

Carnosine in broiler diet: a promising nutritional strategy to reduce the prevalence of breast muscle myopathies

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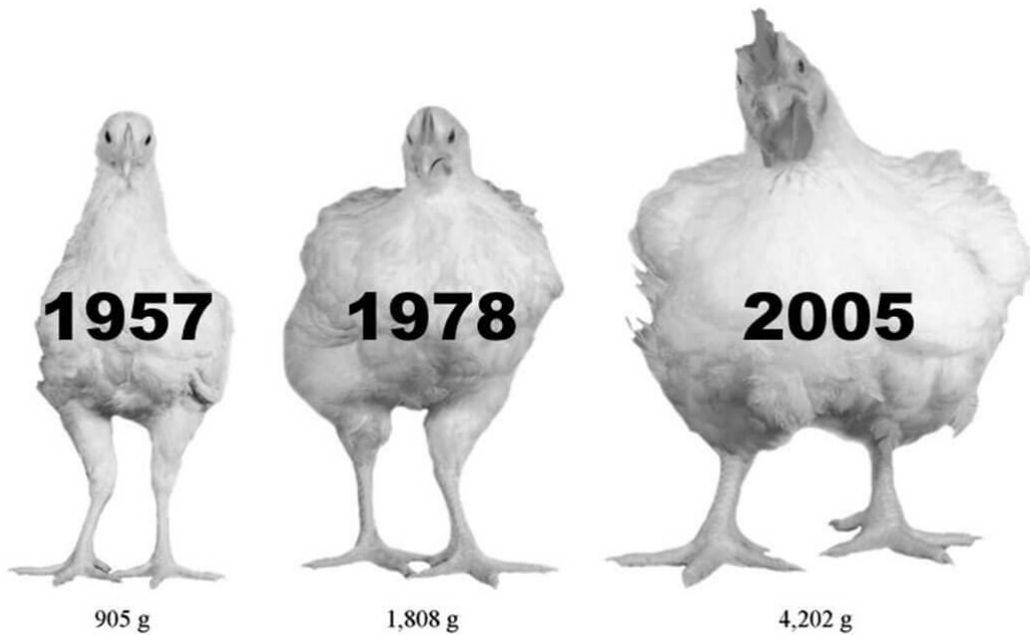
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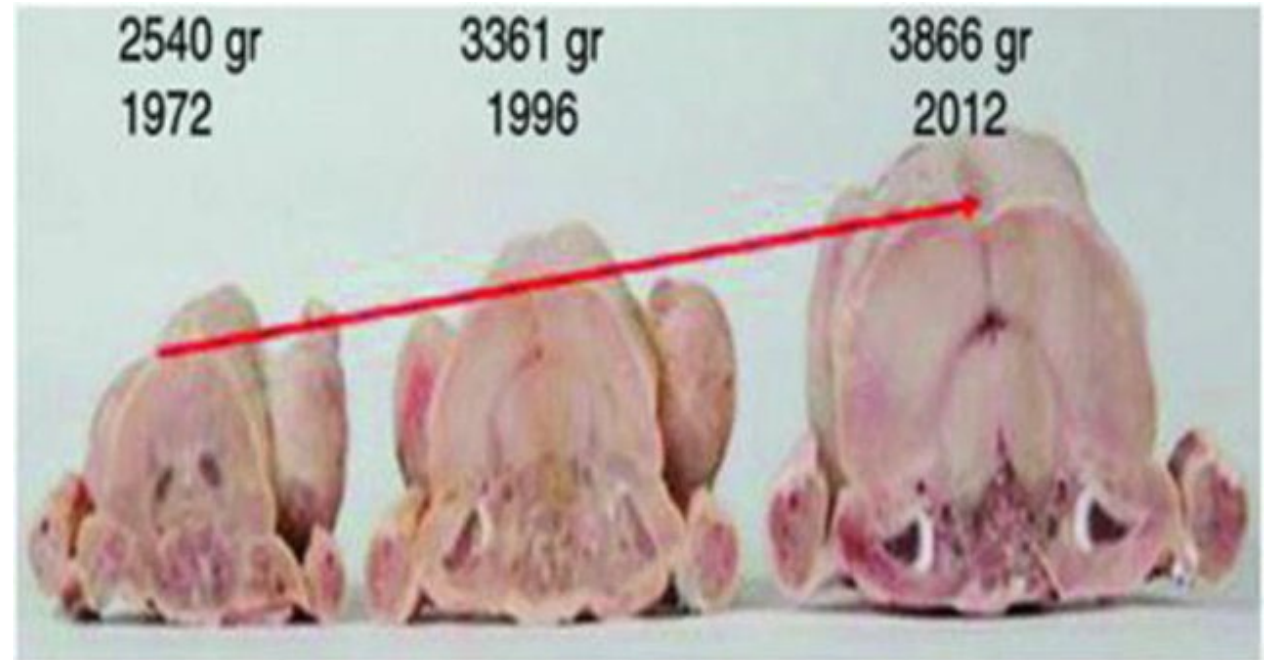
Context

- ❑ In light of increased worldwide demand for poultry meat => genetic selection efforts have intensified to produce more efficient broiler strains.



Zuidhof et al. (2014)

- Improved growth rate
- Higher feed efficiency



Lilburn et al. (2018)

- Greater breast meat yield

Breast muscle myopathies (BMM)

Structural and metabolic changes in the *P. major* muscle.

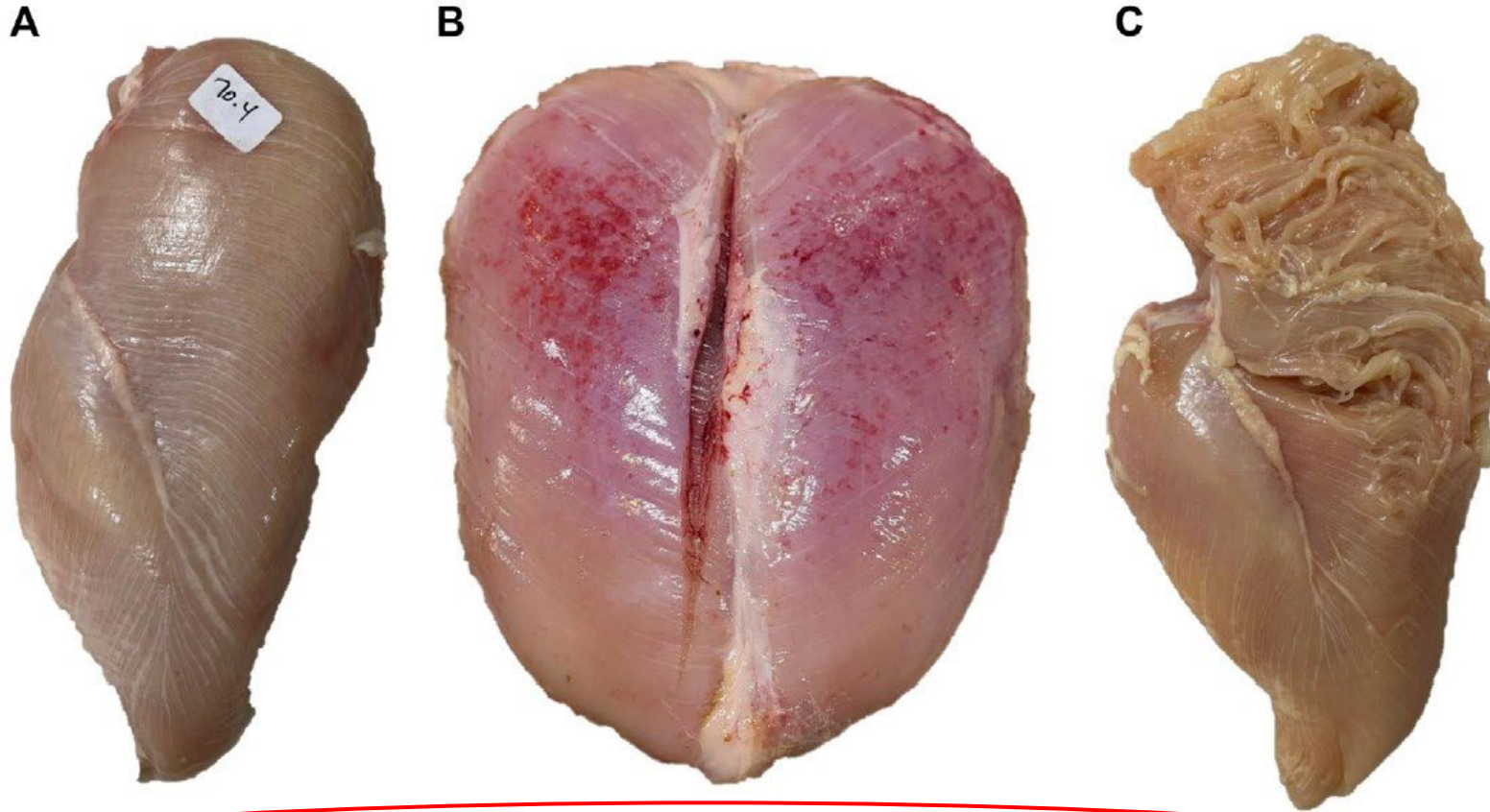
Compromising *P. major* muscle function and predisposing it to the occurrence of meat quality issues.

Breast muscle myopathies BMM:
White Striping, Wooden Breast, and Spaghetti Meat.

(Alnahhas et al., 2016; Lake et al., 2021; Alnahhas et al., 2023)

A survey of broiler breast meat quality in the retail market of Quebec, Canada

- *A: White Striping**
- *B: Wooden Breast**
- *C: Spaghetti Meat**

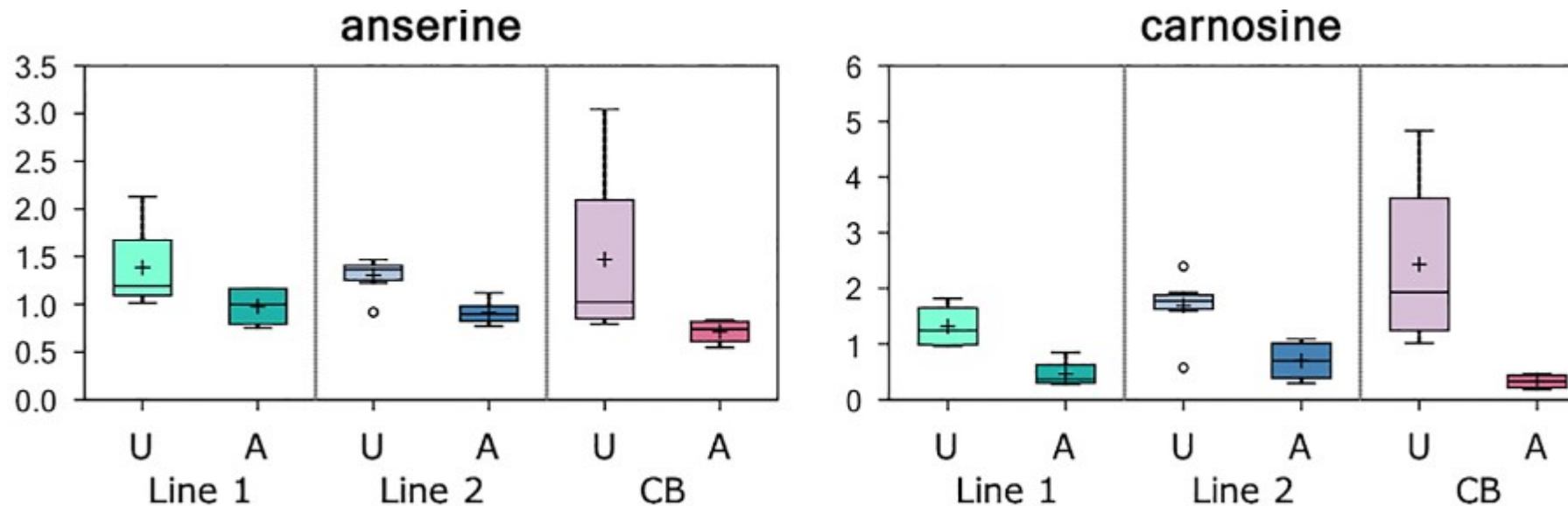


One out of two breast fillets exhibited some degree of BMM.

(Alnahhas et al., 2023 ; Sammari et al., 2023)

Research hypothesis

- ❑ Oxidative stress in myopathic muscles is mainly related to the depletion of muscle reserves of antioxidant molecules.



U= unaffected, A = affected

- ❑ Decreased levels of **histidine containing dipeptides** such as **carnosine** and anserine in the affected tissues suggest an altered redox homeostasis.

Abasht et al. (2016)

Research hypothesis

Oxidative stress

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graph TD; A[Oxidative stress] --- B[Antioxidants: carnosine]; B --- C[Reducing the occurrence and the prevalence of BMM];
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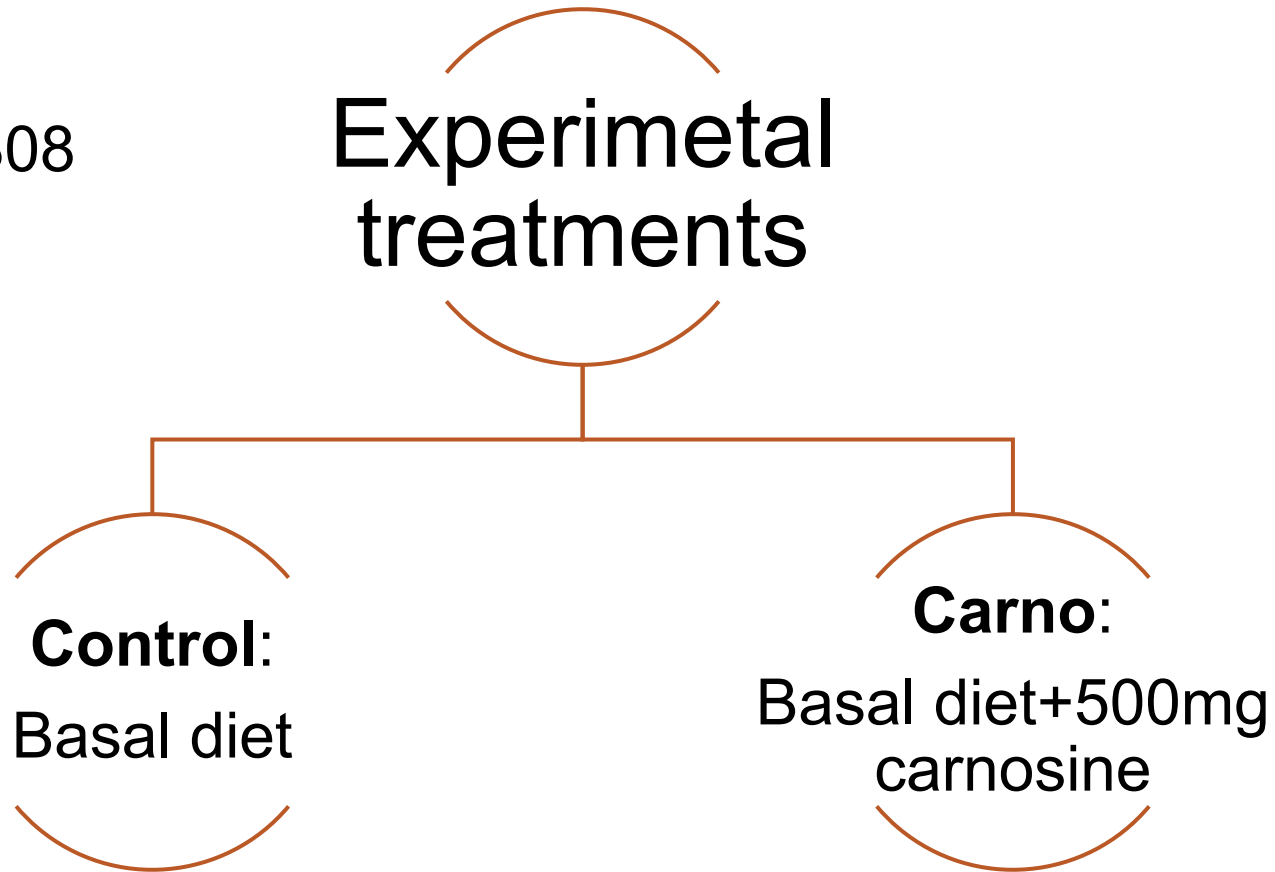
The diagram illustrates a research hypothesis through a vertical flow. At the top, a light blue box contains the text 'Oxidative stress'. Below it, a horizontal black line with a central downward-pointing bracket connects to a light gray box containing 'Antioxidants: **carnosine**'. Another horizontal black line with a central downward-pointing bracket connects the gray box to a light green box at the bottom containing 'Reducing the occurrence and the prevalence of BMM'.

Antioxidants: **carnosine**

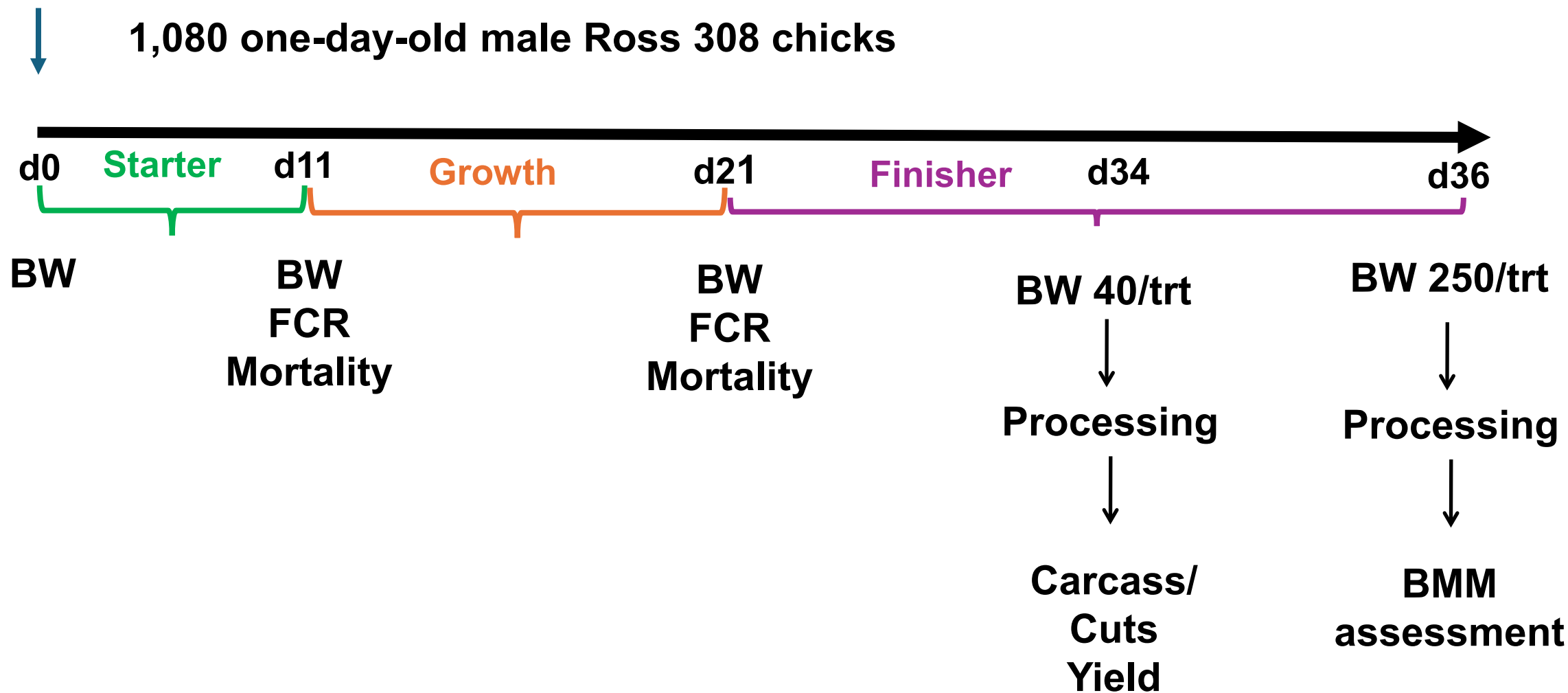
Reducing the occurrence and the
prevalence of BMM

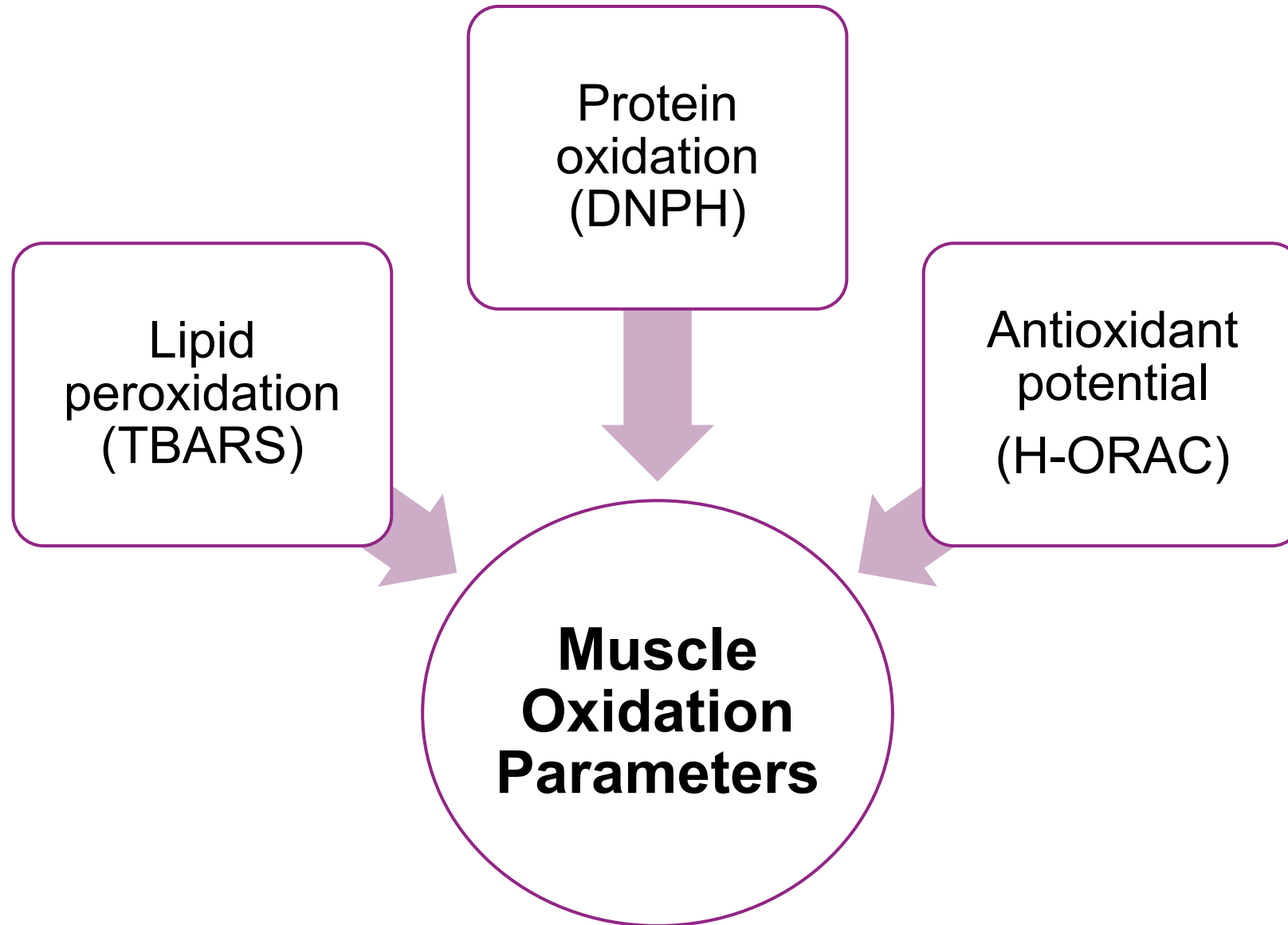
Methodology

□ 1,080 Ross 308



Measurements





Results



Effect of dietary treatment on growth performance

Fig 1. Effect of carnosine on body weight

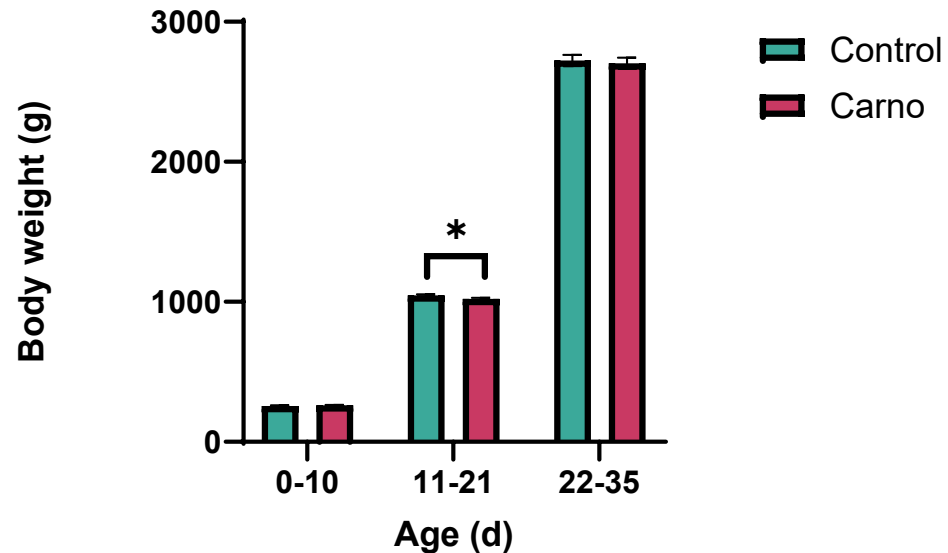
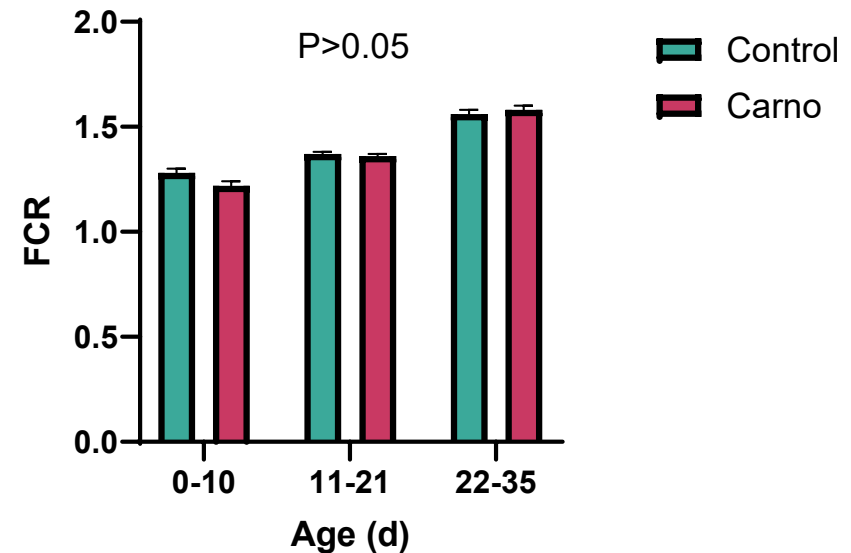


Fig 2. Effect of carnosine on feed conversion ratio



- ➡ No significant effect on body weight **except on d 21** that was slightly but significantly lower in the carnosine-fed group compared to the control.
- ➡ No significant effect on FCR.

Effect of dietary treatment on carcass and cuts yield

Fig 3. Effect of carnosine on carcass yield

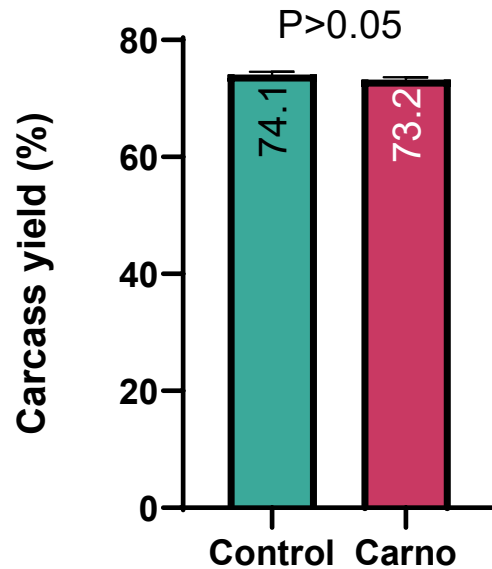
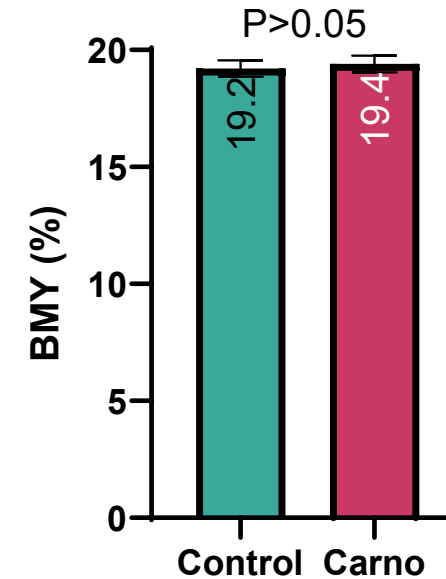


Fig 4. Effect of carnosine on breast meat yield



➡ No significant effect of carnosine supplementation on carcass or meat yield in comparison to the control group.

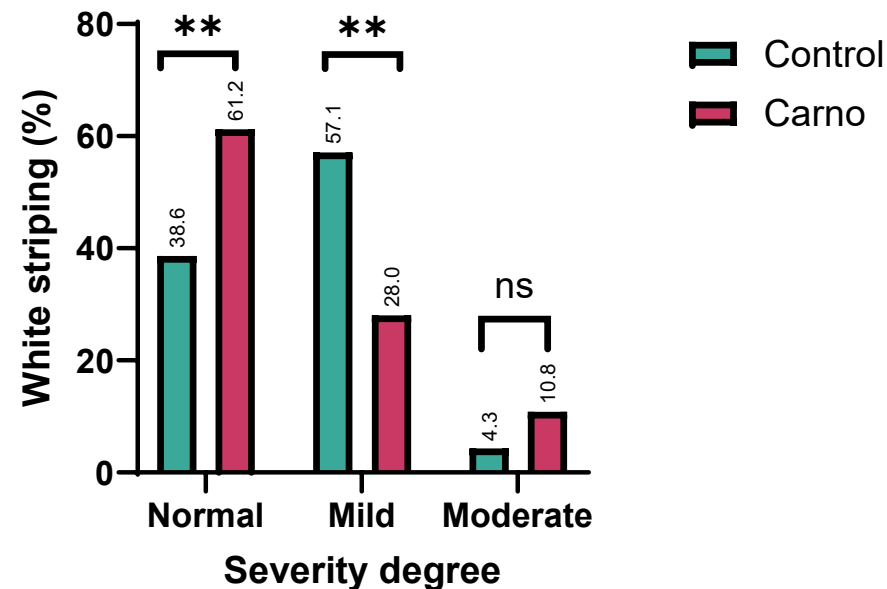
Effect of dietary treatment on breast meat quality traits

Trait	Control	Carnosine	SEM	P-value
pHu	5.77	5.76	0.02	0.59
L*	59.5	59.8	0.42	0.55
a*	5.95	6.89	0.43	0.12
b*	17.10	17.60	0.29	0.19
C*	18.20	19.10	0.38	0.07
h*	1.24	1.21	0.02	0.41
DL, %	7.36	7.26	0.86	0.90
CL, %	19.30	18.70	0.45	0.17
WBSF, N/cm2	21.10	19.90	1.95	0.21
Freeze-Thaw, %	9.77	10.80	1.55	0.63
Marinade uptake, %	7.98	7.91	0.27	0.85
CLTM, %	12.40	11.80	0.28	0.22

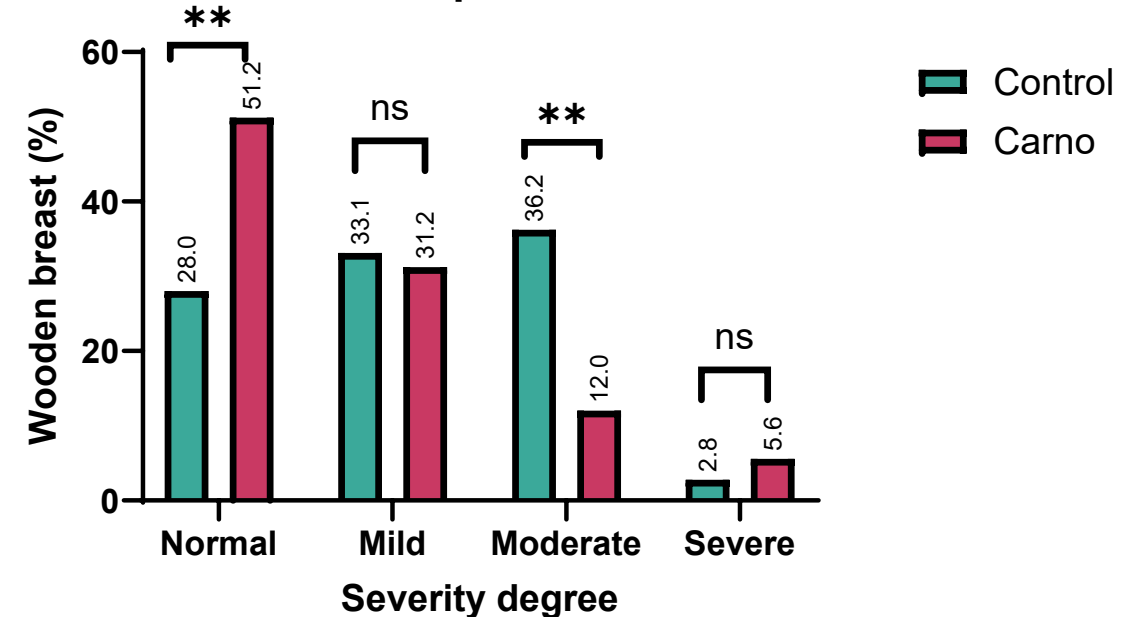
➡ Supplementing broiler diets with carnosine was not associated with significant changes in the quality attributes of breast meat.

Effect of dietary treatment on the prevalence (%) of breast muscle myopathies

Effect of carnosine on the prevalence of white striping



Effect of carnosine on the prevalence of wooden breast

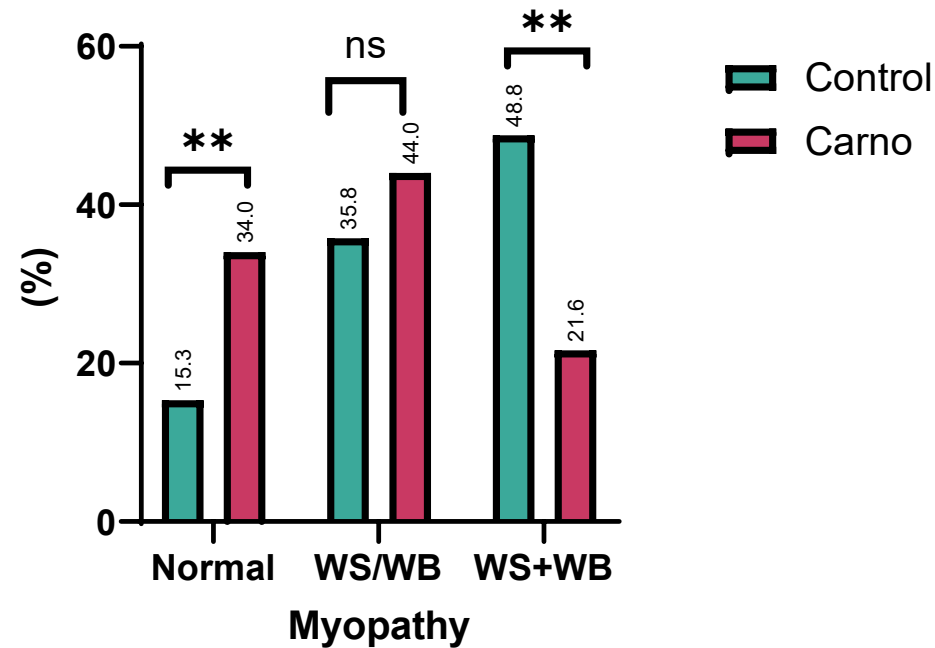


➡ Carnosine-fed broilers had significantly higher percentage of normal breast fillets and significantly lower percentage of mildly WS-affected fillets.

➡ Carnosine-fed broilers had significantly higher percentage of normal breast fillets and significantly lower percentage of moderate WB-affected fillets.

Effect of carnosine dietary supplementation on the co-occurrence of white striping and wooden breast

Effect of carnosine on the co-occurrence of WS/WB



Carnosine-fed group exhibited a **significantly lower percentage of breast fillets affected by both myopathies simultaneously.**

Effect of dietary treatment on muscle oxidation parameters

Fig 5. Effect of carnosine on lipid peroxidation of the *P.major*

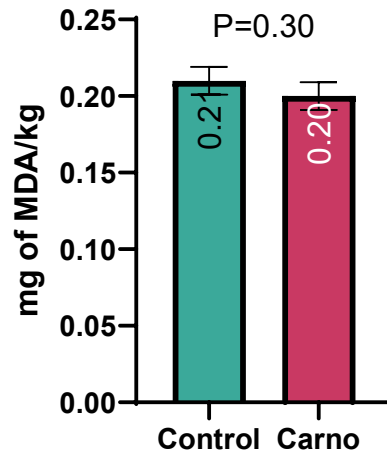


Fig 6. Effect of carnosine on protein oxidation of the *P.major*

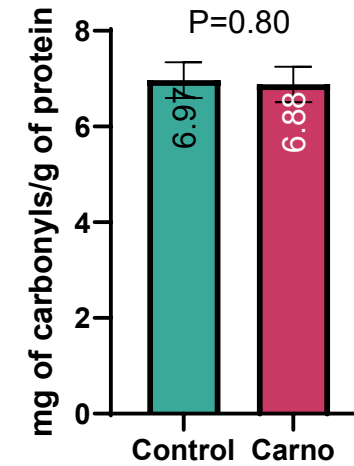
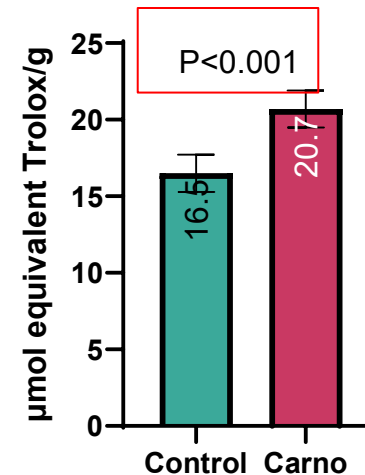


Fig 7. Effect of carnosine on the antioxidant potential of the *P.major*



Significant increase in the antioxidant potential of the *P.major* muscle.

Conclusions

Carnosine supplementation (500 mg/kg) in broiler diets:



Was not associated with **noticeable changes** in growth performances, carcass yield, and technological quality traits.



Reduces the prevalence of White striping (WS).



Reduces the prevalence of Wooden breast (WB).



Reduces the co-occurrence of White striping and Wooden breast.

Thank you



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