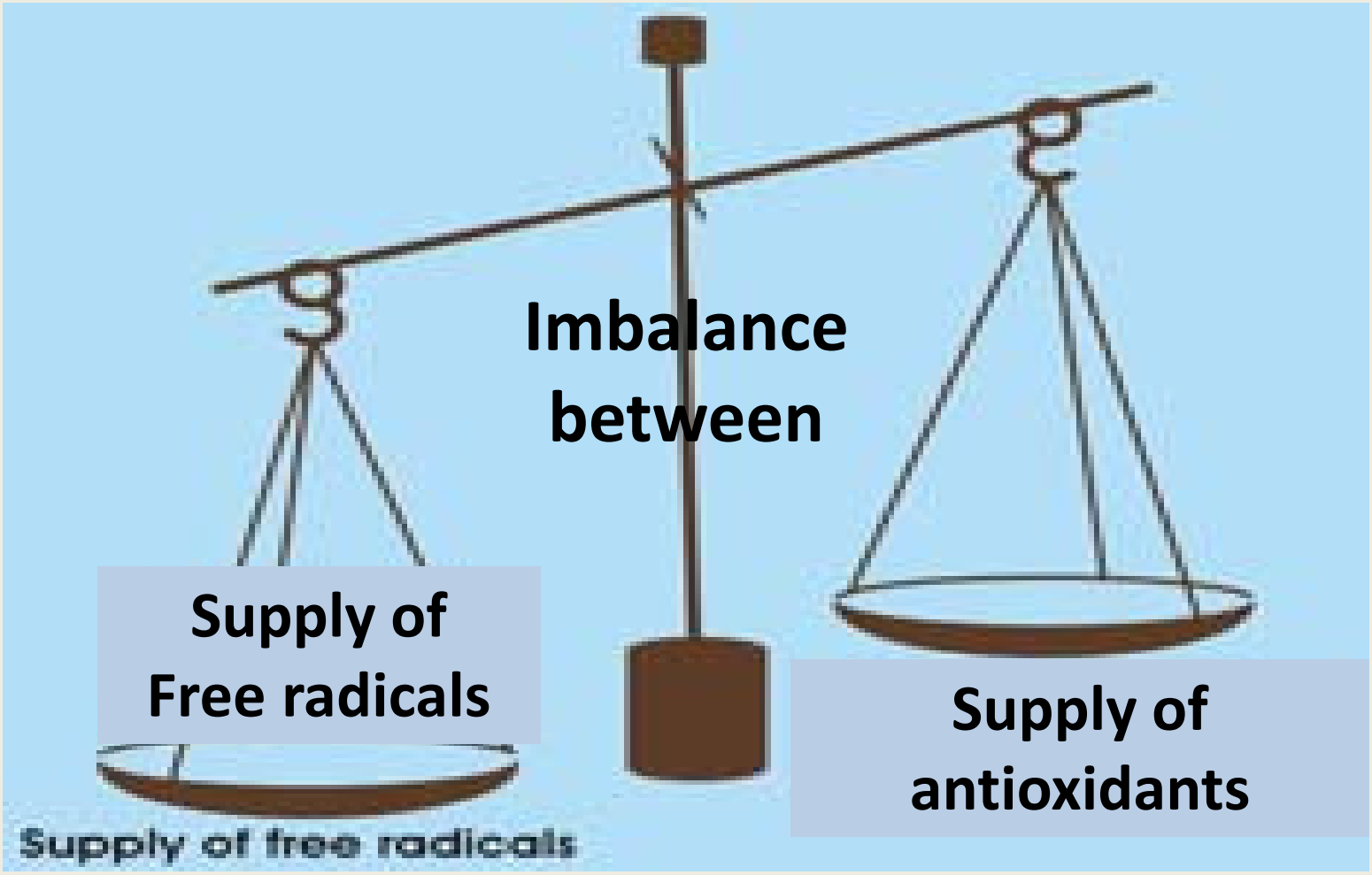
Metabolic stress

- BHB
- NEFA
- Glucose
- Urea
- Creatinine

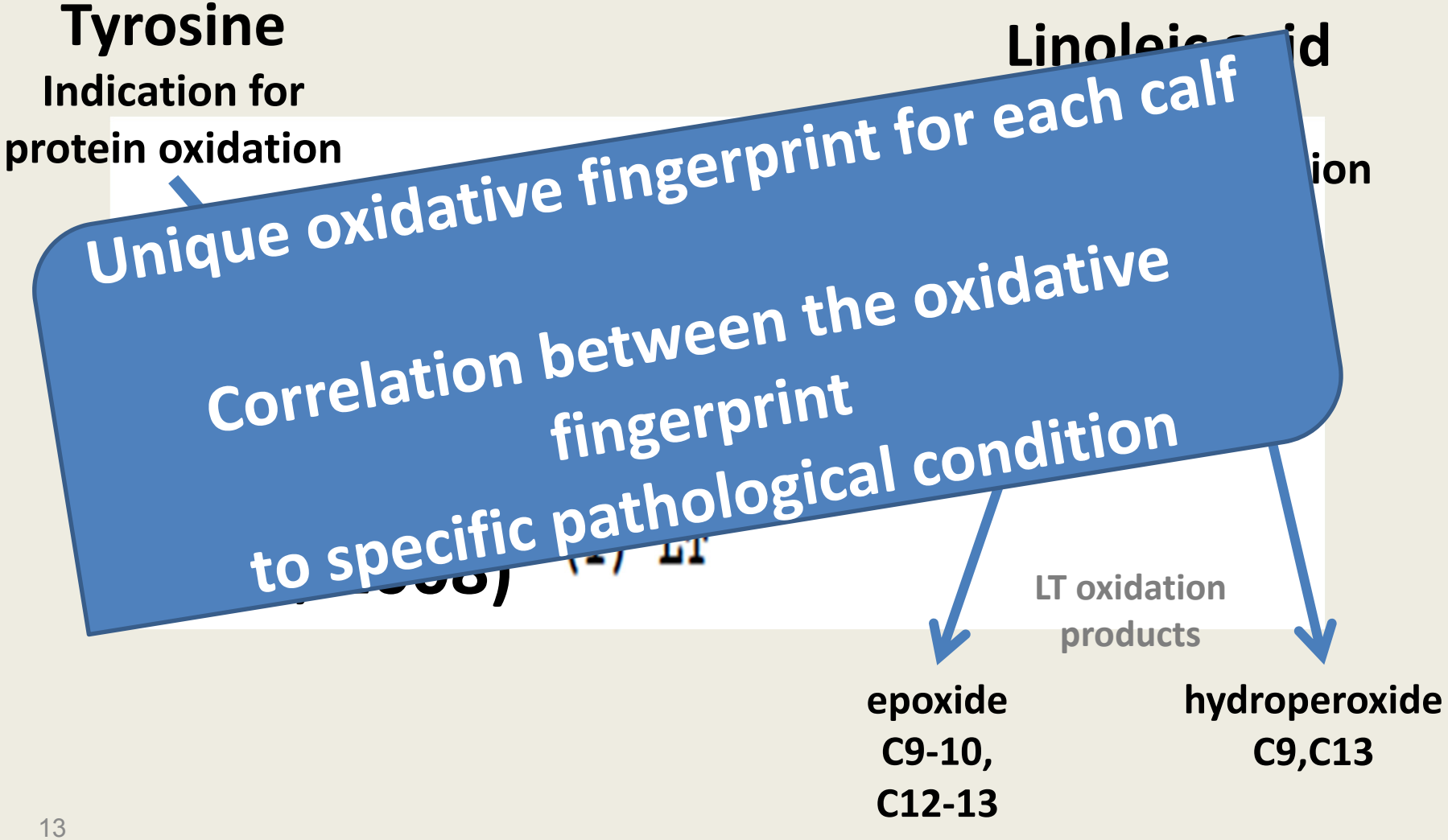
Oxidative stress

- LT
- MDA
- FRAP
- Oxidized fibrinogen

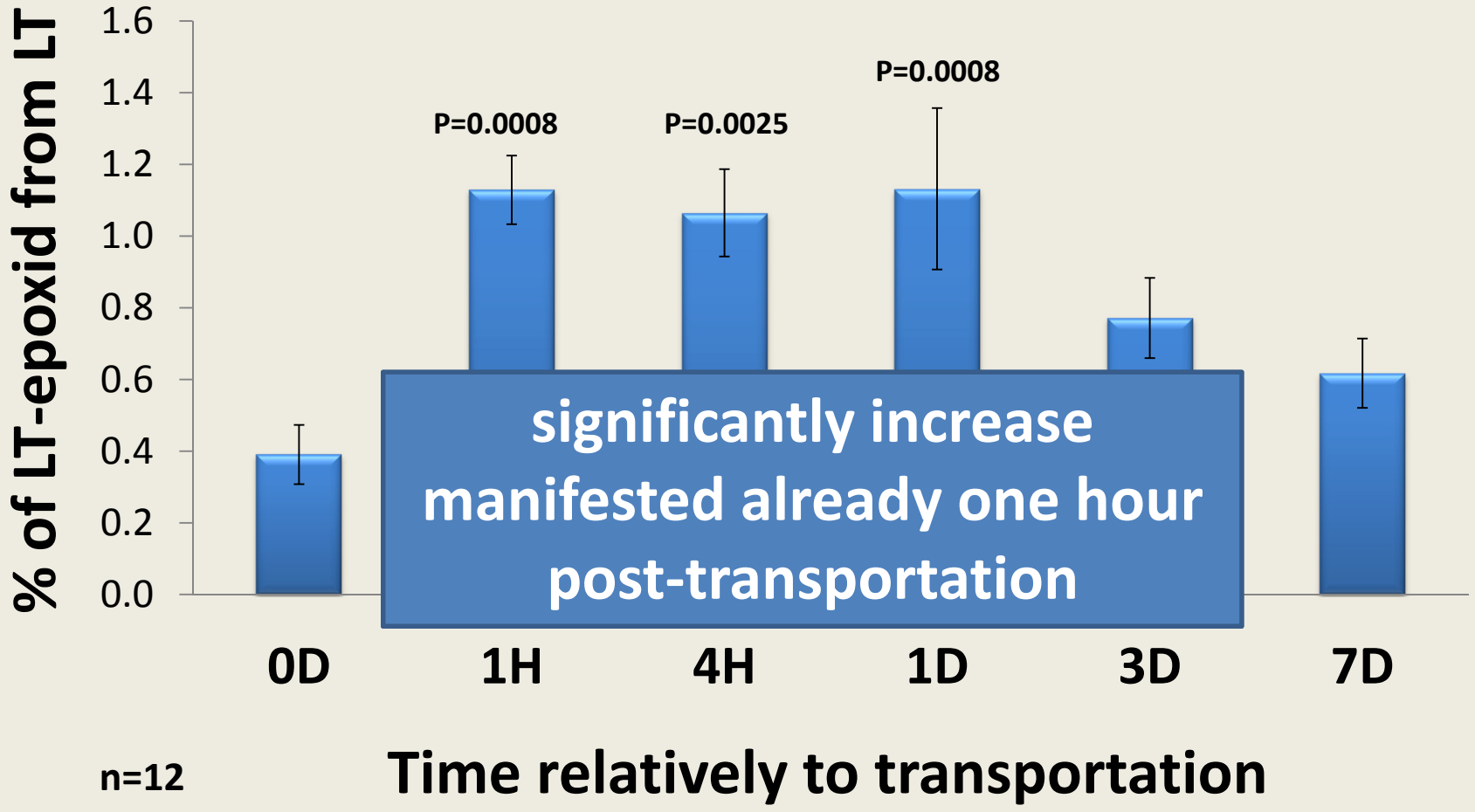
Oxidative stress indicators



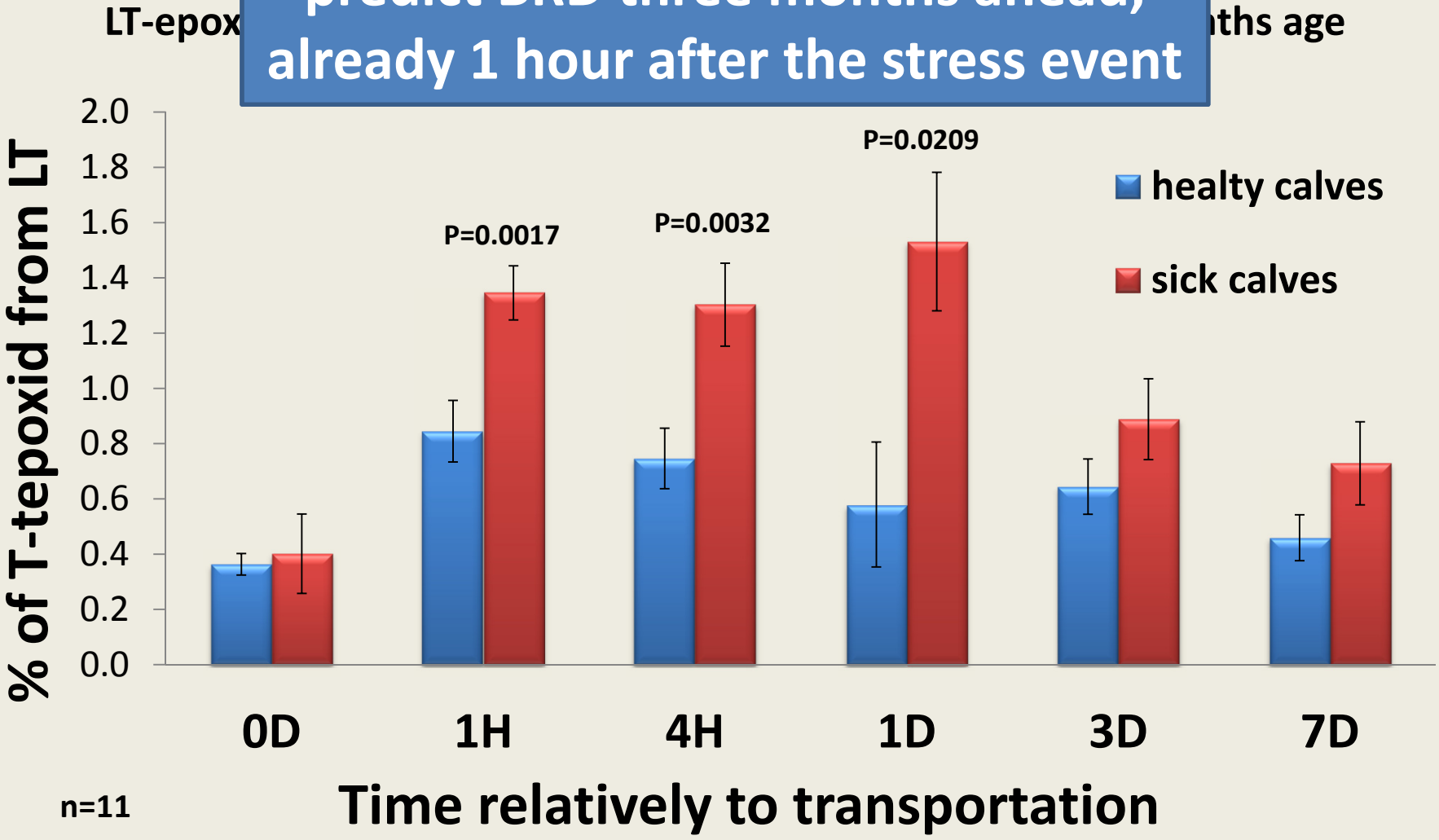
Exogenous linoleoyl- tyrosine (LT) marker



Profile of LT oxidation products relatively to transportation

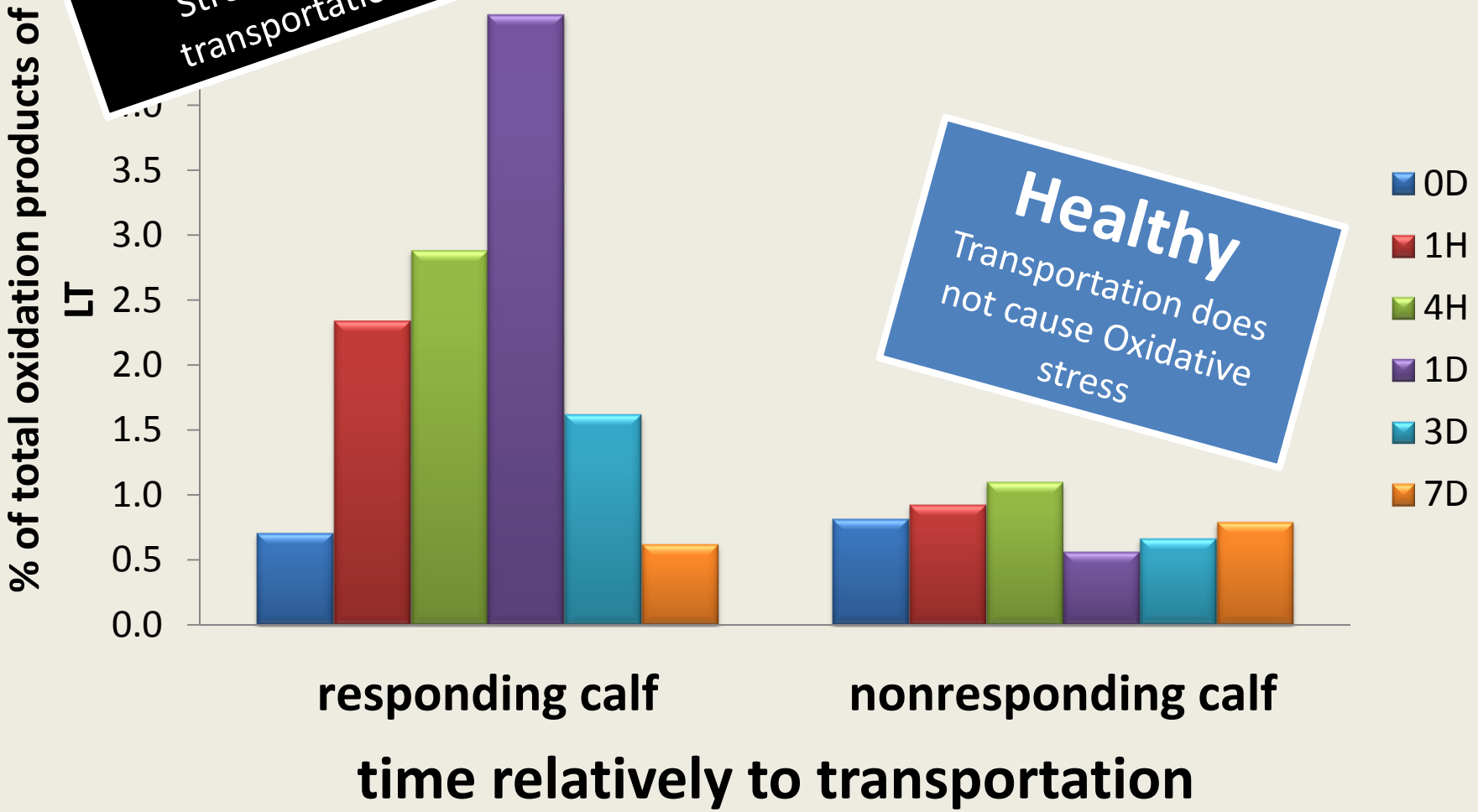


LT-epoxide was found to effectively predict BRD three months ahead, already 1 hour after the stress event



o oxidative stress
avioral patterns

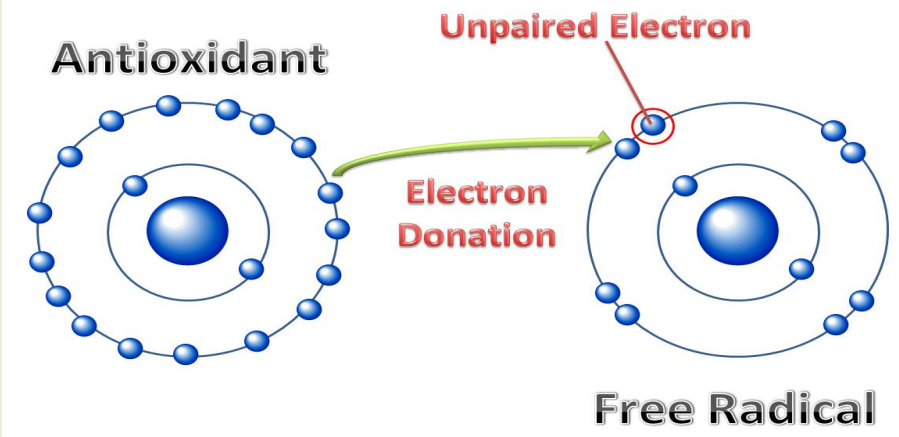
Sick
Increase in Oxidative Stress during transportation



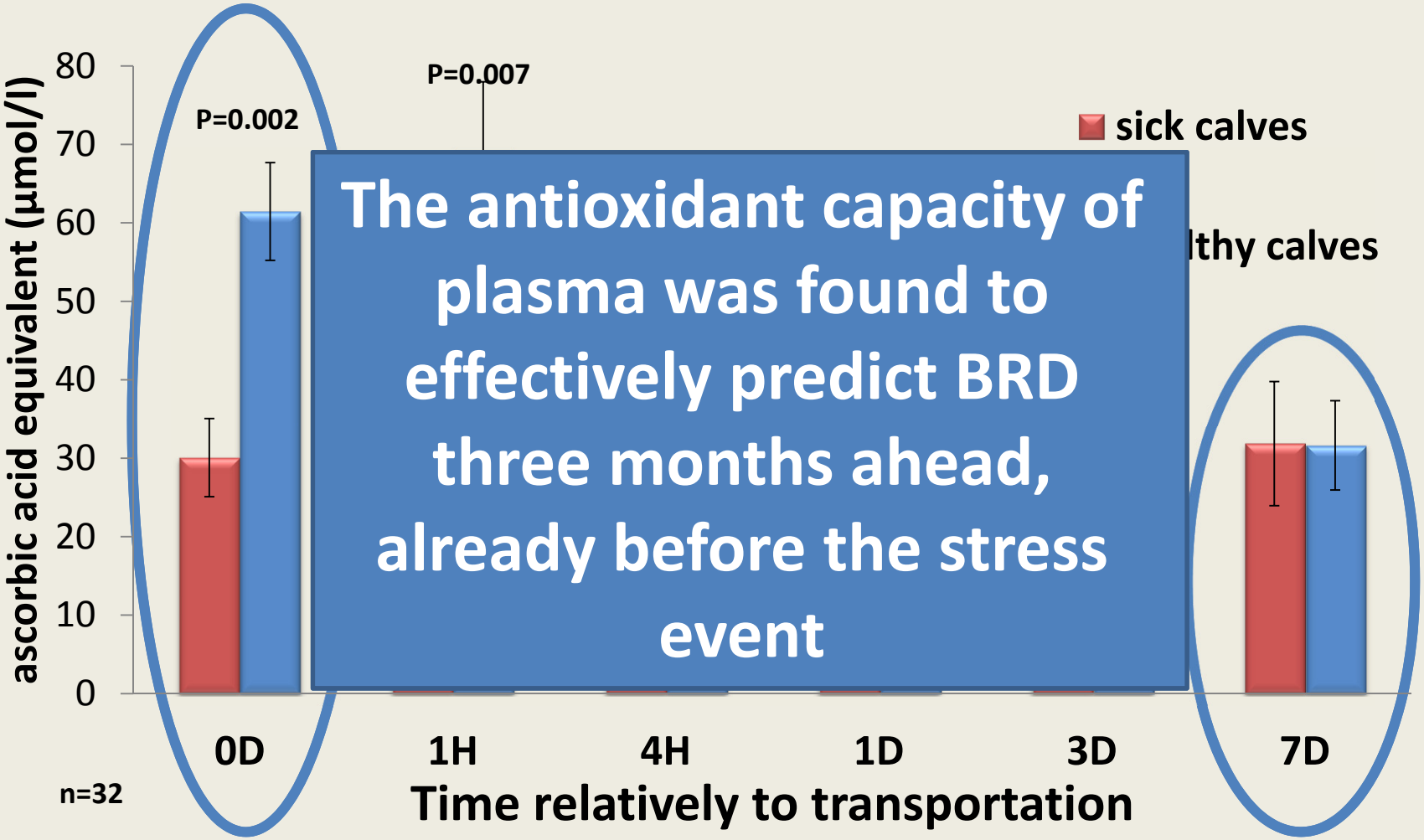
Healthy
Transportation does not cause Oxidative stress

Antioxidant capacity of plasma

- Antioxidants are chemical compounds that giving an e- to free radicals, convert them to an harmless configuration.
- Including enzymes, hydrophilic scavengers and lipophilic scavengers.
- The great majority of antioxidants are supplied with the diet.
- Measured by **FRAP** method

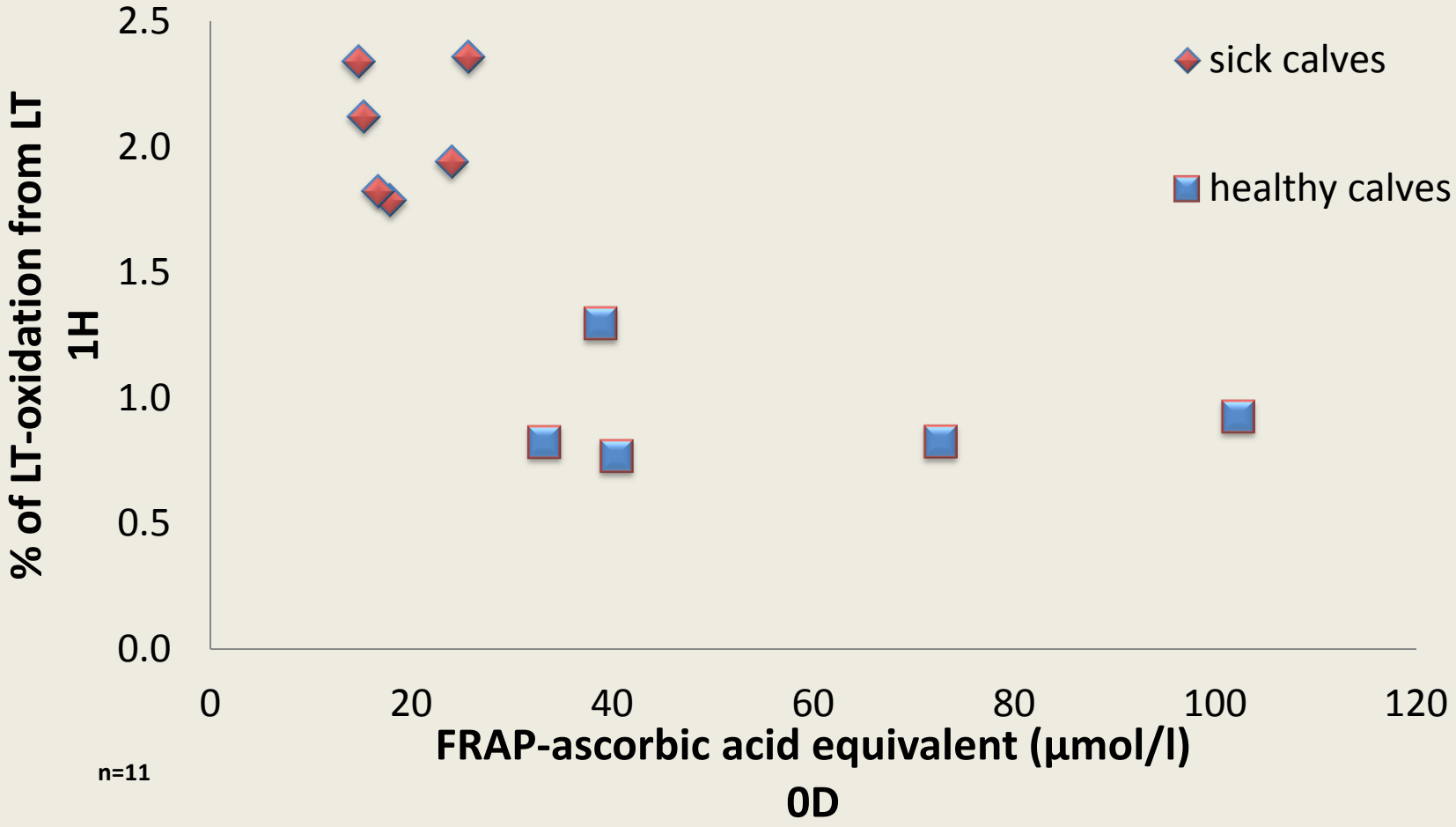


Antioxidant capacity of plasma



The antioxidant capacity of plasma was found to effectively predict BRD three months ahead, already before the stress event

The relationship between antioxidant capacity pre -transportation and LT oxidation products post- transportation



Conclusions

- Following transportation calves possess differential stress response
- **The susceptibility of calves to BRD can be predicted at early life stage, even before transportation**
- Healthy calves shown higher levels of antioxidant capacity that correlated with lower levels of lipid peroxidation

To examine whether

antioxidant therapy,

pre-transportation, may be used

to reduce the incidence of

oxidative stress related morbidity.

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