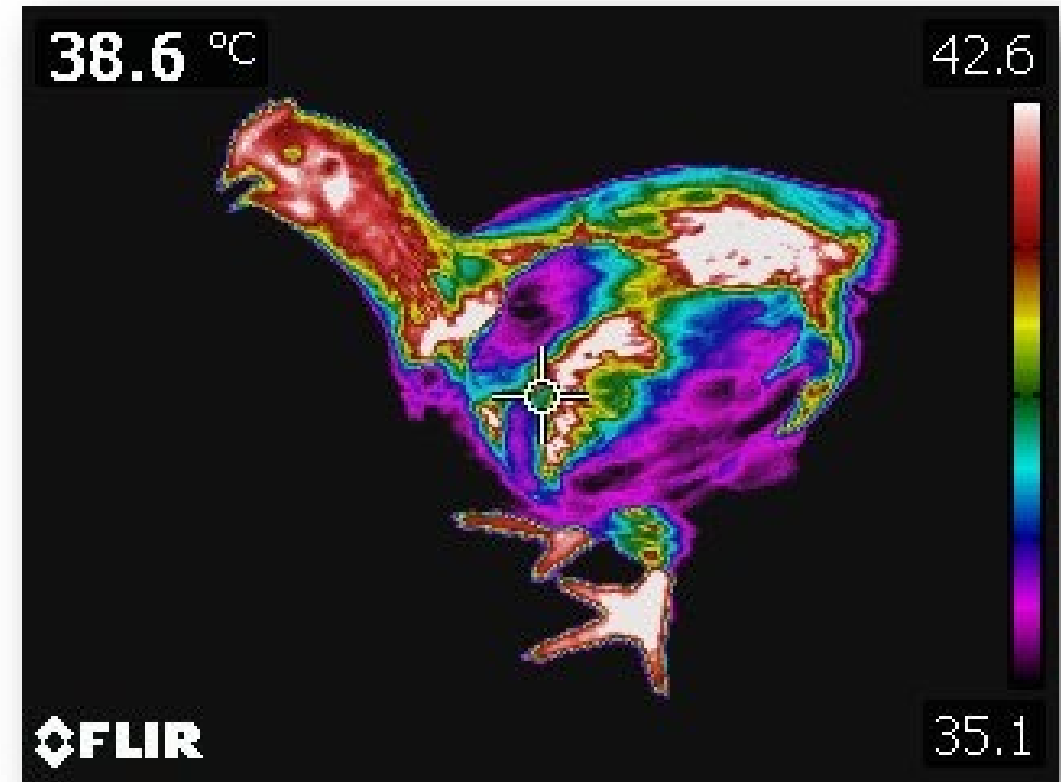


The **potential** of *in ovo*-fed **amino acids** to alleviate the effects of **heat stress** on broiler chickens: effect on performance, body temperature, and oxidative status during the finisher phase



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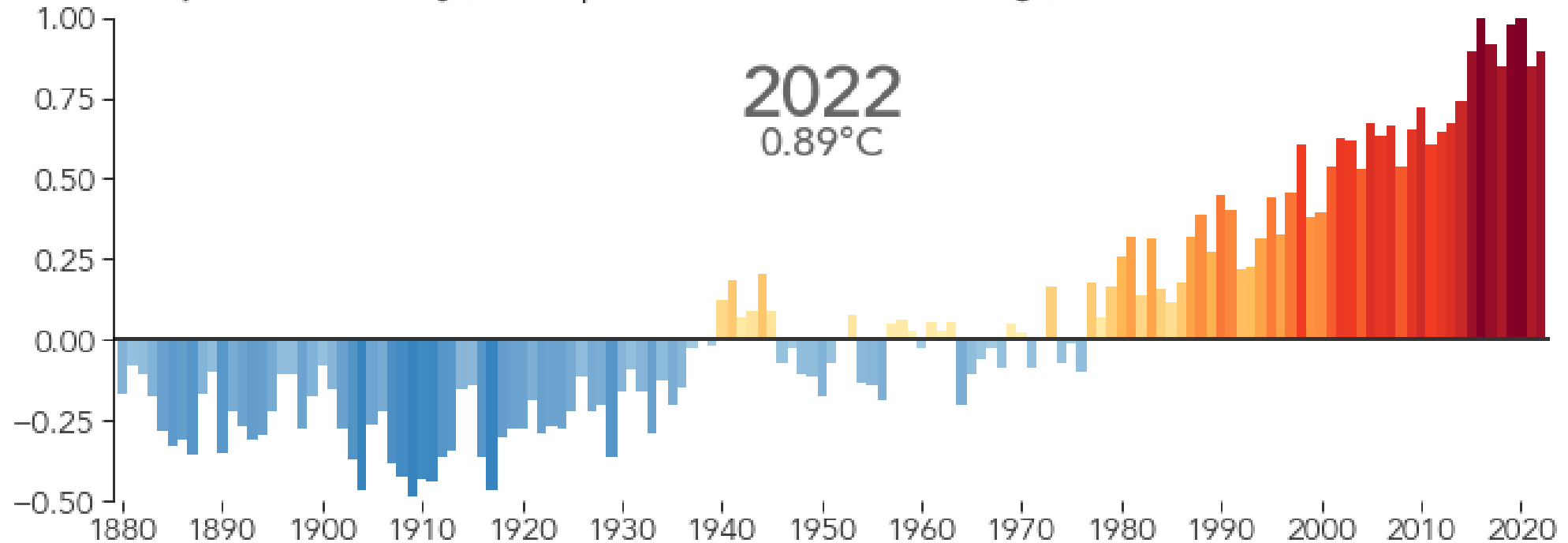
LinkedIn: Moustafa Yehia

Context

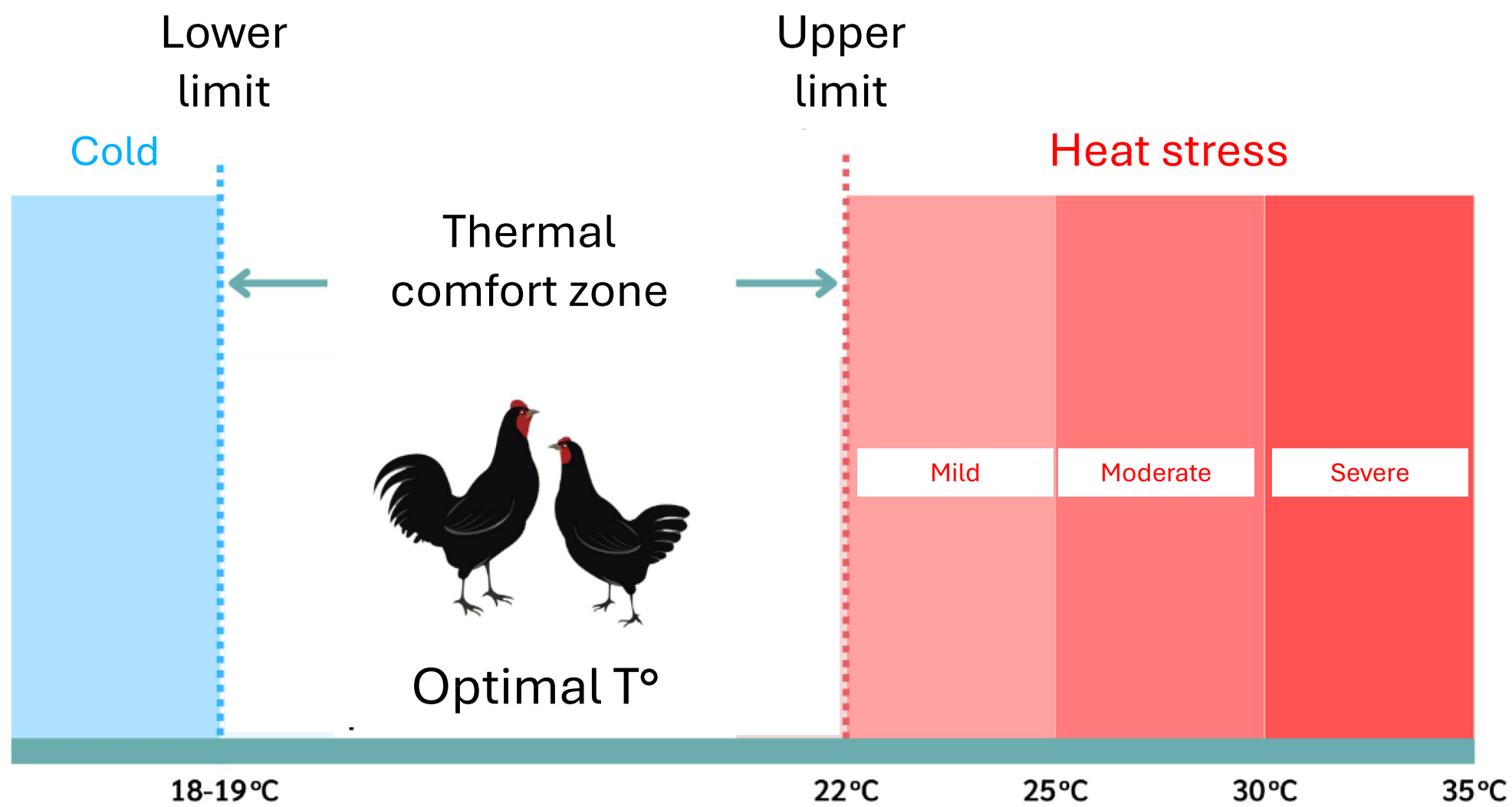
Context – Global warming

Last 9 Years Warmest on Record

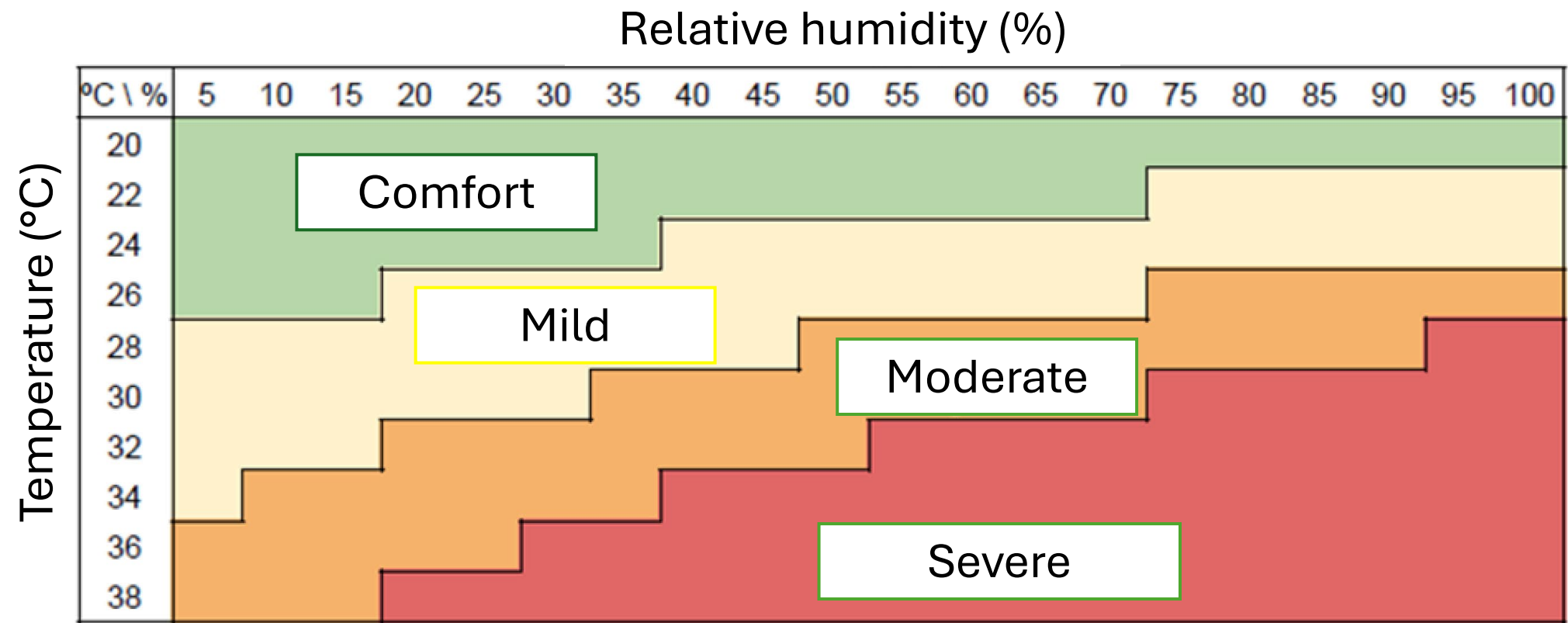
Global Temperature Anomaly (°C compared to the 1951-1980 average)



Context – Thermal comfort zone I

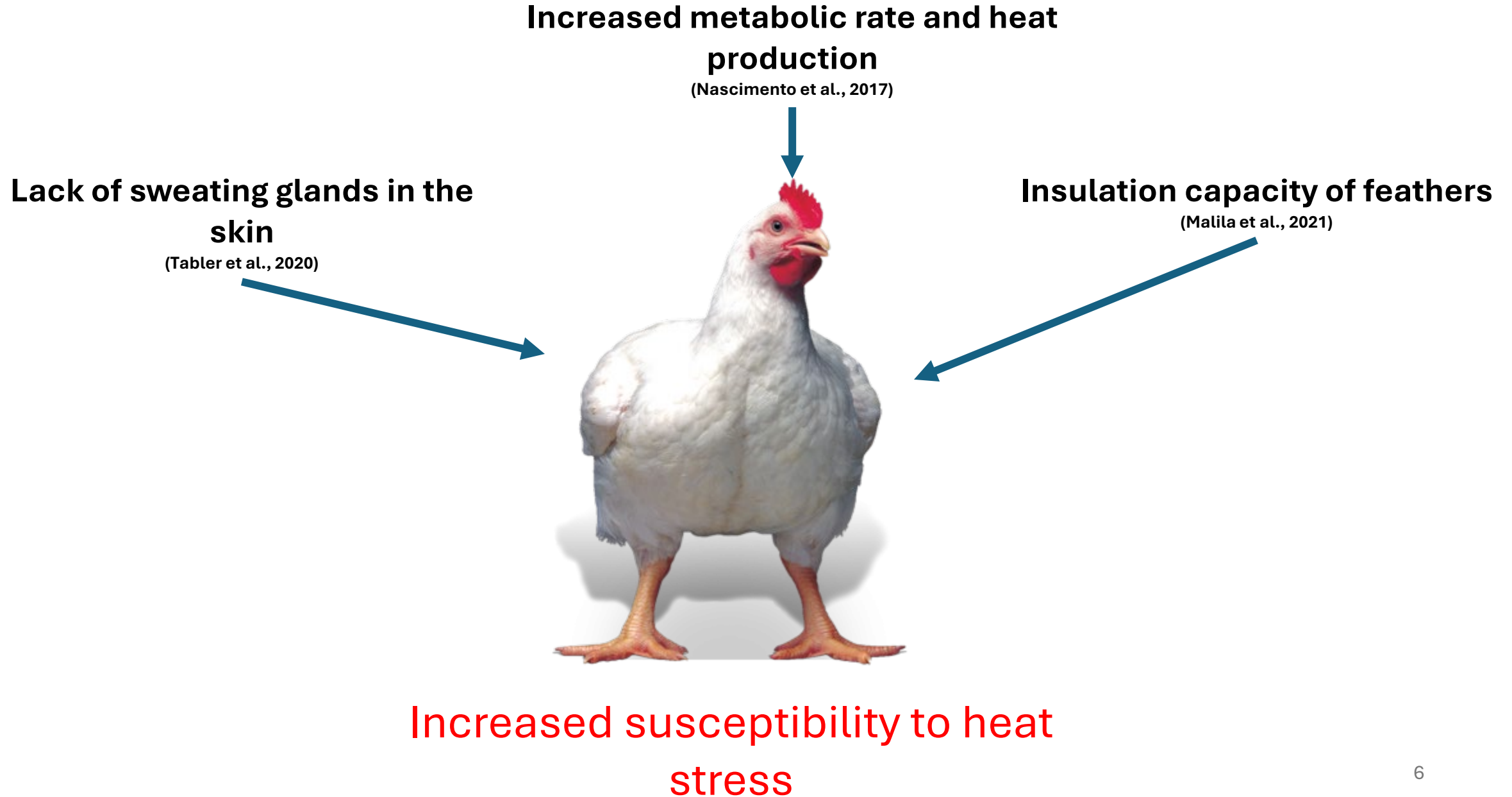


Context – Thermal comfort zone II



$$Heat\ Stress\ Index = (1.8 \times 23) - [(0.55 - 0.0055 \times \textcolor{red}{HR}) \times (1.8 \times \textcolor{red}{T} - 26)]$$

Context – Broiler vulnerability to heat stress



Working hypothesis

❑ Detrimental effects of heat stress:

1. Increased body temperature (Giloh et al., 2012).
2. Oxidative stress (Han et al., 2022).

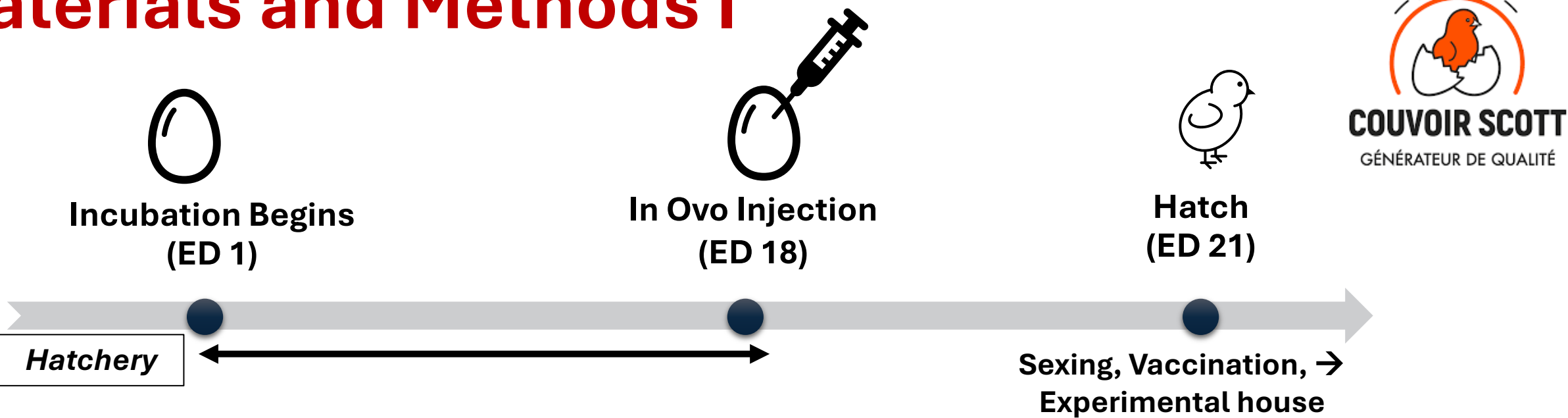
❑ In ovo feeding of amino acids:

1. Hypothermic effect (Han et al., 2020).
2. Antioxidant effect (Elnesr et al., 2019).

❑ **Hypothesis:** A combination of amino acids with hypothermic and antioxidant properties injected **in ovo** could improve broiler thermotolerance **later in life.**

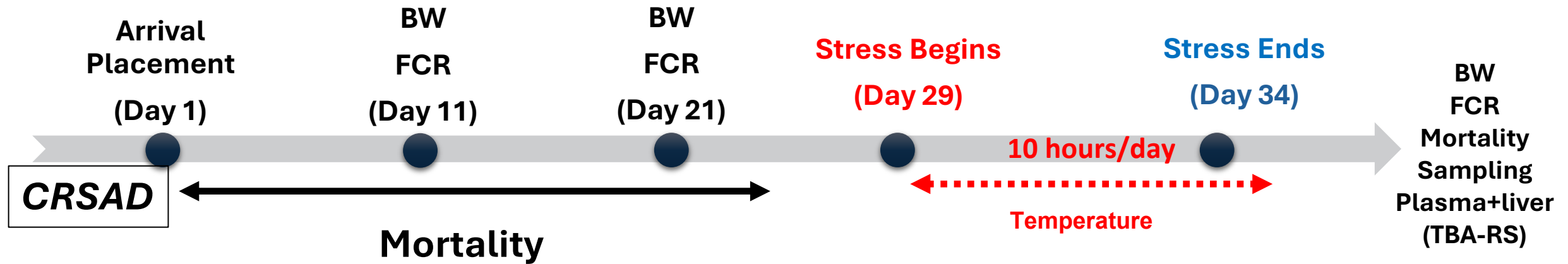
Methods

Materials and Methods I



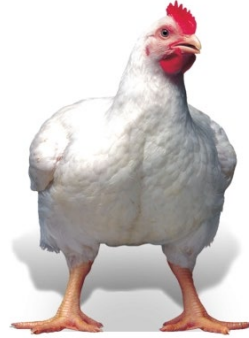
n/Treatment	Treatment	Code
280	Sterile Diluent	CTRL
280	Leu (1 mg)	L
280	Leu (0.45 mg) + Meth (1.15 mg)	L + M
280	Meth (3 mg) + Cys (2 mg)	M + C
280	Leu (0.4 mg) + Meth (1.6 mg) + Cys (1.6 mg)	L + M + C

Materials and Methods II



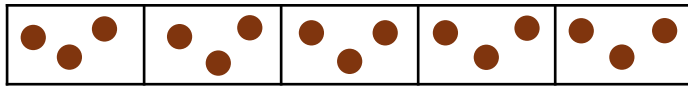
BW = Bodyweight
FCR = Feed Conversion Ratio
RH = Relative Humidity

Experimental design – Randomized Block Design

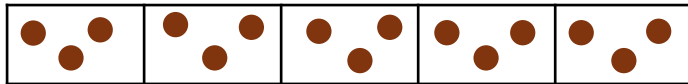


N = 1400 broilers - Ross 308

Room 1 : Cyclic Heat Stress (HS)
34°C, 60% HR from 6h00 to 16h00

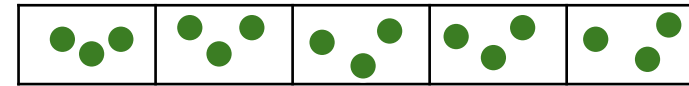


700 birds = 28 birds/pen

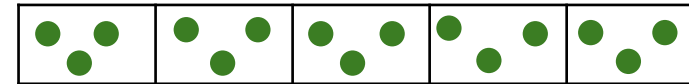


25 pens = 5 pen/trt x 5 trt

Room 2 : Thermoneutral (TN)
23°C, 45% HR



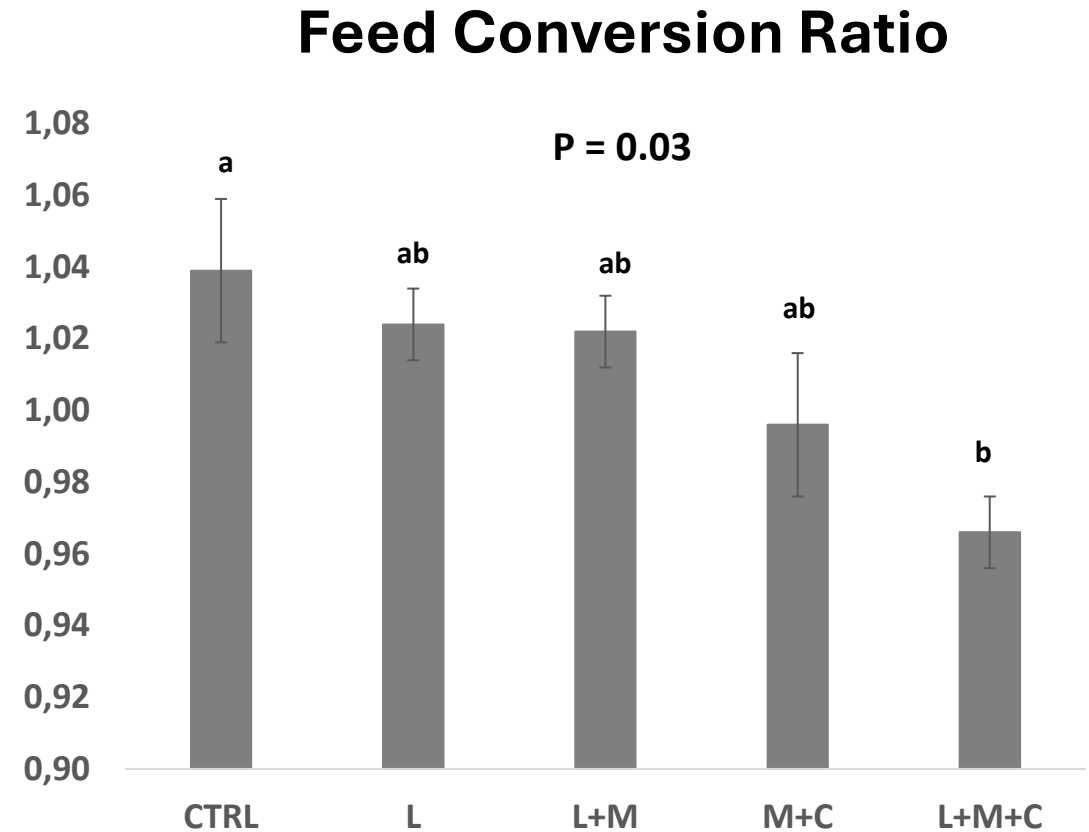
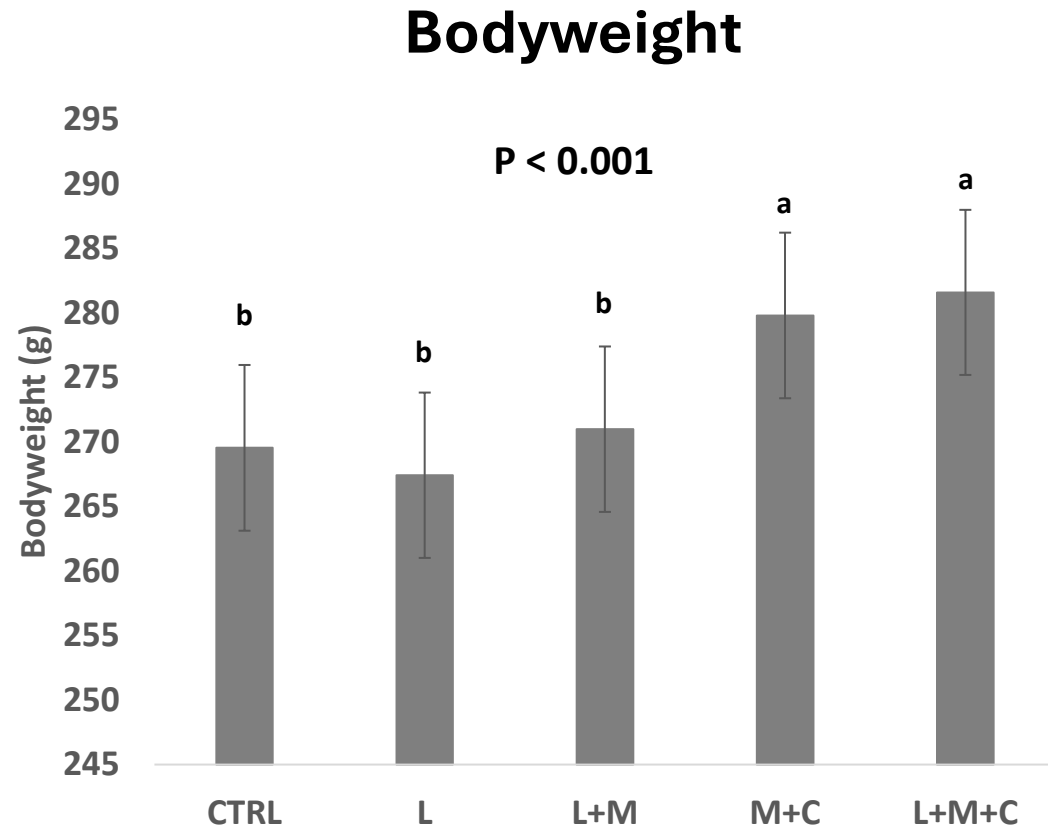
700 birds = 28 birds/pen



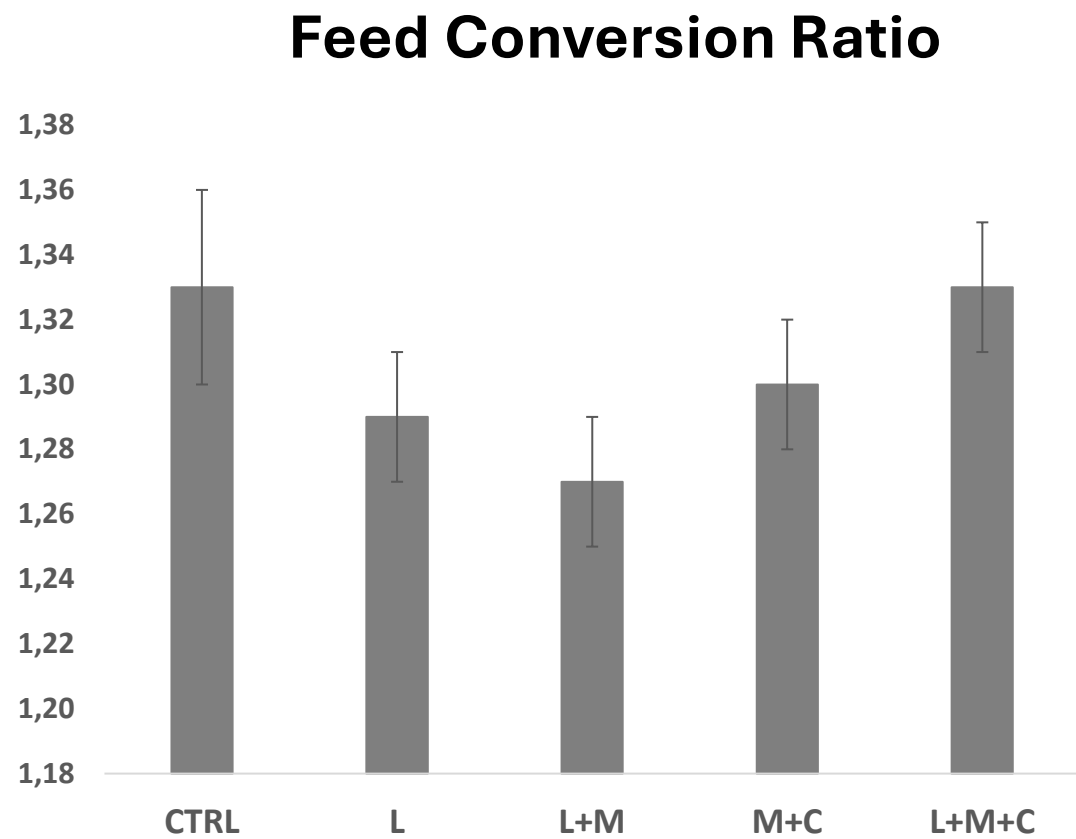
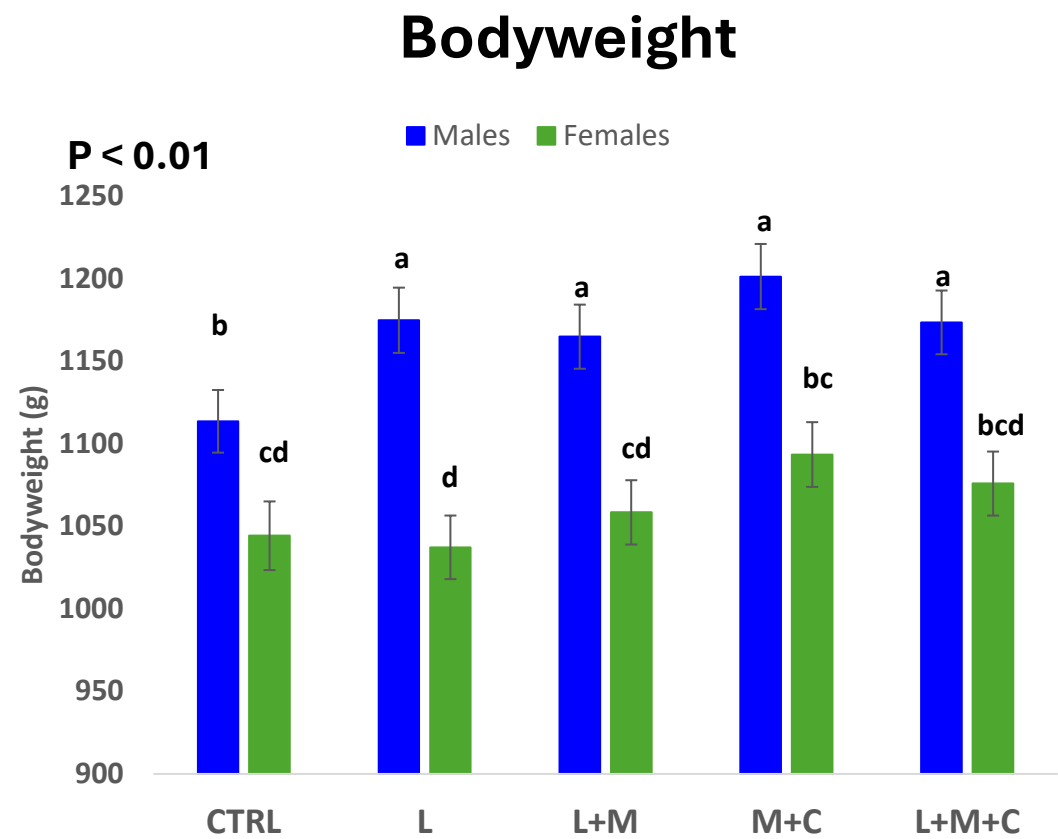
25 pens = 5 pen/trt x 5 trt

Results

Results – Performances from D0 to D11

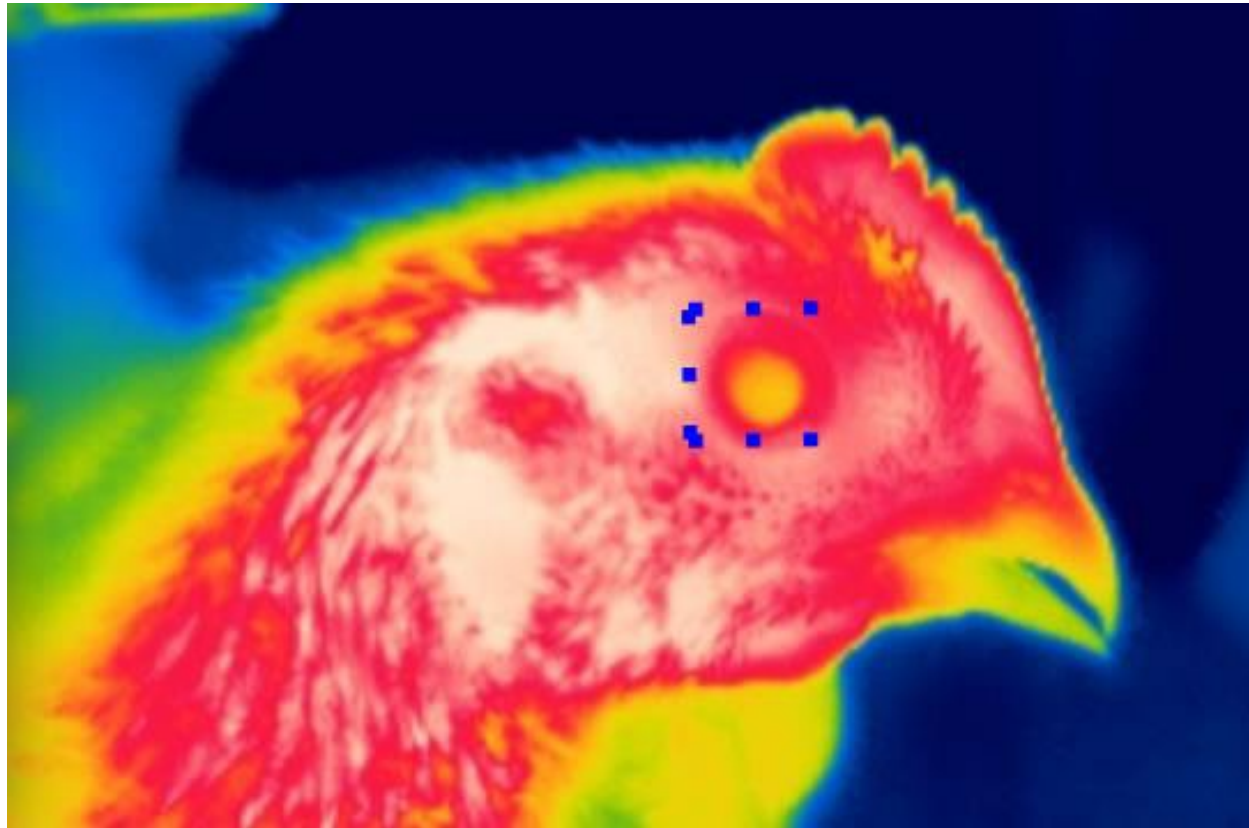


Results – Performances from D12 to D21



Heat stress application – D29 to D34

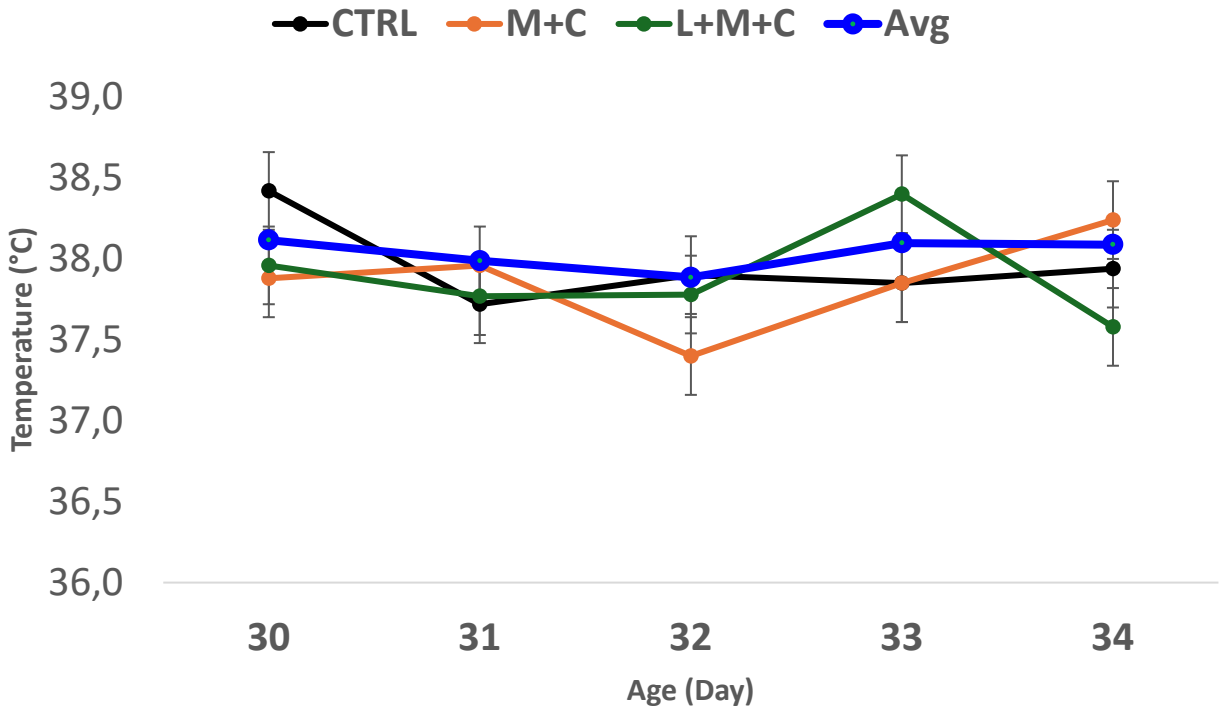
Infrared thermography, 4 birds/pen, AM and PM



Results – Physiological temperature from D29 to D34

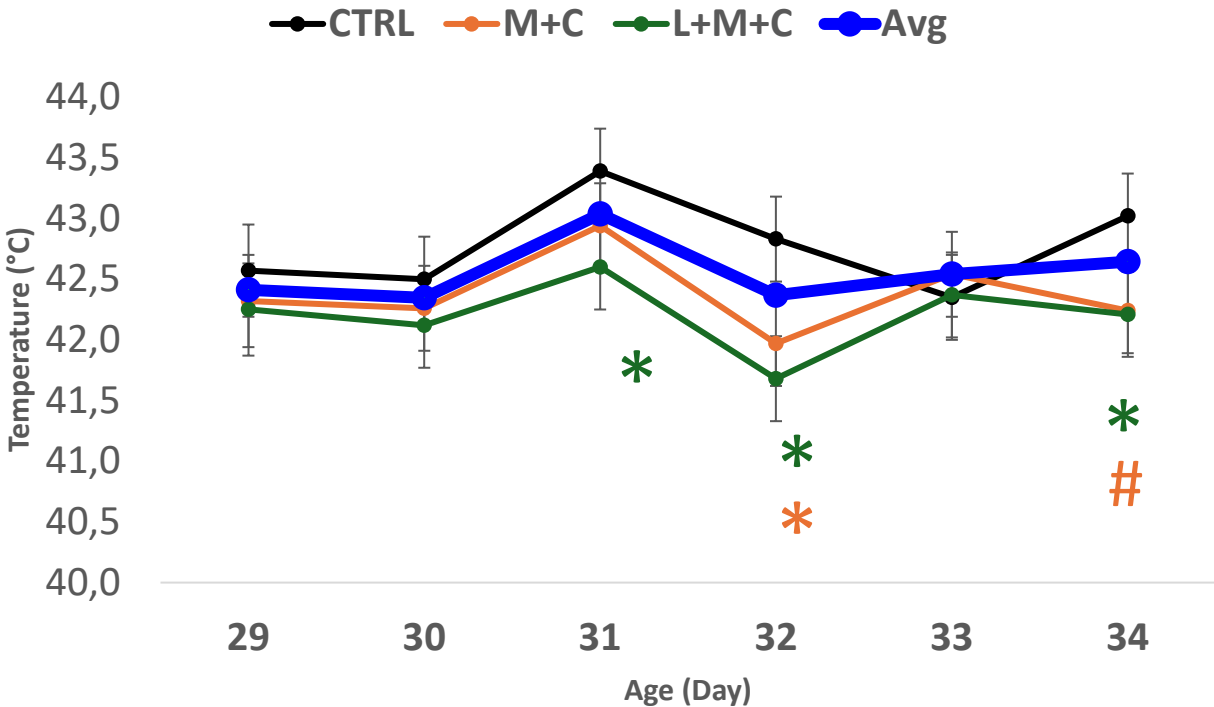
Thermoneutral

$P_{(TRT \times Day)} < 0.001$



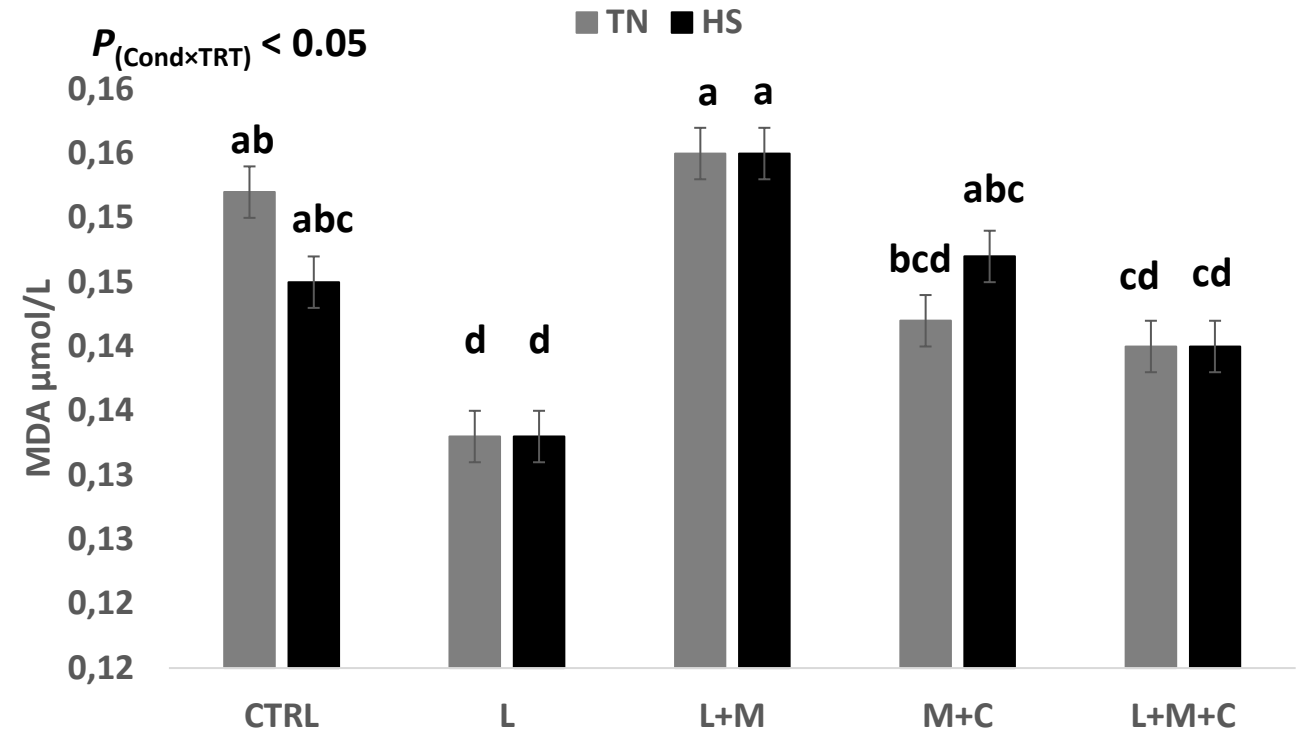
Heat stress

$P_{(TRT \times Day)} < 0.001$

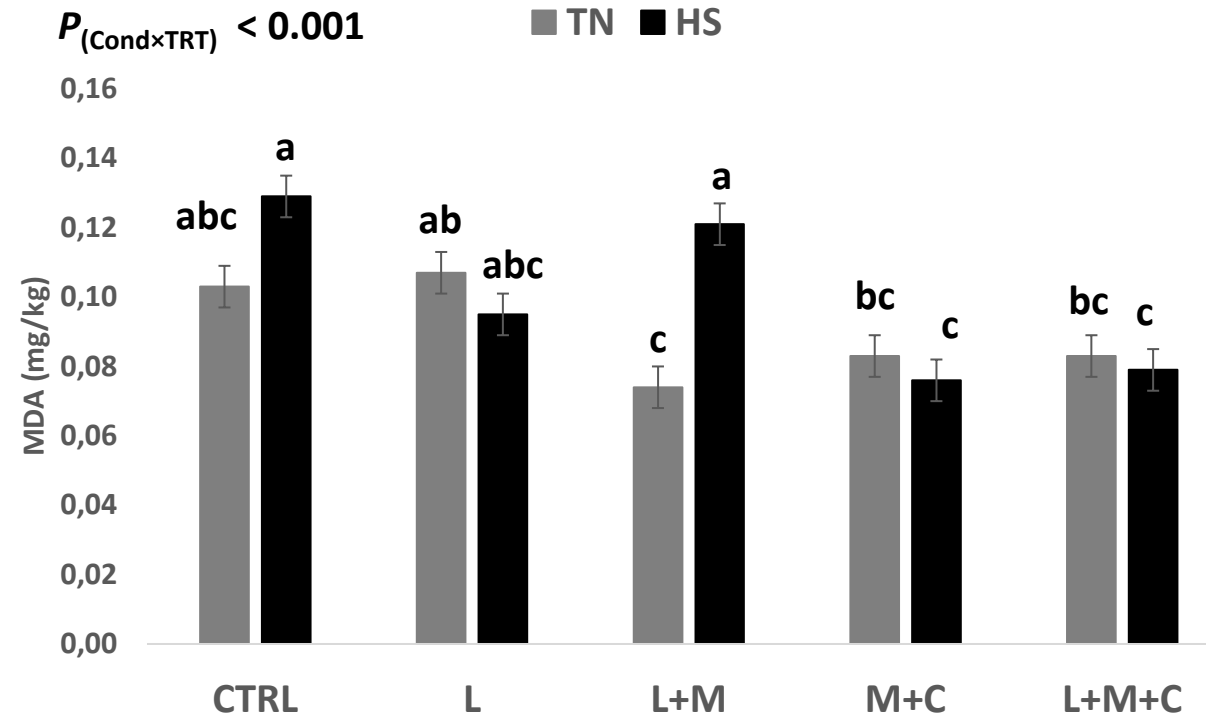


* $P < 0.05$, # $P < 0.1$

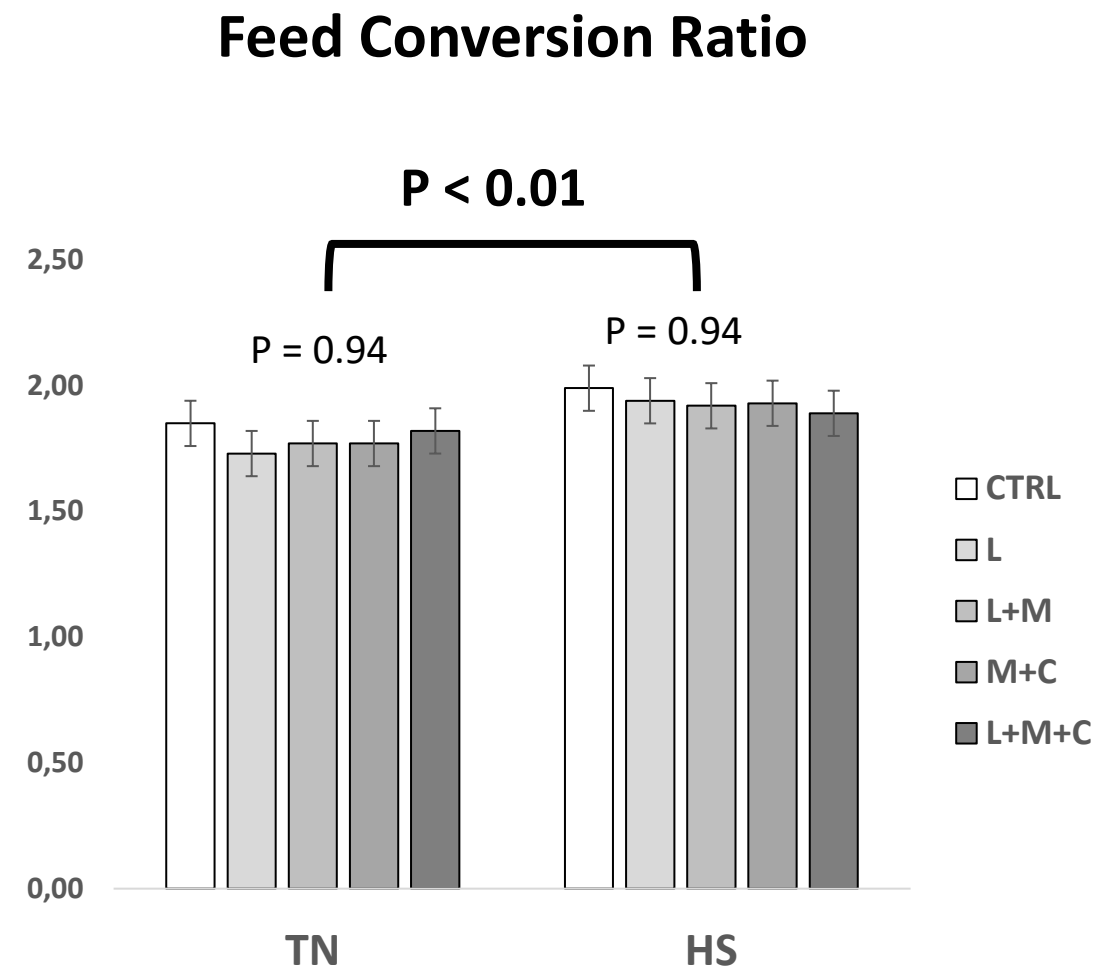
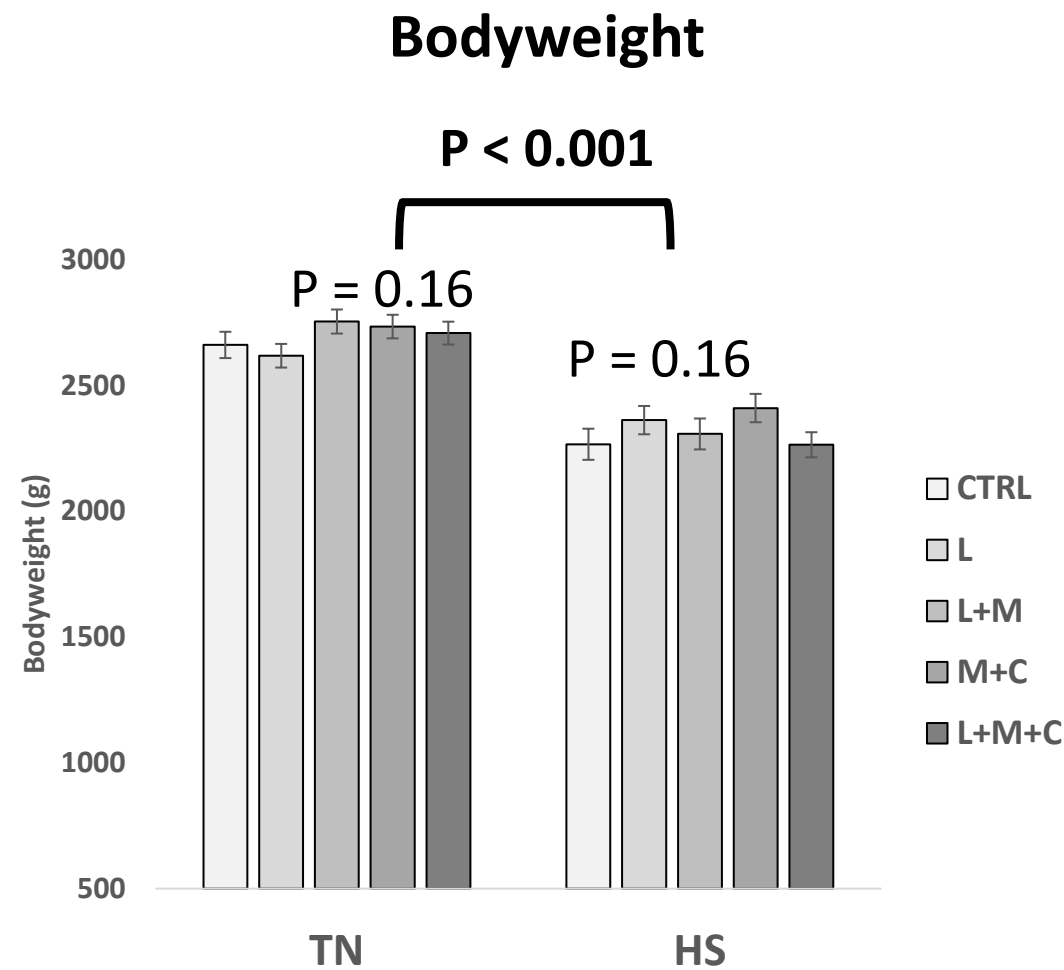
Results – Indicators of oxidative stress: Plasma MDA



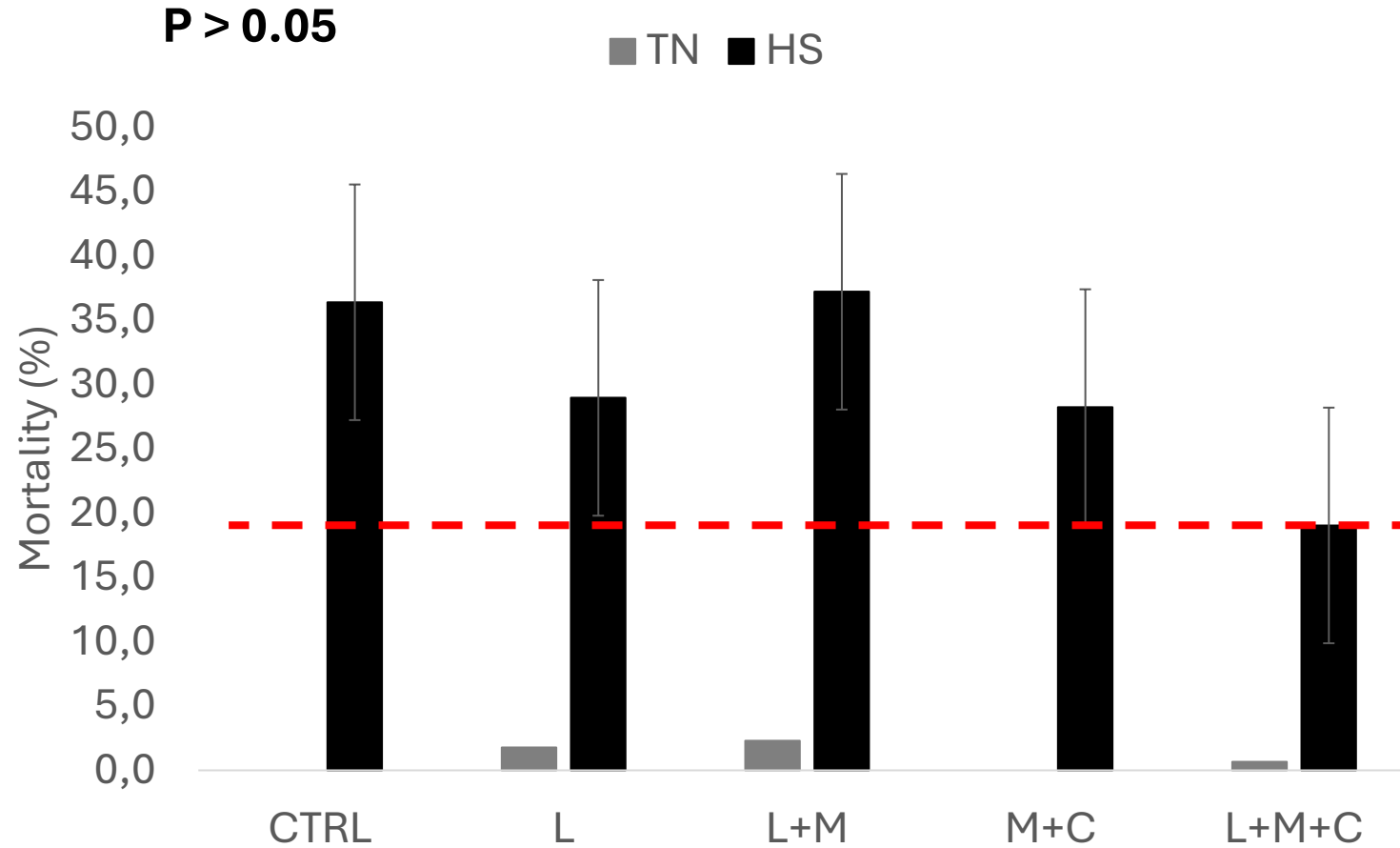
Results – Indicators of oxidative stress: Liver MDA



Results – Performance from D22 to D35



Results – Mortality (%) from D29 to D34



Conclusions

Conclusions

❑ Combinations of Methionine + Cysteine (T3) and Leucine + Methionine + Cysteine (T4):

✓ Starter phase (D0 – D11) → ↑ Bodyweight + ↓ FCR

✓ Grower phase (D12 – D21) → ↑ Bodyweight (males)

✓ Finisher phase (D22 – D34) + Heat Stress (D29 – D34) →

↓ Body Temperature + ↓ Oxidative Stress + ↓ Mortality



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