High dietary vitamin E and selenium improves oxidative status of finisher lambs during heat stress

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Presentation Outline

Introduction

Experimental Animals

- Selection, acclimatization and antioxidant supplementation

Heat stress and lairage

- Heat treatment, transportation to abattoir and pre-slaughter measurements

Results

- Physiological responses
- Oxidative stress biomarkers

Conclusions and future research

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Introduction


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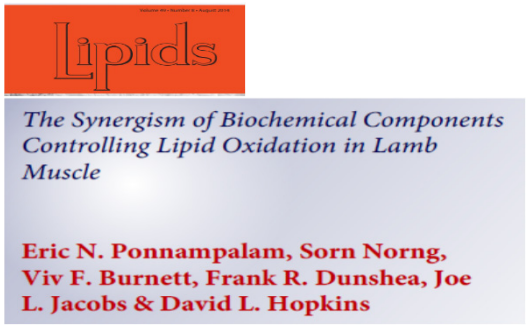
Review

Myoglobin and lipid oxidation interactions: Mechanistic bases and control

Cameron Faustman [a,*], Qun Sun [b], Richard Mancini [a], Surendranath P. Suman [c]


Lipids

The Synergism of Biochemical Components Controlling Lipid Oxidation in Lamb Muscle

Eric N. Ponnampalam, Sorn Norng, Viv F. Burnett, Frank R. Dunshea, Joe L. Jacobs & David L. Hopkins


Journal of Animal Science

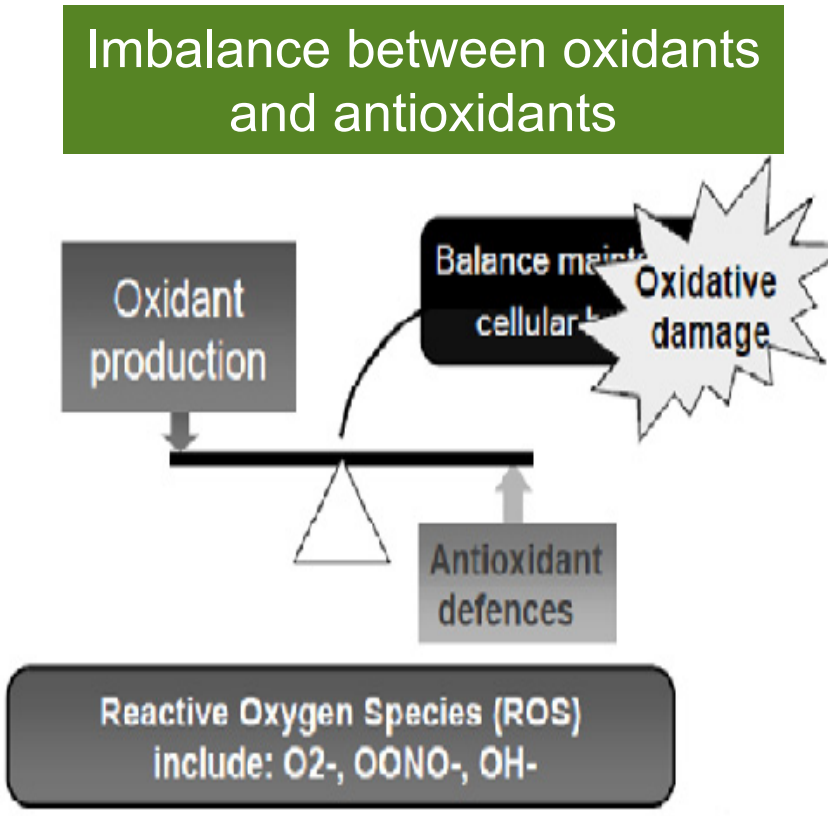
Dietary antioxidants at supranutritional doses improve oxidative status and reduce the negative effects of heat stress in sheep

S. S. Chauhan, P. Celi, B.J. Leury, I. J. Clarke and F.R. Dunshea

- Consumer's decision to buy meat is strongly influenced by meat colour
- Meat discoloration is a oxidative process and is due to conversion of oxymyoglobin to metmyoglobin
- Concentration of antioxidants in the muscle has an influence on meat colour
- Availability of antioxidants in the feed is variable and affected by season
- Heat stress reduces the feed intake and affects post absorptive metabolism
- Heat stress leads to oxidative stress and may compromise meat colour and lipid stability

Oxidative stress

- Excessive production of free radicals
- Deficiency of antioxidants
- Failure of antioxidant system of body



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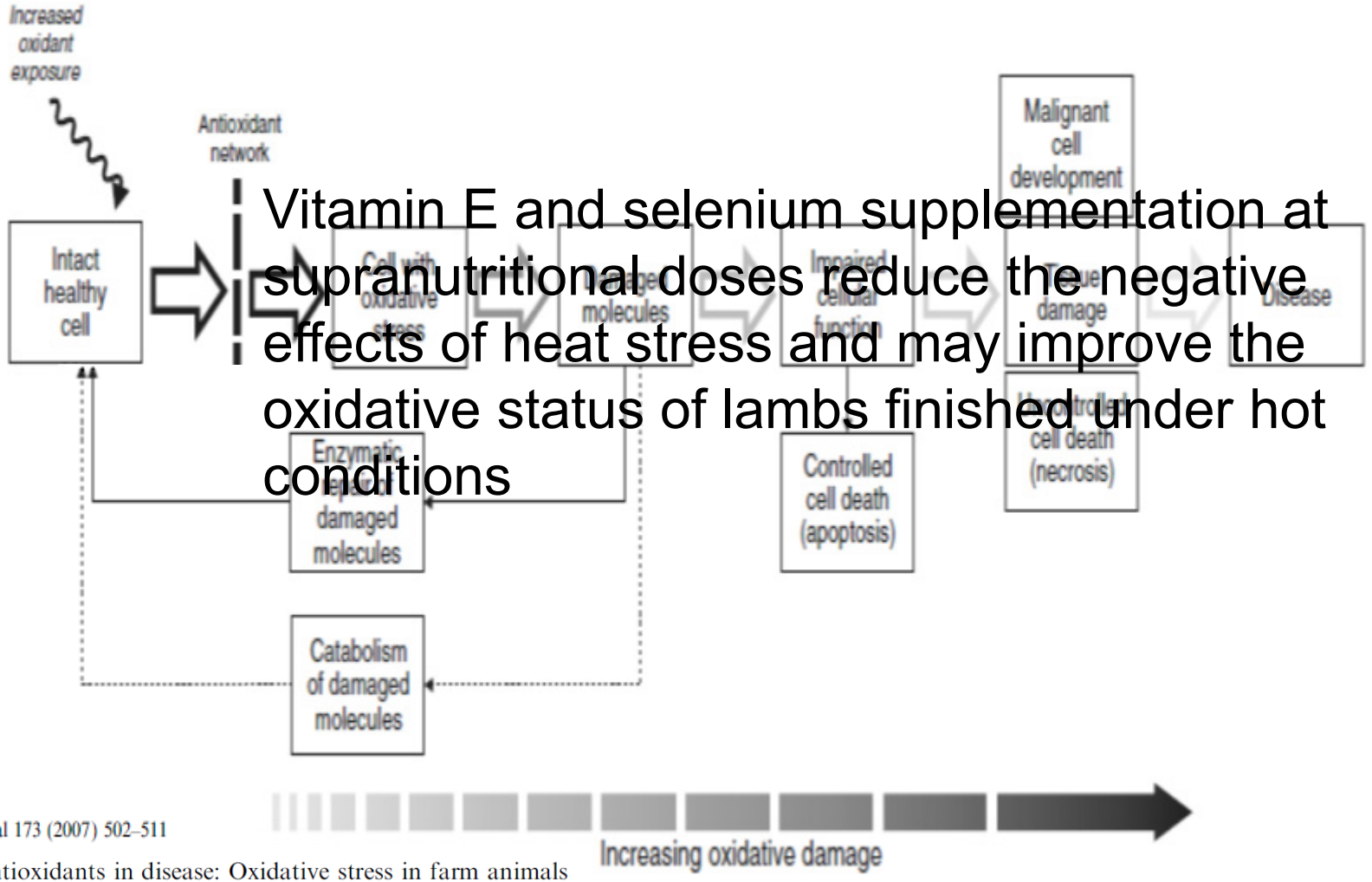
Hypothesis



Vitamin E and selenium supplementation at supranutritional doses reduce the negative effects of heat stress and may improve the oxidative status of lambs finished under hot conditions

The Veterinary Journal 173 (2007) 502–511

Oxidants and antioxidants in disease: Oxidative stress in farm animals

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Experimental animals

Selection and acclimatization

Antioxidant feeding

Doses of Vit E and Se for control (CON), moderate (MOD), and supranutritional (SUP) diets were 27.6, 130, 227.5 IU/kg DM and 0.16, 0.66, 1.16 mg/kg DM, respectively

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Thermal treatments

Heat stress

Temperature 28-40˚C (0900-1700 hrs)
Relative Humidity 35-26%
Temperature Humidity Index 74-86

Thermoneutral

Temperature 18-21˚C (24 hrs)
Relative Humidity 35-50%
Temperature Humidity Index >72

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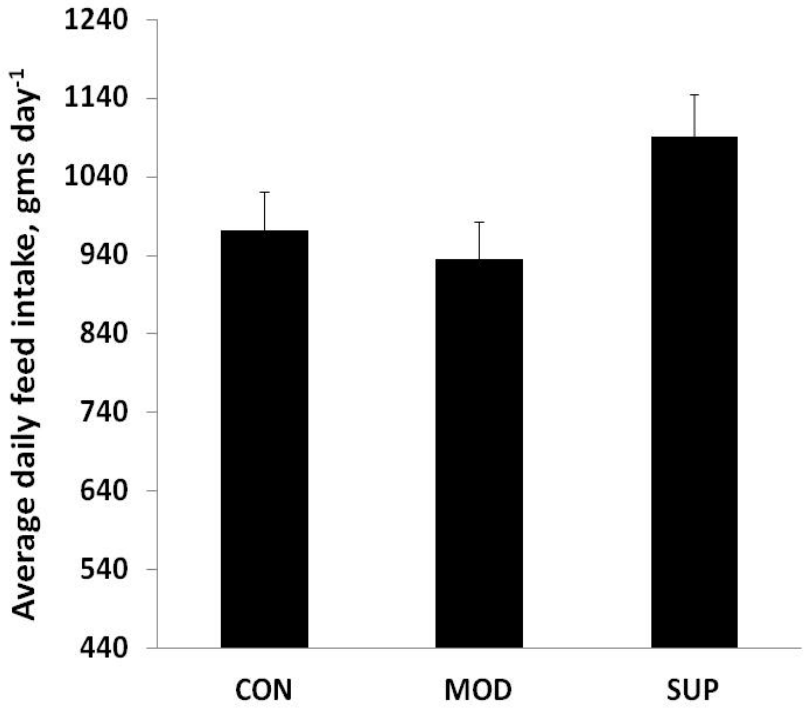
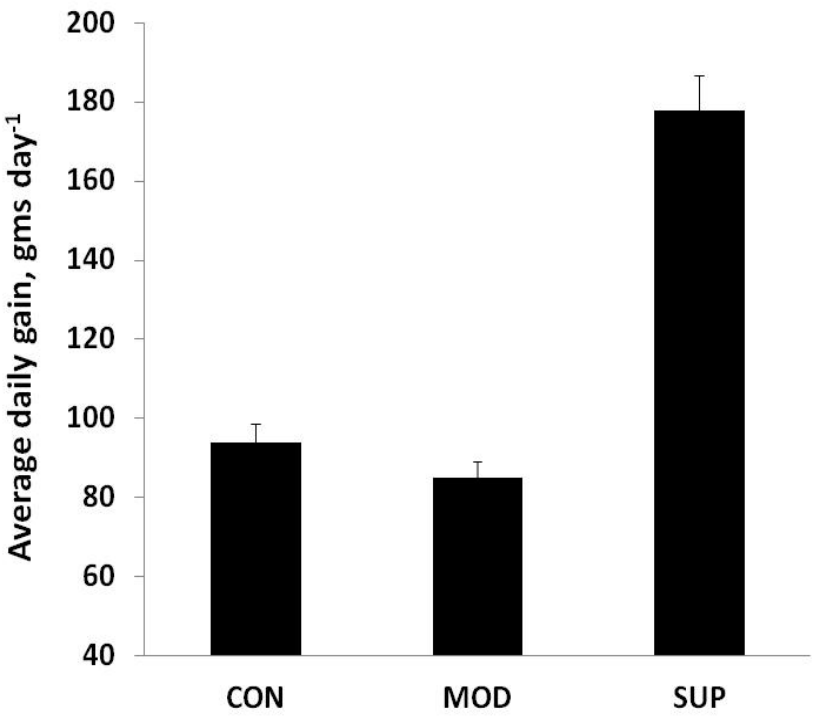
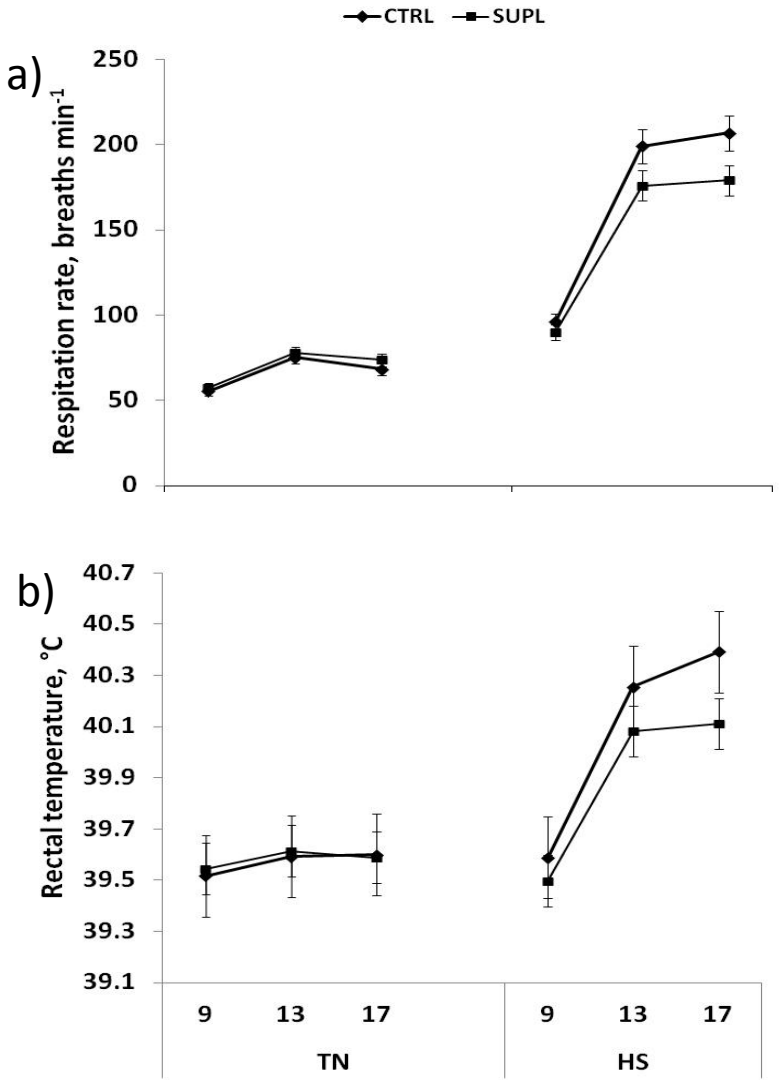
Supranutritional dose of vitamin E and Se improves feed intake and average daily gain of lambs

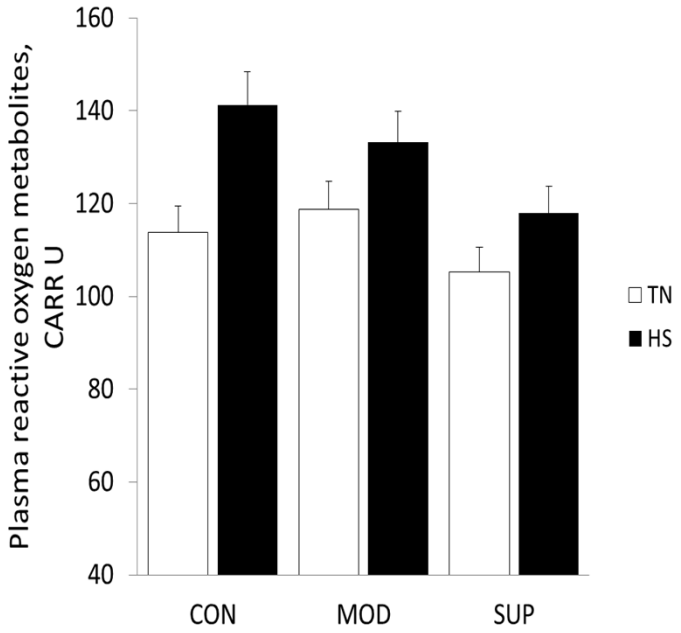


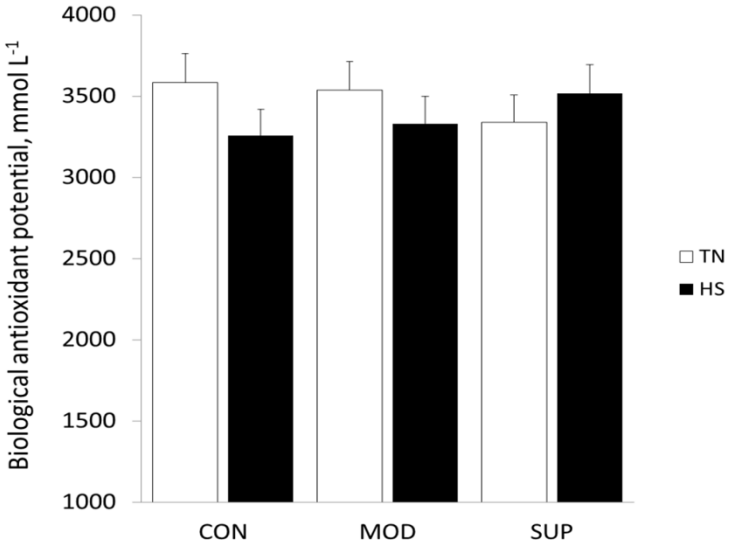


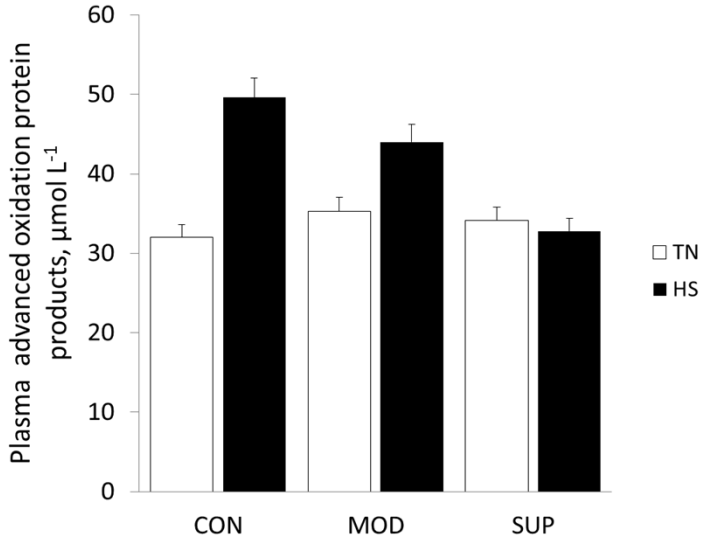
Vitamin E and Se reverses effects of heat stress on respiration rate and rectal temperature of lambs



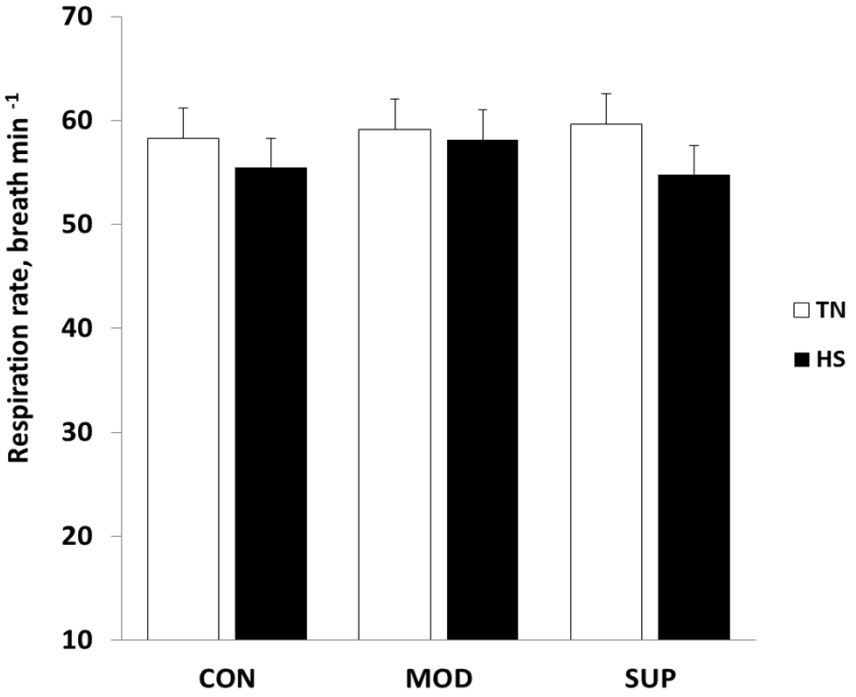
Supranutritional dose of vitamin E and Se improves oxidative status of lambs

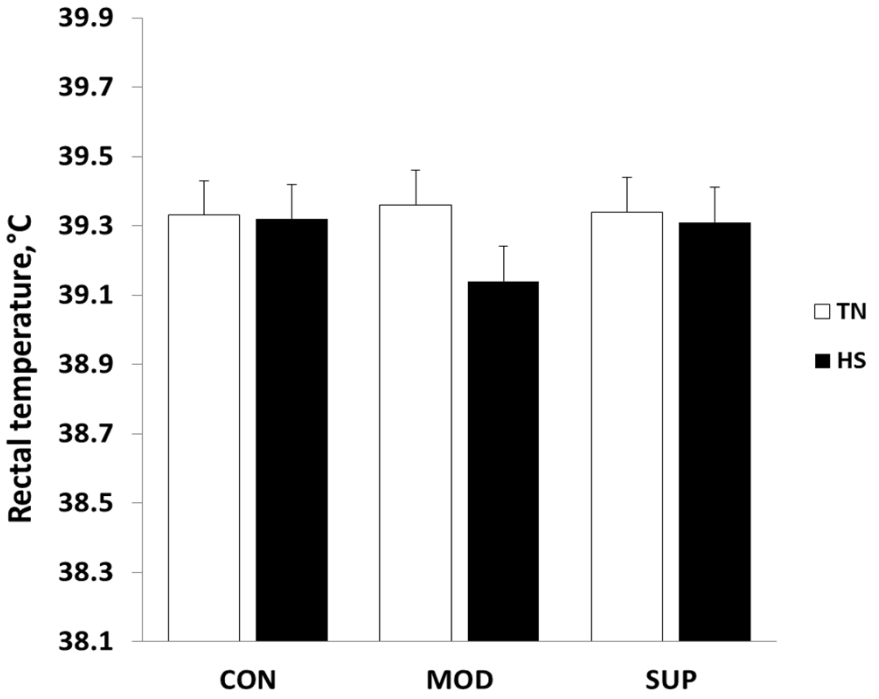




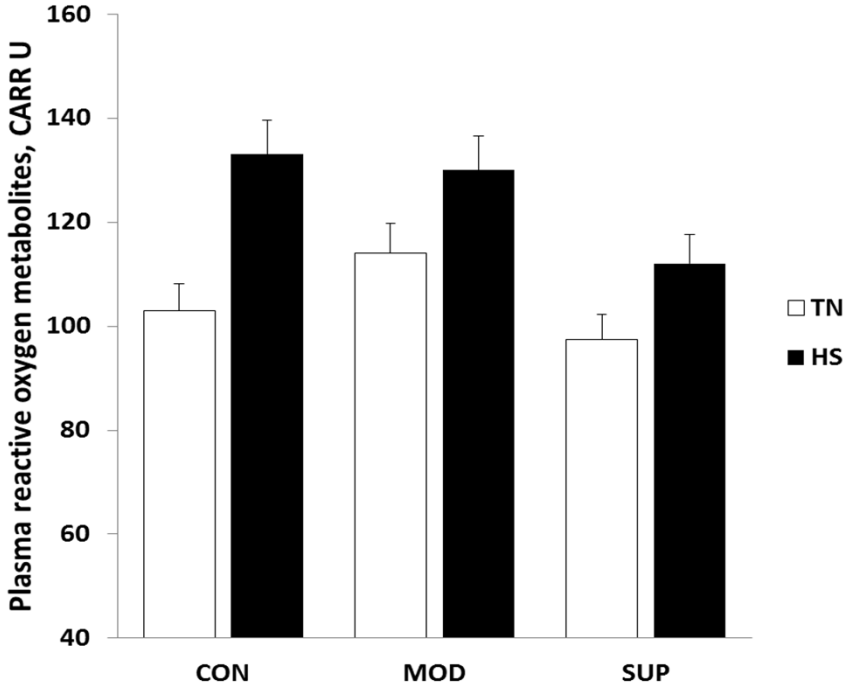


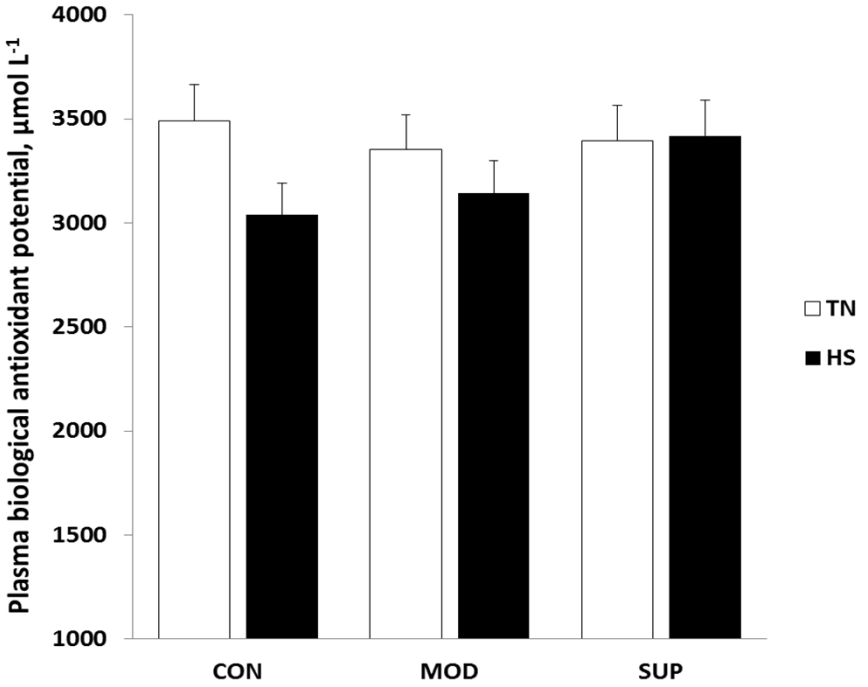
Lairage helps to normalize the respiration rate and rectal temperature of lambs finished under hot conditions



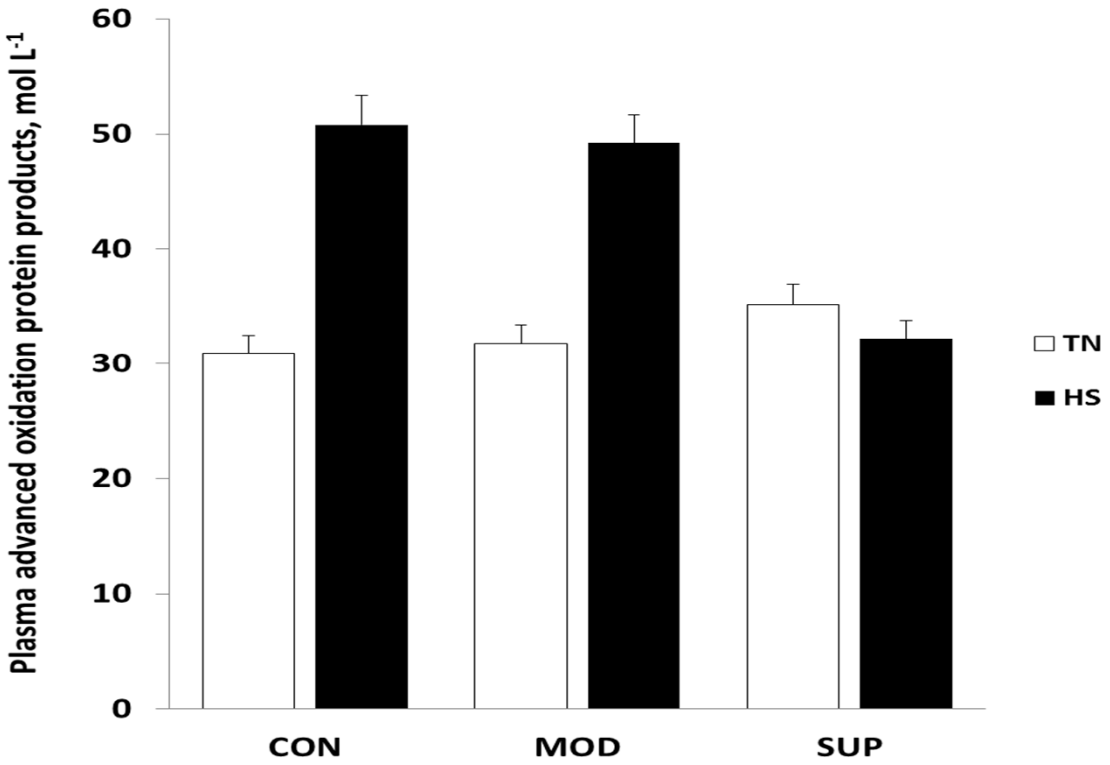


Supranutritional dose of vitamin E and Se reduces plasma ROS levels and maintains the BAP of lambs in lairage





Supranutritional dose of vitamin E and Se reduces plasma AOPP levels of lambs during lairage



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Conclusions

- High dietary vitamin E and selenium improves the feed intake and average daily gain in lambs finished on pellet feeding
- High dietary vitamin E and selenium improves the oxidative status of lambs finished under hot conditions
- Holding lambs in lairage under TN conditions following finishing under hot conditions, help to normalise their physiological responses

Future research

- Effects of heat stress and high vitamin E and Se supplementation on meat colour stability and shelf life of lamb meat
- Feeding systems to optimize the incorporation of Vitamin E and Se in lamb muscles
- Pasture finishing or grain based pellet finishing with high antioxidant supplementation

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Thanks for your attention