

# High pH in lamb meat accelerates browning



Honor Calnan

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Prof. David Patrick  
Dr. Robin Jacob

# Outline

- Background
- Hypothesis
- Materials & Methods
- Results
- Conclusions

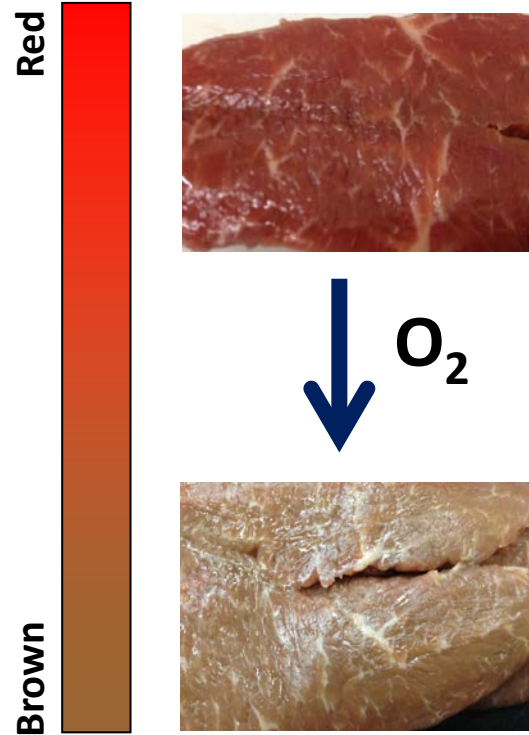


# Lamb browning

- Lamb meat browns rapidly
- Consumers prefer red meat

↓ shelf life

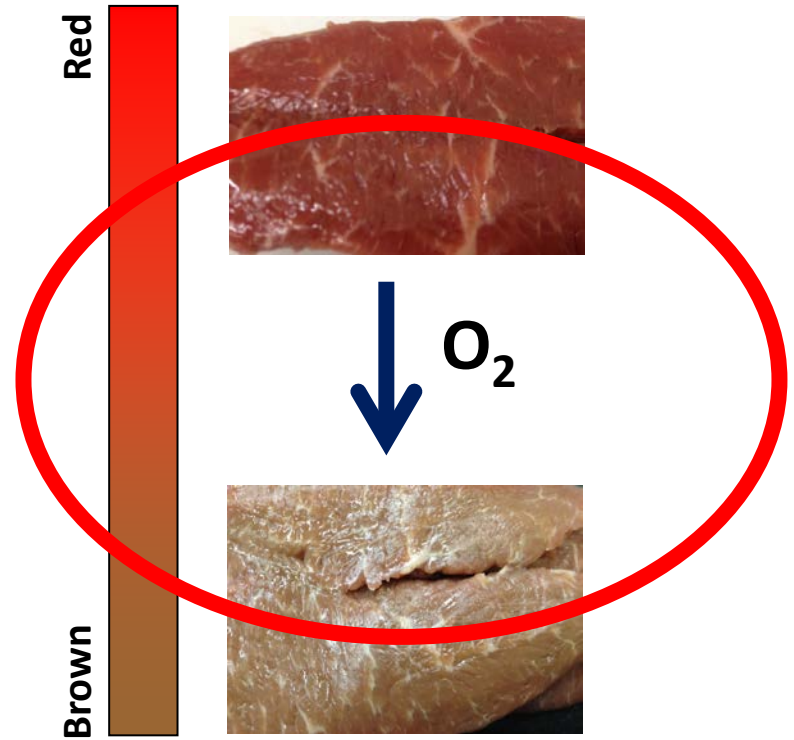
↓ \$





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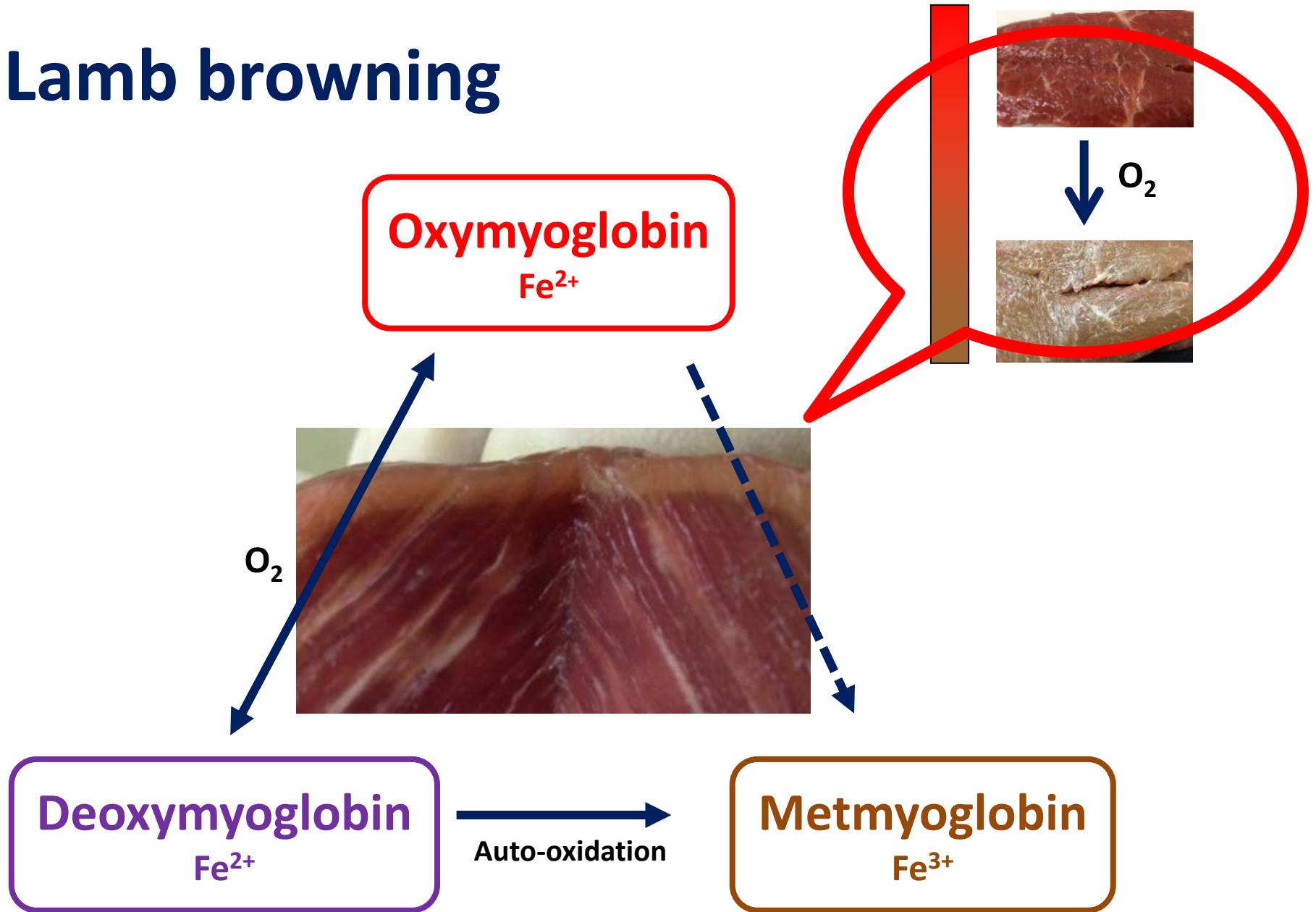


↓ shelf life

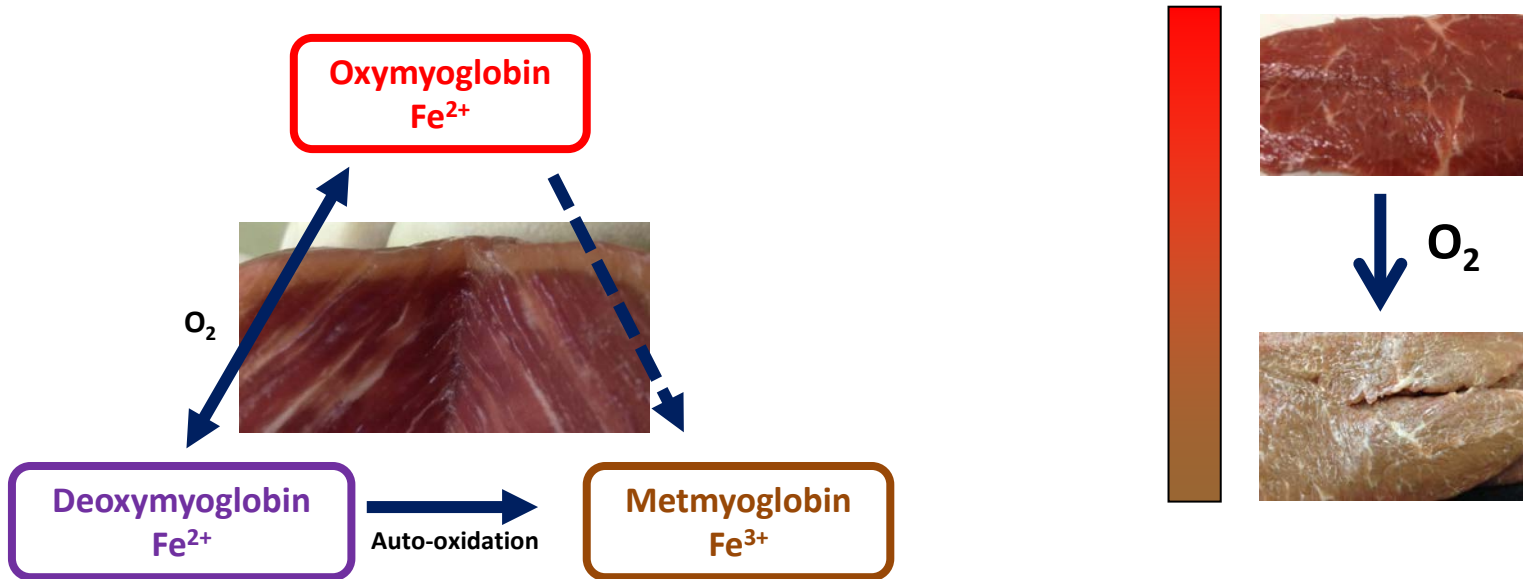
↓ \$



# Lamb browning



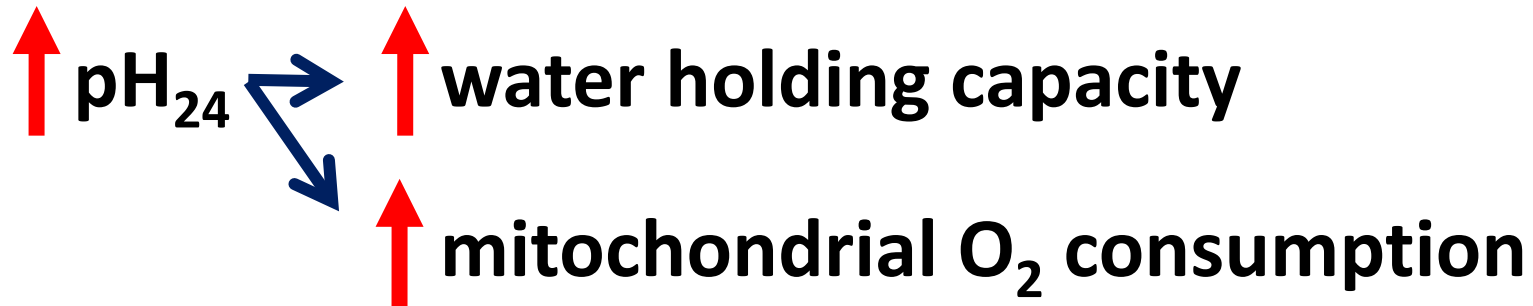
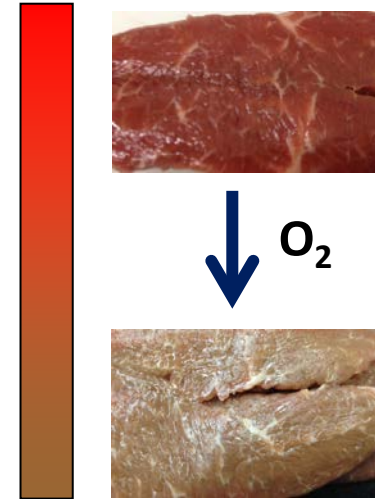
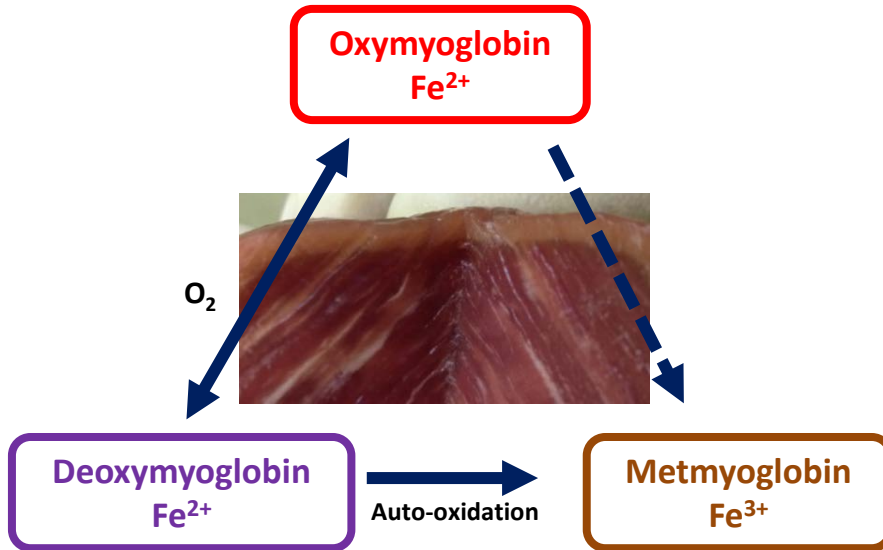
# Lamb browning



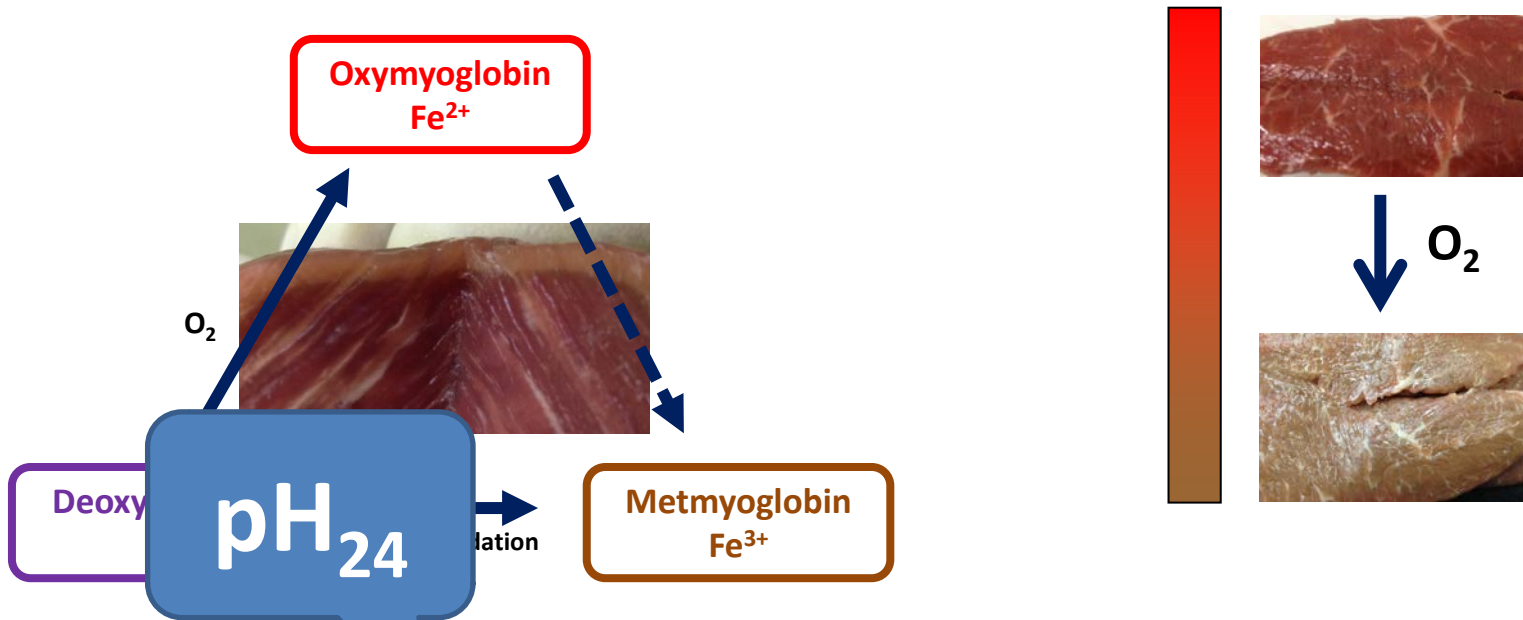
## Factors governing meat browning:

- $O_2$  penetration & consumption
- Rate of myoglobin auto-oxidation
- Extent of metmyoglobin reducing activity

# pH<sub>24</sub> & Lamb browning



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## Factors governing meat browning:

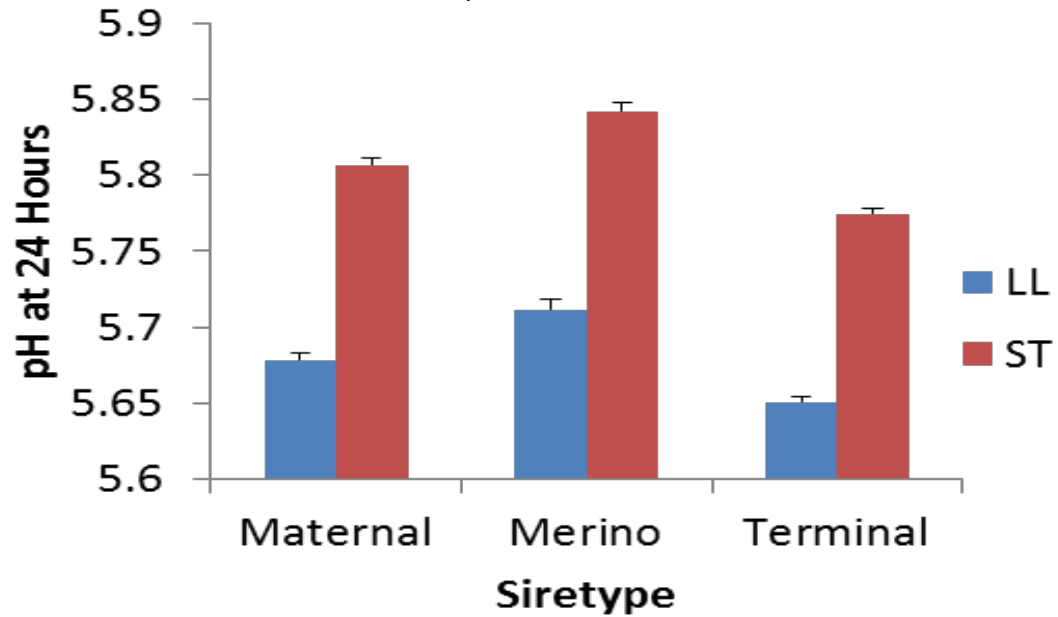
- **O<sub>2</sub> penetration & consumption → ↓ depth of bloom**
- Rate of myoglobin auto-oxidation
- Extent of metmyoglobin reducing activity



# pH<sub>24</sub> & Breed type



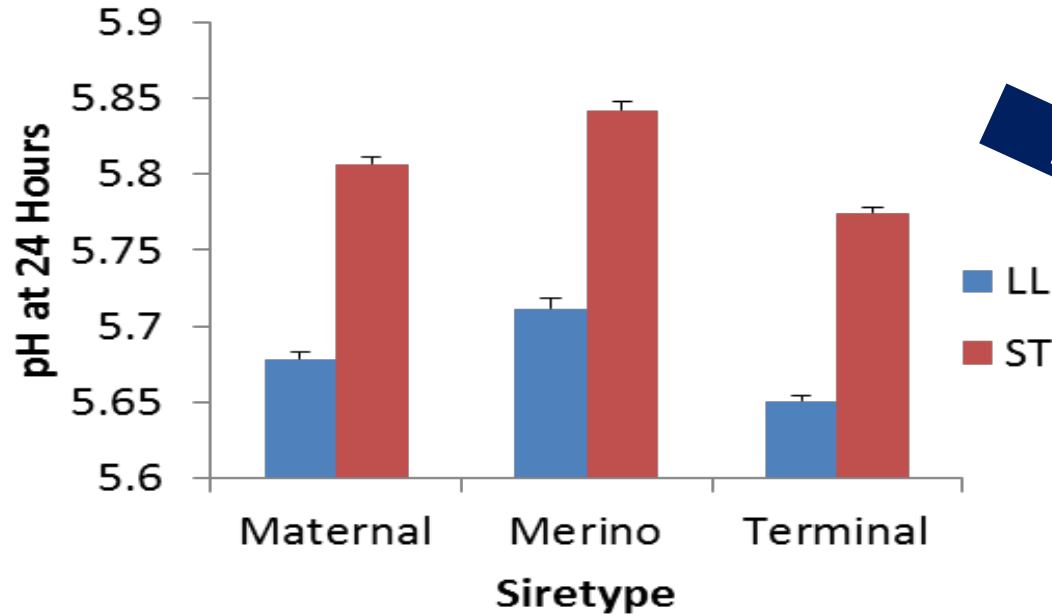
Corbett, S., pers. comm. 2013



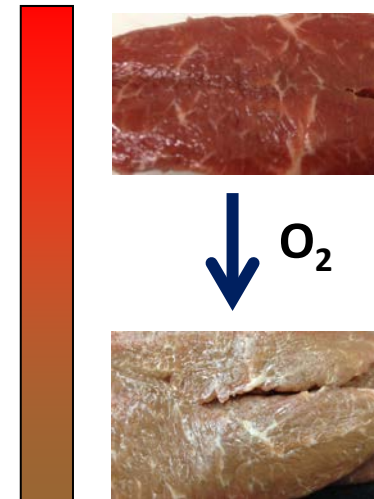
# pH<sub>24</sub> & Breed type



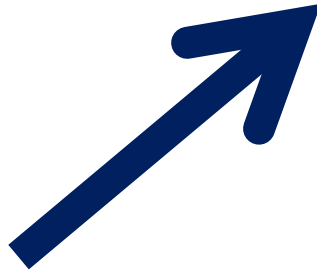
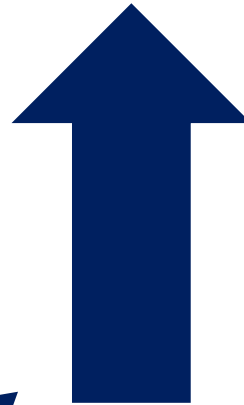
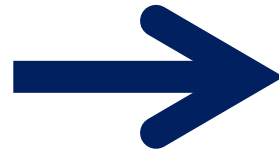
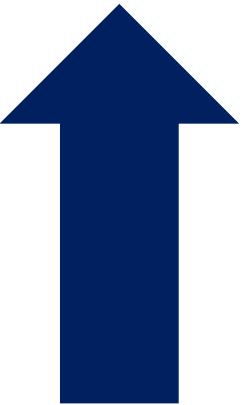
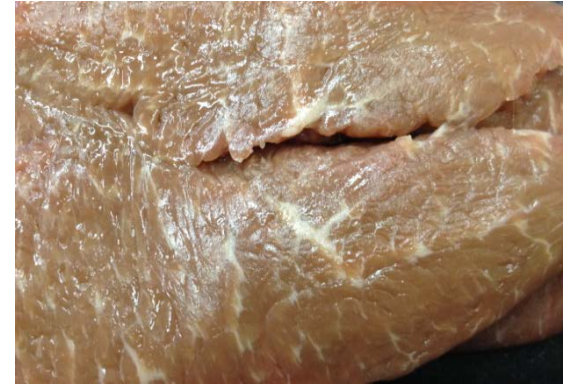
Corbett, S., pers. comm. 2013



Merinos?



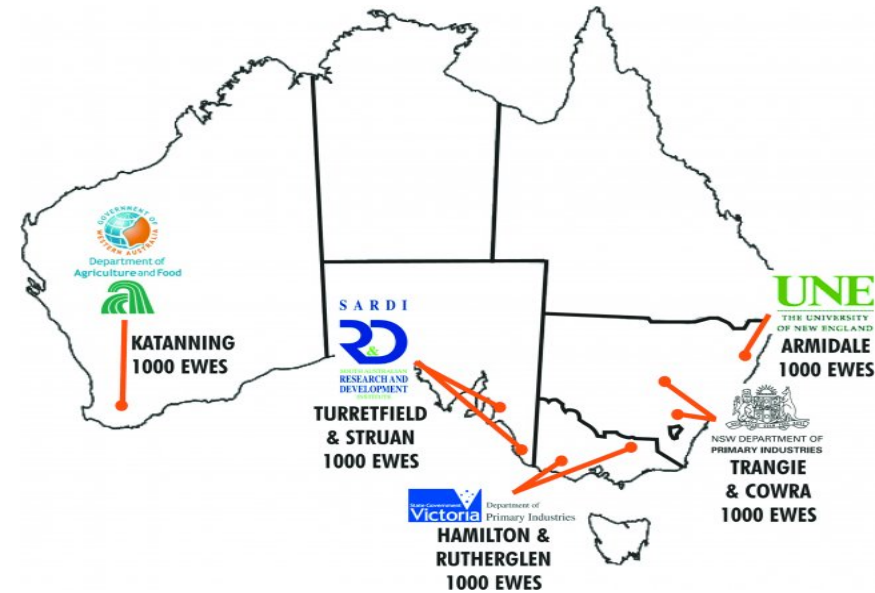
# Hypothesis



# Materials & Methods

4953 lambs:

- 5 years (2007-2011)
- 5 sites



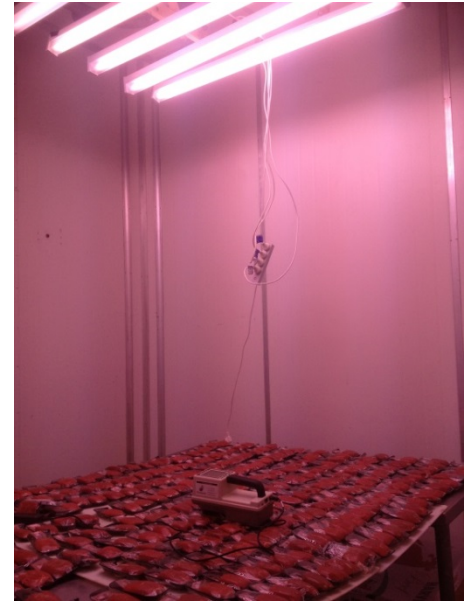
Sire type	Dam breed
Maternal	Merino
Merino	Merino
Terminal	Merino
Terminal	Border-Leicester Merino

- Extensive pasture grazing



# Materials & Methods

- Loin muscle @ 24 hrs
- Vacuum packaged & aged 5 days
- Re-packaged with oxygen-permeable wrap
- Simulated retail display for **3 days**



# Materials & Methods



- Ratio of reflectance:

**R630 nm**



**R580 nm**

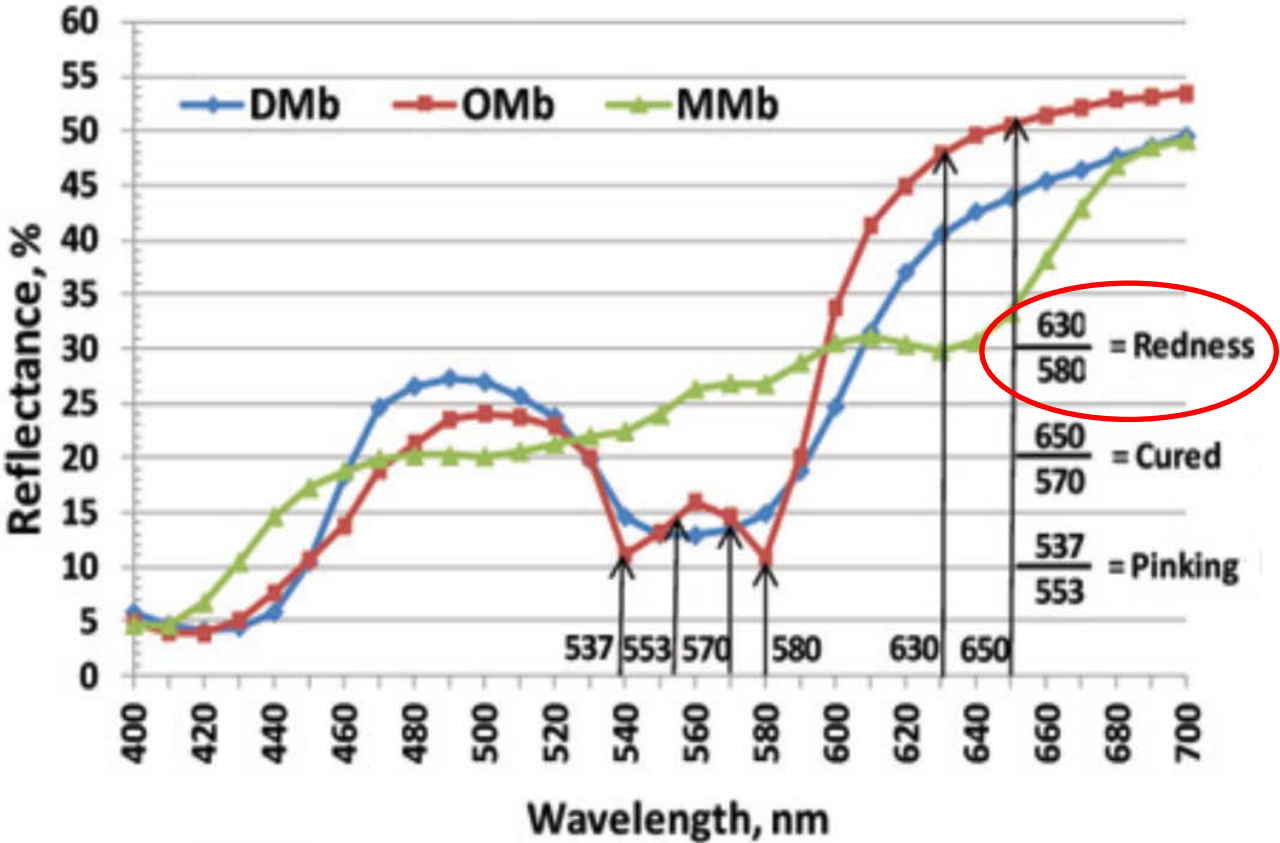
- R630/R580 represents  
meat redness



# Materials & Methods



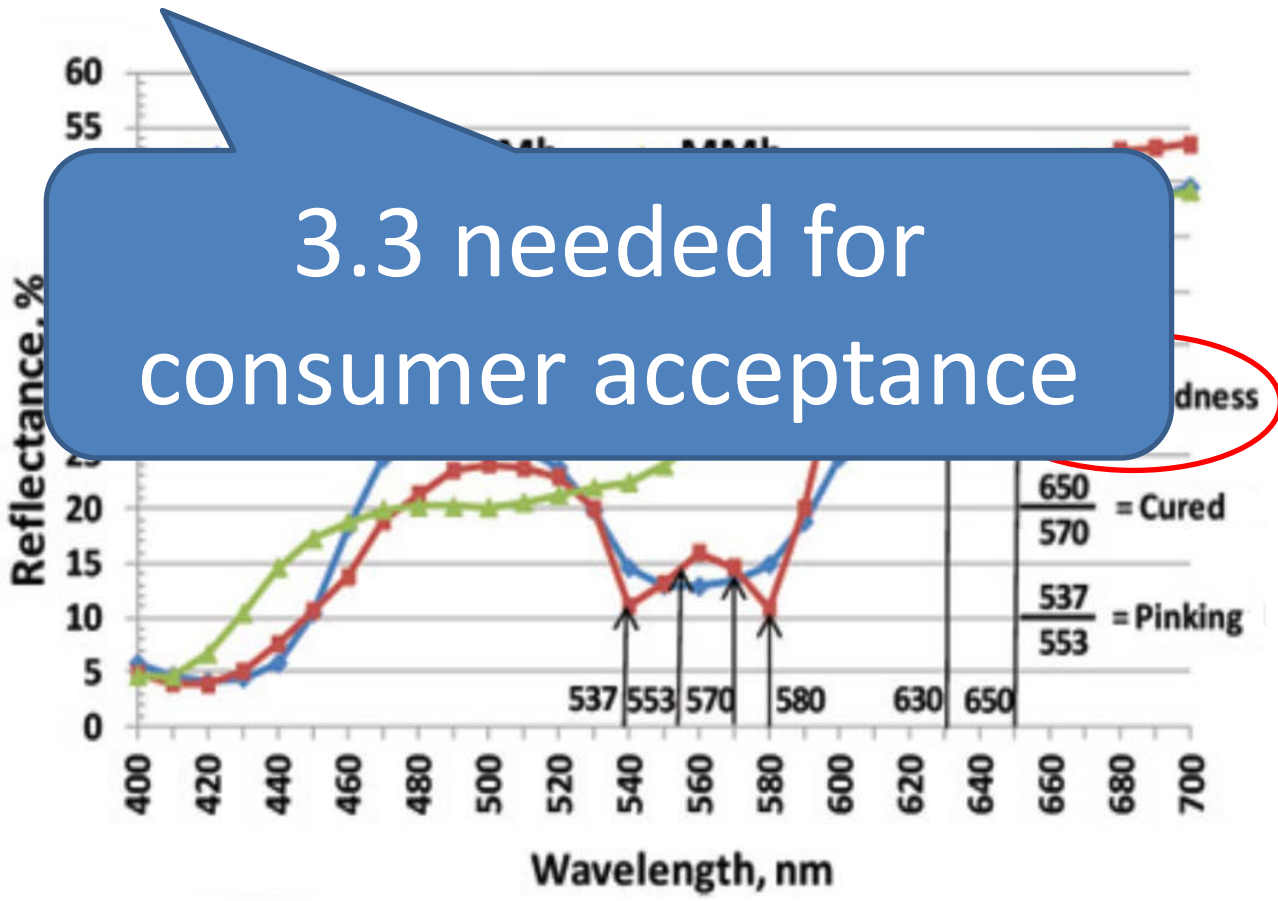
## R630/R580:



# Materials & Methods



R630/R580



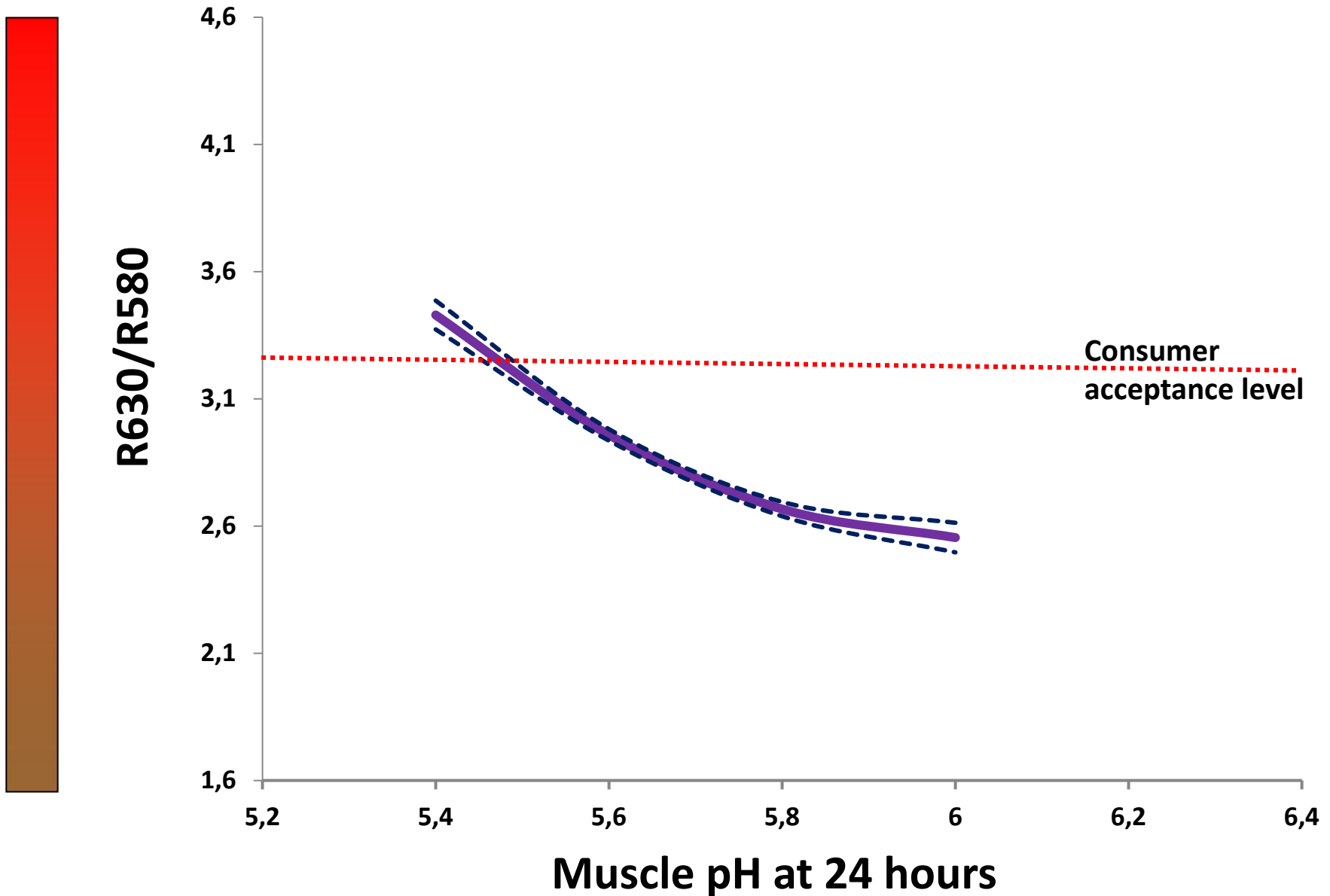


# Materials & Methods

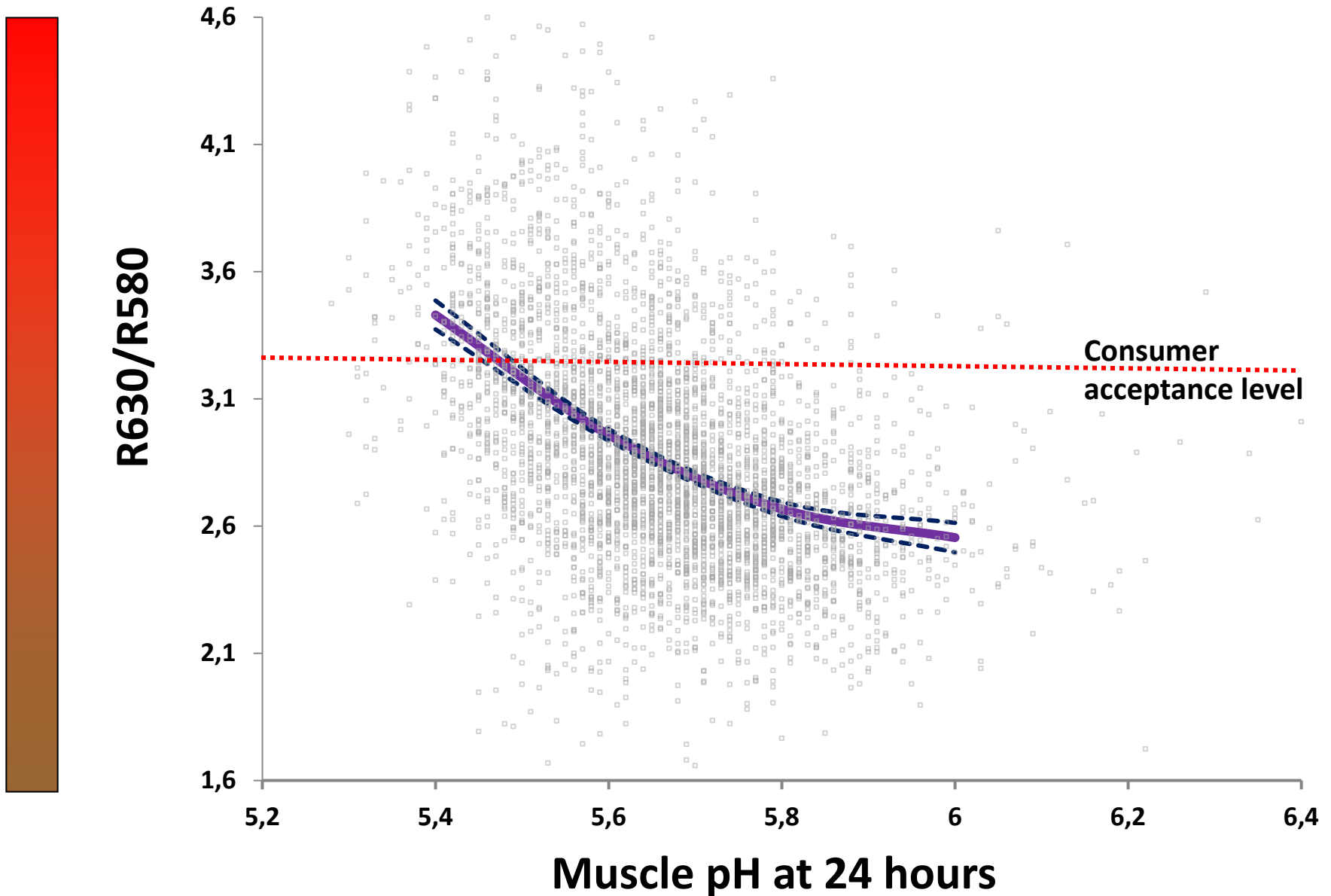
## Statistical Analysis

- Linear mixed effects model (SAS)
- Fixed Effects
  - Year of birth
  - Site reared
  - Kill group (within site by year)
  - Sire type
  - Dam breed (within sire type)
  - Sex
- Random Effects
  - Sire
  - Dam \* year
- Covariable →  $\text{pH}_{24}$

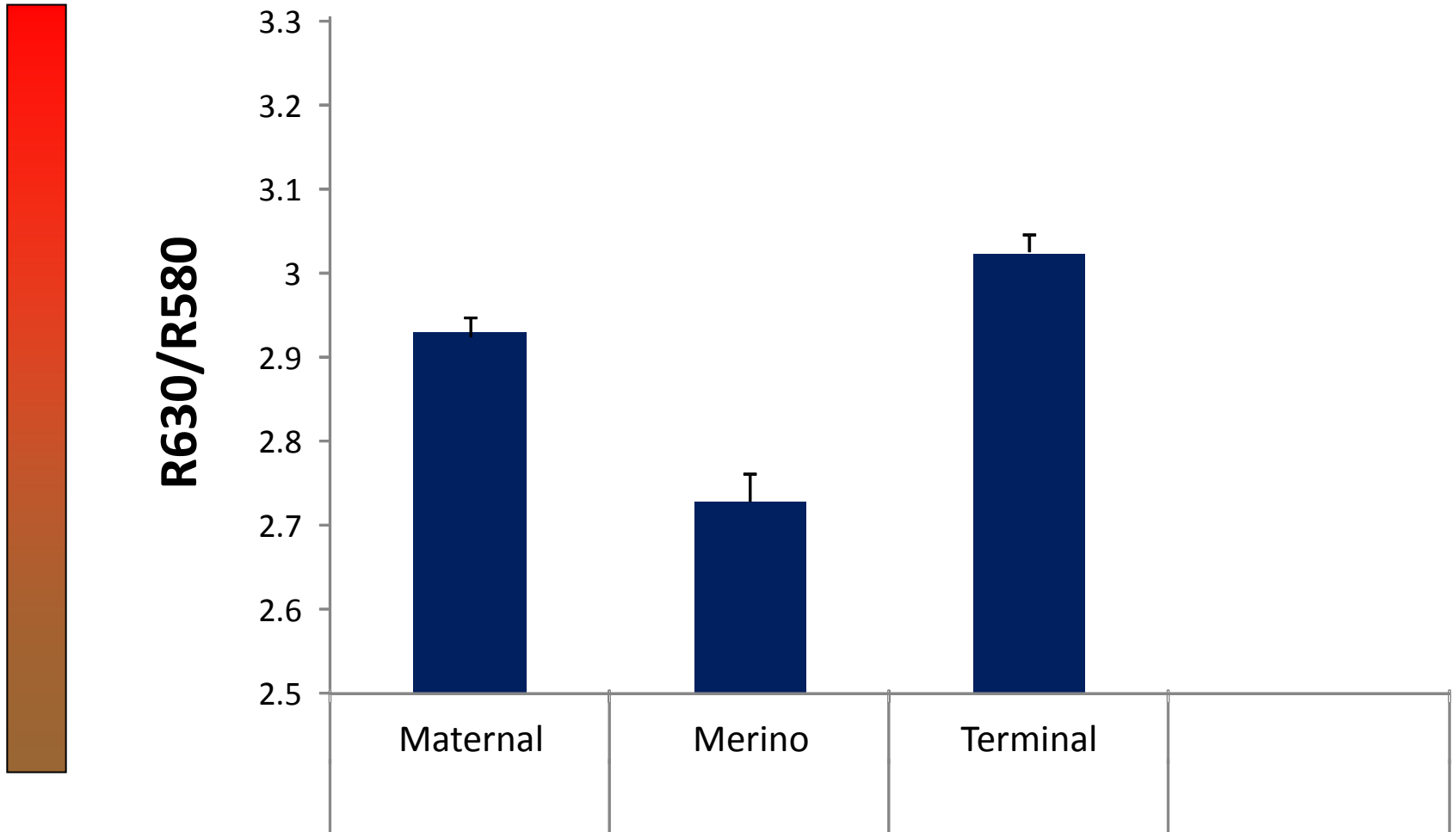
# pH<sub>24</sub> & Retail Colour



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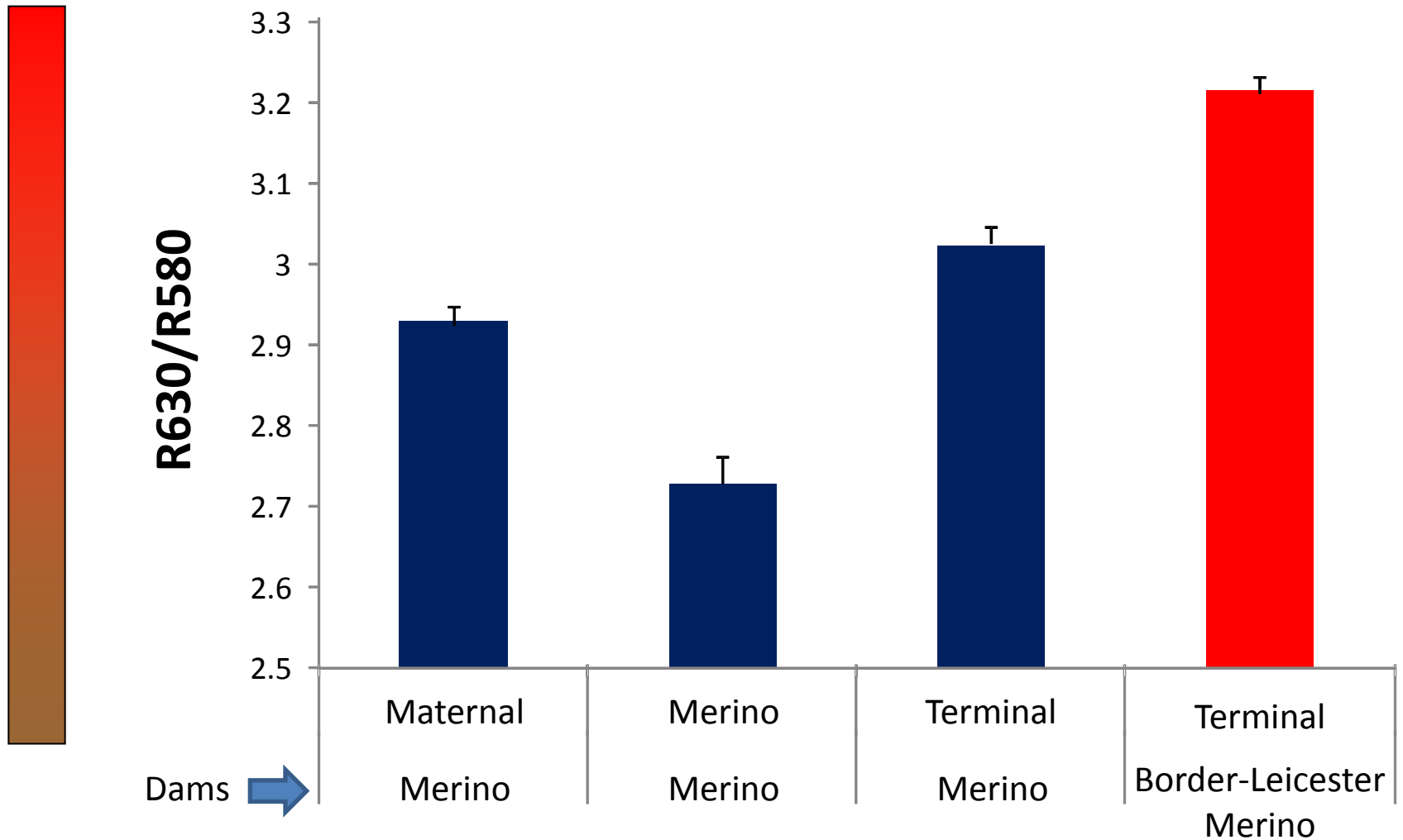


# Sire type

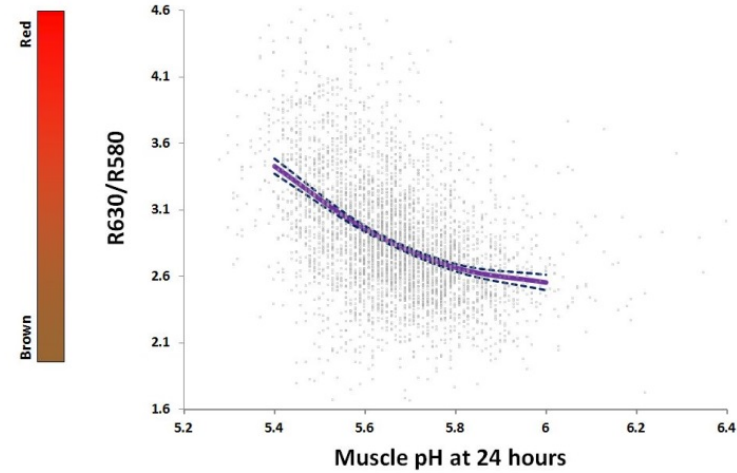
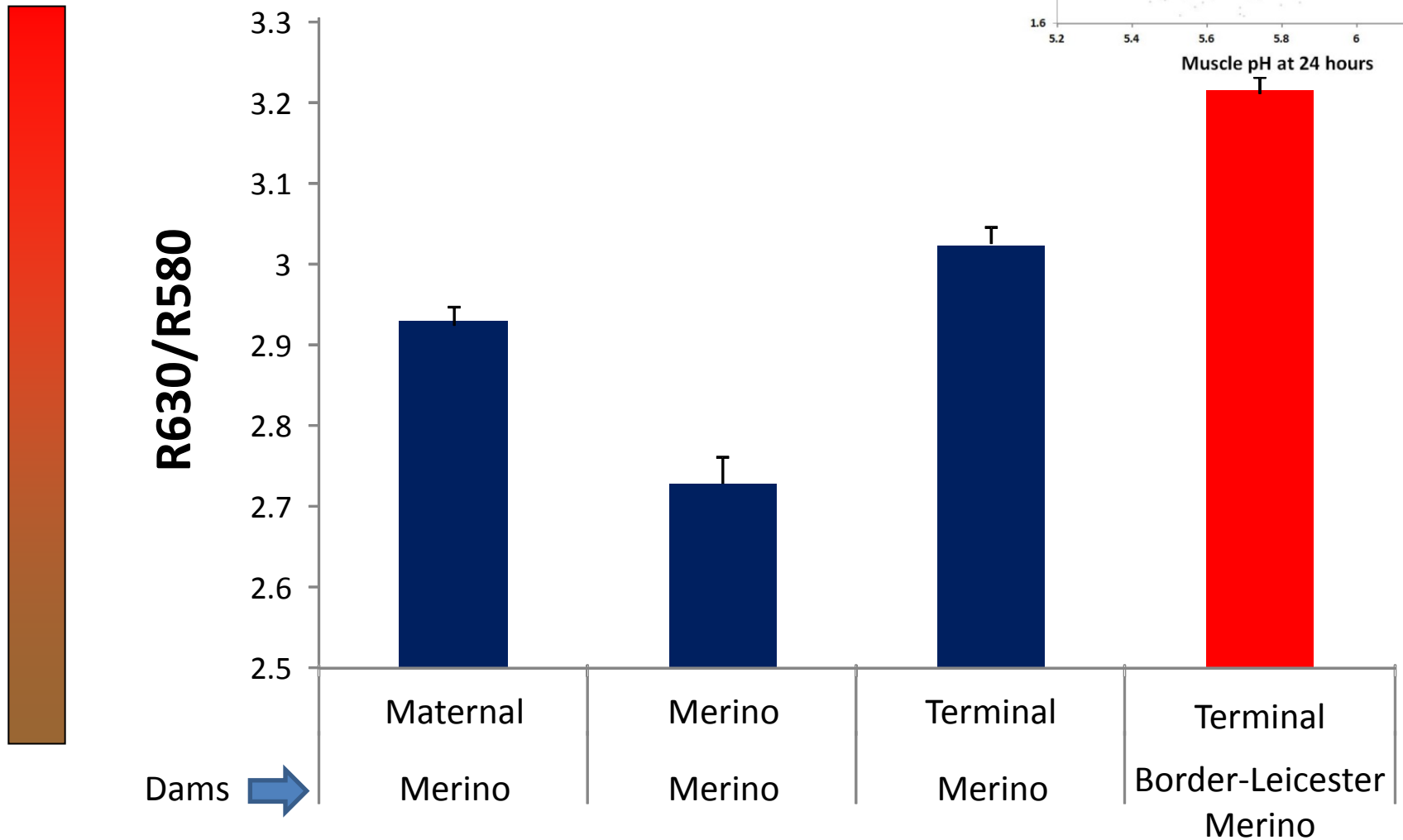




# Sire type & Dam breed



# Sire type & Dam breed



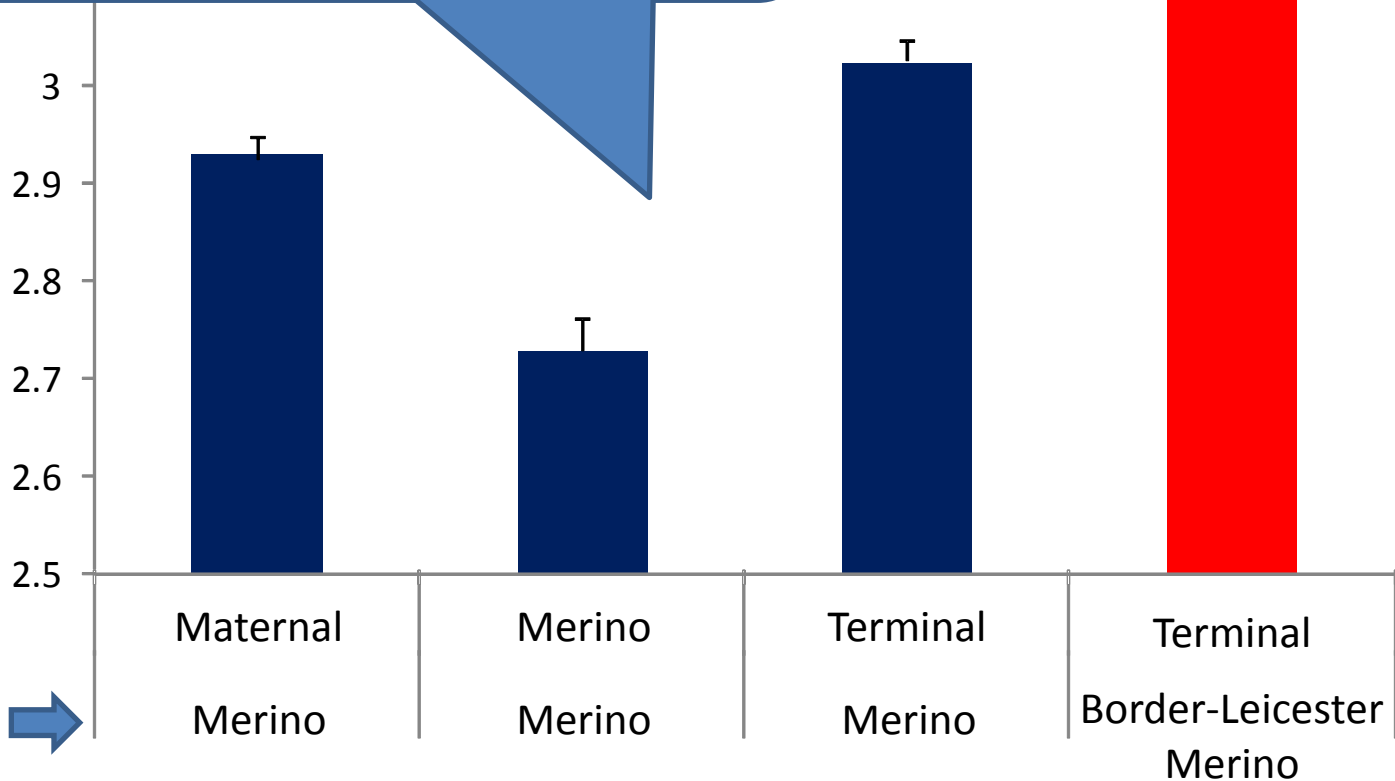
# Sire type & Dam breed

No change with pH24 correction!

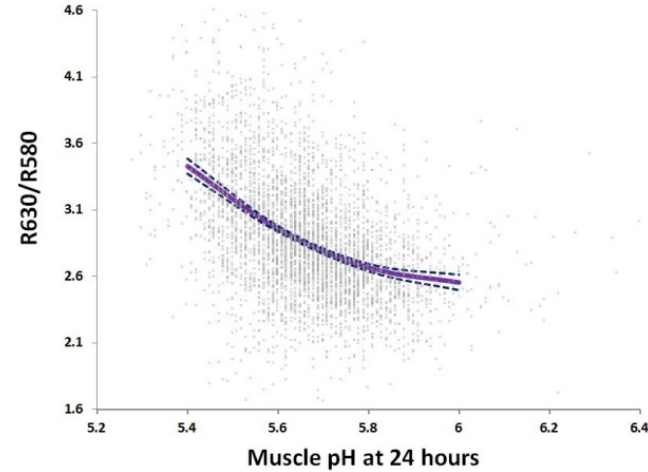


R630/R580

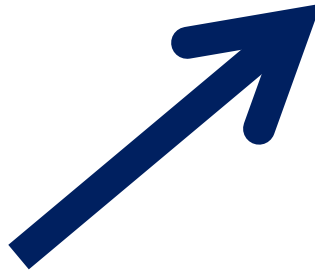
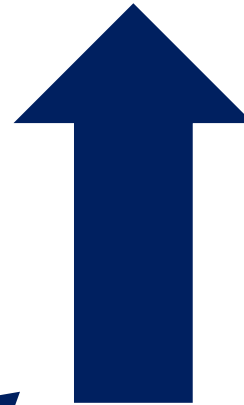
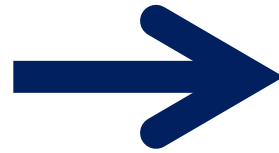
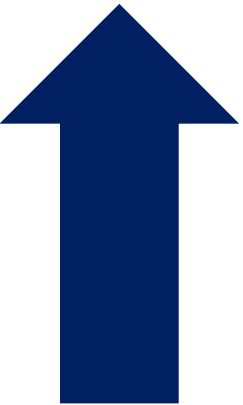
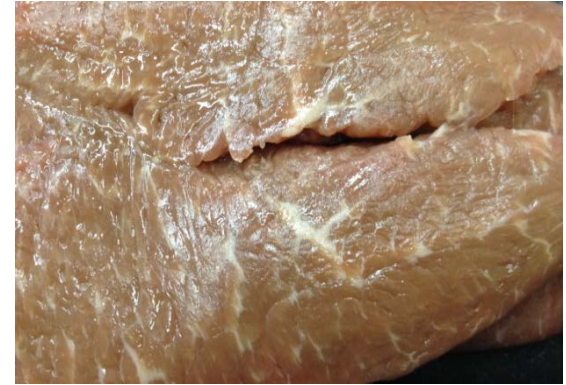
Dams →



Red  
Brown

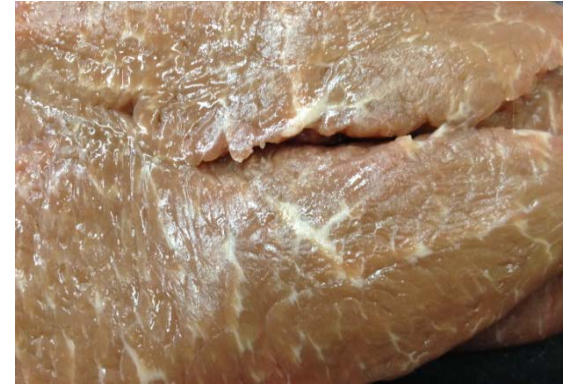
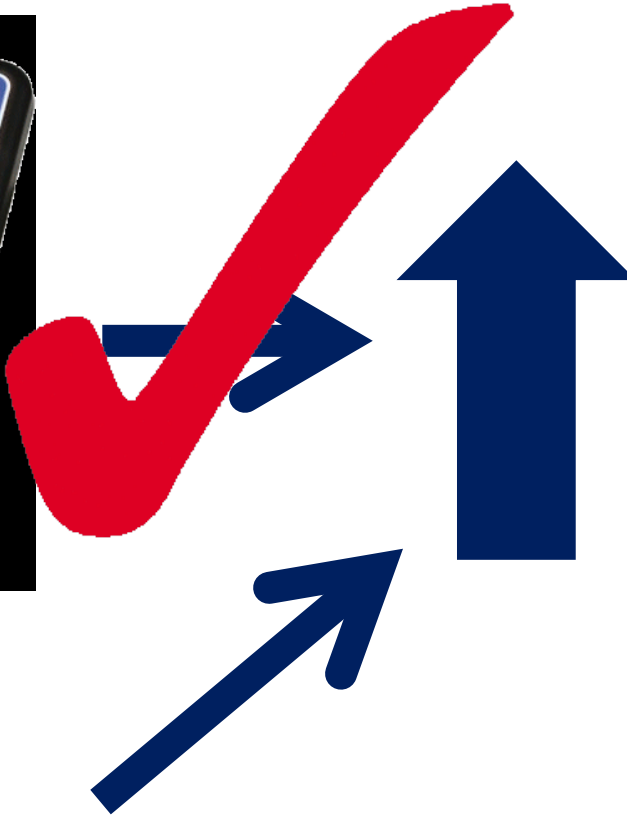


# Hypothesis

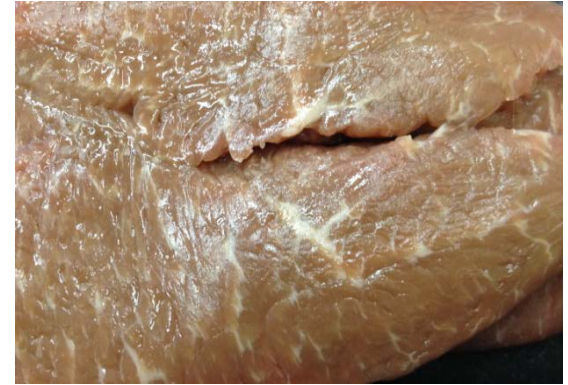




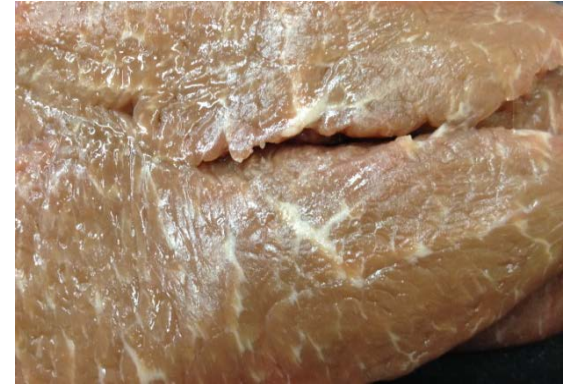
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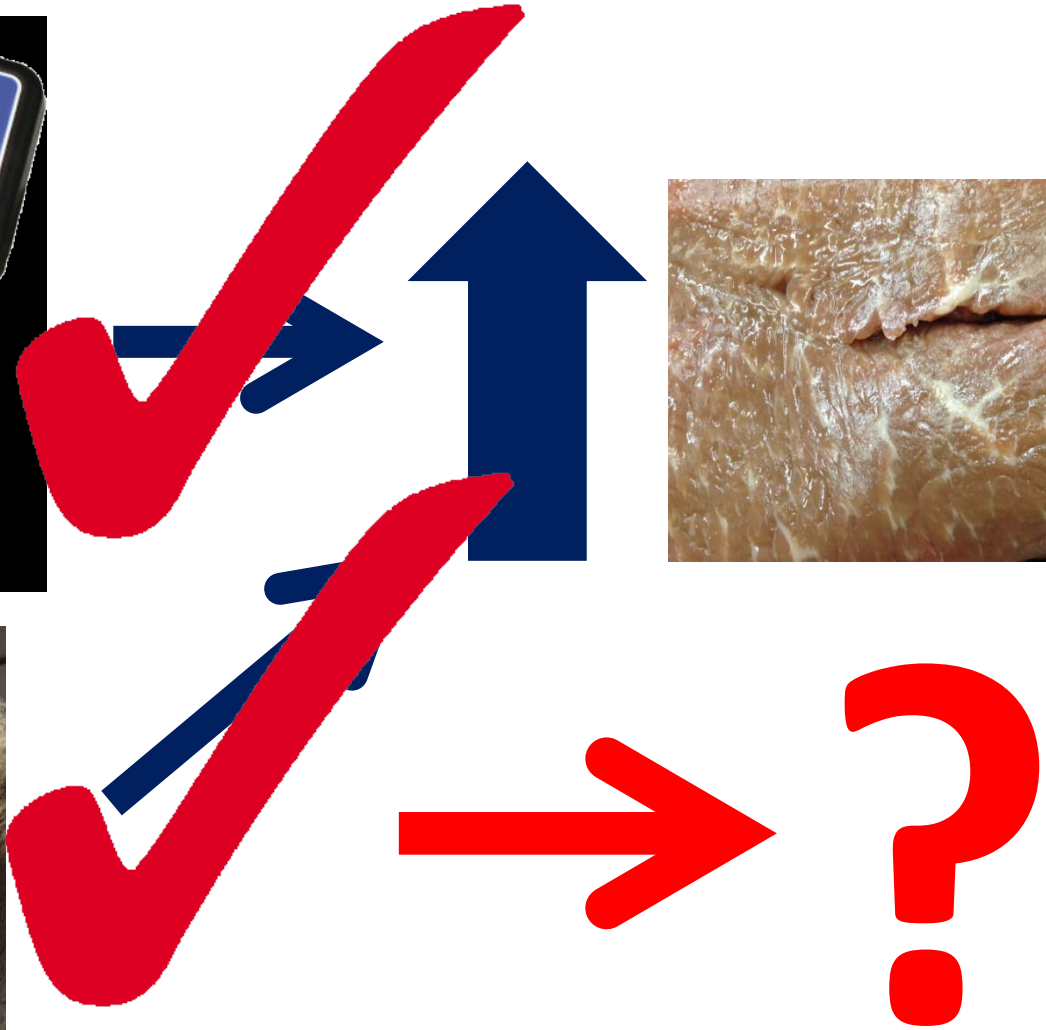
# Hypothesis



# Hypothesis



Merinos



# Conclusion

**Low lamb meat  $\text{pH}_{24}$  will improve colour during display**

**Merino produce worse meat colour, though this cannot be accounted for by their higher pH**

## **Further work**

- measure depth of oxygen penetration &  $\text{pH}_{24}$**
- metmyoglobin reductase activity?**
- Further investigation into breed effects on colour**