Effects of temperament on growth, plasma cortisol concentrations, and puberty attainment in *Bos indicus* beef heifers

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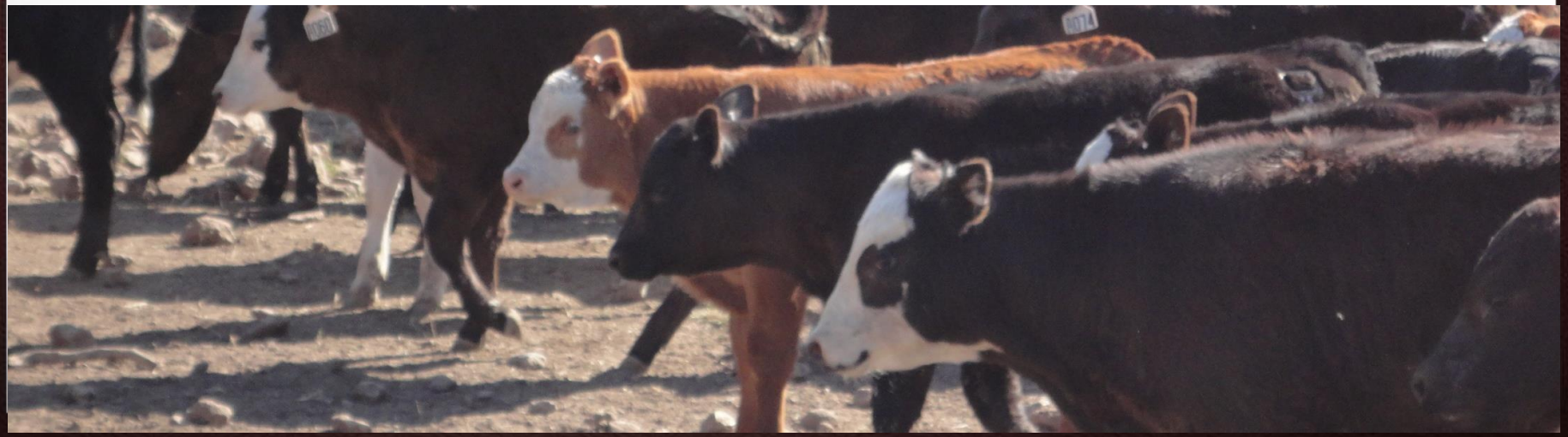
Beef Heifer Development

- Critical component of cow-calf production
  - Reach puberty by 12-13 months of age
  - Able to conceive by 15 months of age
  - Calve at 24 months of age
  - Wean first calf at 32 months of age

Maximizes heifer lifetime productivity



Beef Heifer Development

- *Bos indicus* typically reach > 15 mo
  - Genetic, physiological, environmental reasons
  - Excitable temperament
- Fear-related responses to human handling
  - Altered growth rates and physiology (i.e. cortisol)
    - Disrupts key physiological events for puberty

Beef Heifer Development

- Direct effects of temperament on puberty?
  - *B. taurus* and *B. taurus* × *B. indicus* (DONE)
  - *B. indicus* heifers (i.e. Nelore in Brazil)
    - Needs to be done...

Hypothesis: Heifers with excitable temperament will have reduced BW gain, altered adrenocortical physiology, and delayed puberty attainment compared to cohorts with adequate temperament.

Objective: Investigate the impacts of temperament on post-weaning growth rates, plasma cortisol concentrations, and puberty attainment by 15 mo of age in Nelore heifers.

Materials and Methods

- Commercial cow-calf operations in Brazil
  - Total of 170 Nelore heifers
    - Initial BW = 238 ± 2 kg, initial age = 369 ± 1 days
    - Weaned 4 months prior to experiment.

Materials and Methods

- Maintained in *Brachiaria brizantha* pasture
  - Received TMR at 2.4% of heifer BW/day
    - 69% corn silage and 31% soybean meal (DM)
- Experimental period (d 0 to 91)
  - 12 to 15 mo of age – (a)typical for Nelore
- Heifer temperament assessed on d 0
  - Exit Velocity (1.8-m, using infrared sensors)
  - Categorized into quintiles for Exit Score
    - Exit Score ≤ 3 = **ADEQUATE** (n = 96)
    - Exit Score > 3 = **EXCITABLE** (n = 74)

Materials and Methods

- Samples of pasture and TMR monthly
  - Pasture = 60% TDN, 15.8% CP
  - TMR = 80% TDN, 20.8% CP
- Sampling schedule

– Puberty = 10-day interval period CL detected
– Blood analyzed for plasma cortisol

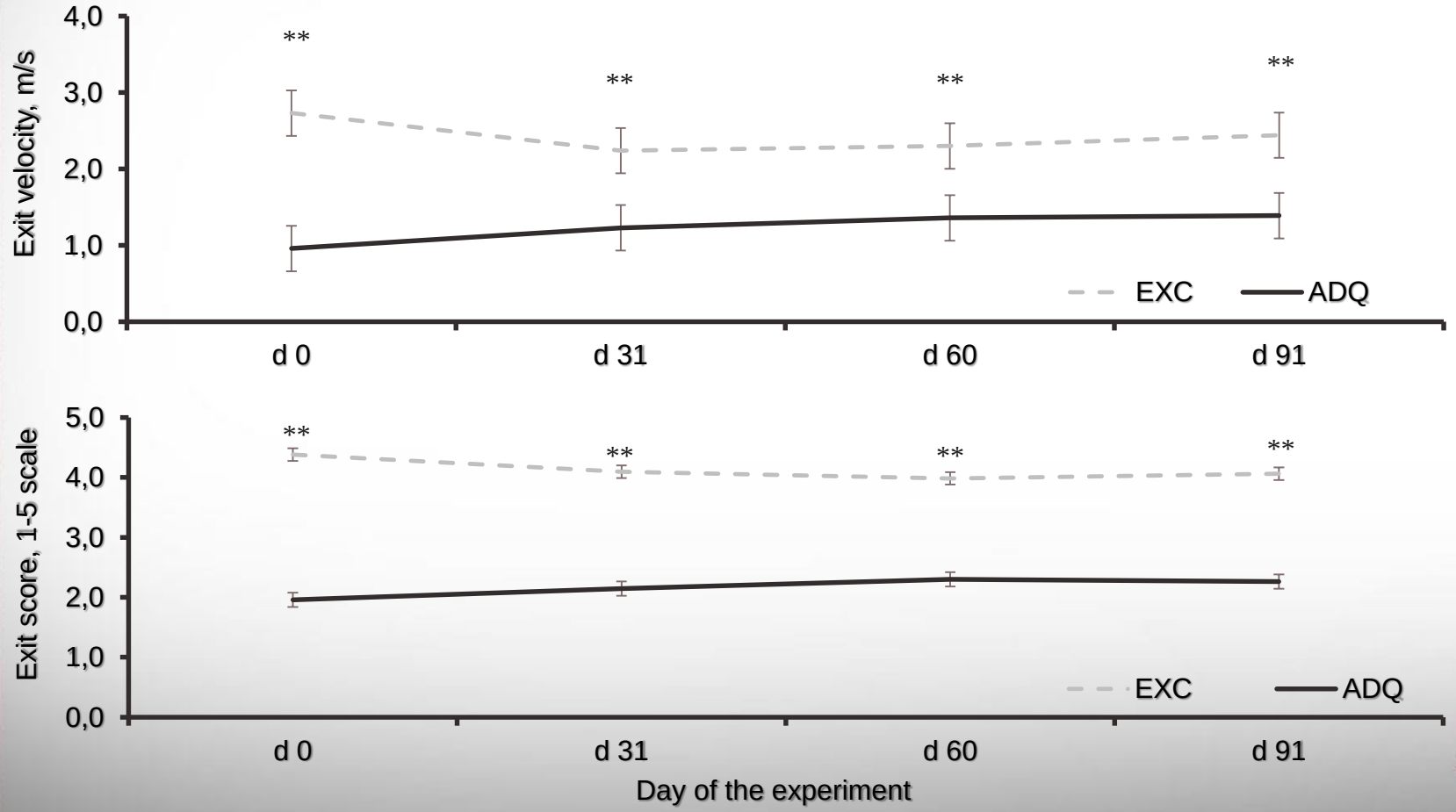
Materials and Methods

- Statistical Analysis
  - MIXED or GLIMMIX procedures of SAS
    - Quantitative and binary data, respectively
    - Model statements
      - Heifer temperament (ADQ or EXC)
      - Day and interaction (for repeated measures)
        - » Repeated statement was day
        - » Subject was heifer(temperament)
        - » Covariance structure utilized was autoregressive
  - CORR procedure of SAS
    - Pearson correlations

Significance at $P \leq 0.05$, tendencies at ≤ 0.10

Results and Discussion

- Exit Velocity and Score
  - Remained similar between temperament groups



Results and Discussion

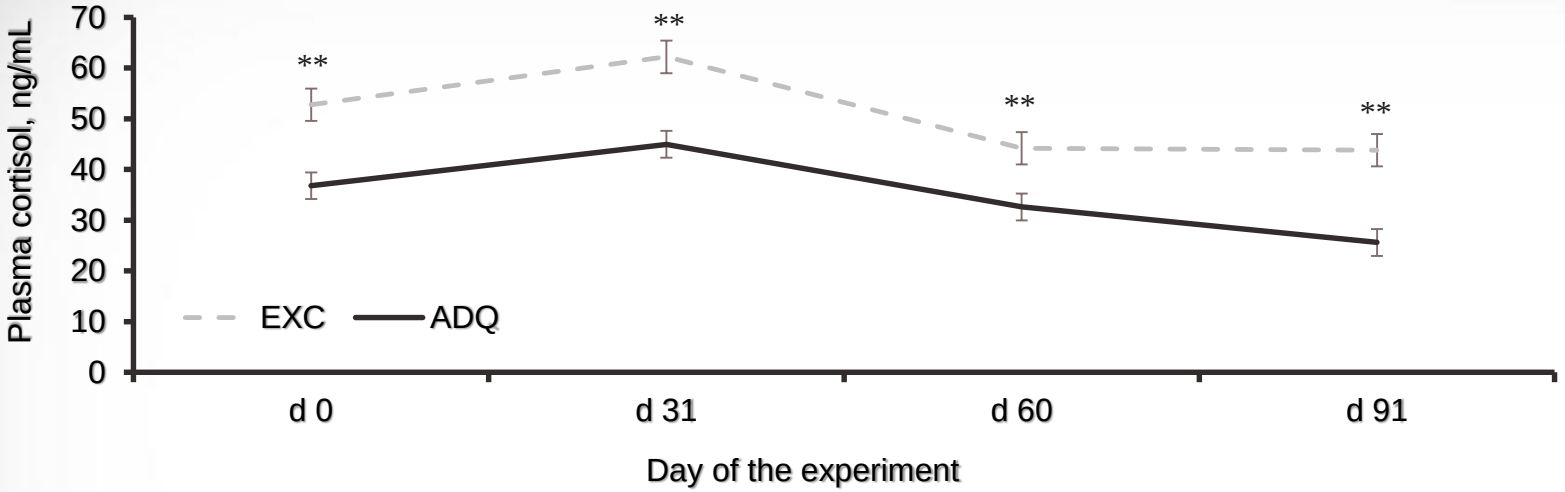
- Pearson correlation coefficients
  - Initial and subsequent EV and ES evaluations

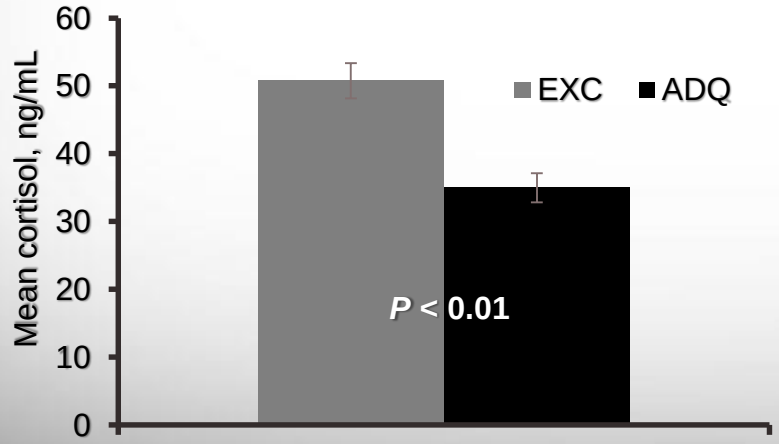
Item		d 31	d 60	d 91
	d 0	0.72 (< 0.01)	0.64 (< 0.01)	0.65 (< 0.01)
Exit velocity	d 31		0.77 (< 0.01)	0.76 (< 0.01)
	d 60			0.84 (< 0.01)
	d 0	0.68 (< 0.01)	0.63 (< 0.01)	0.66 (< 0.01)
Exit score	d 31		0.72 (< 0.01)	0.75 (< 0.01)
	d 60			0.77 (< 0.01)

Repeatable across days, selection criteria by predicting EV and ES during future handling events

Results and Discussion

- Plasma cortisol concentrations



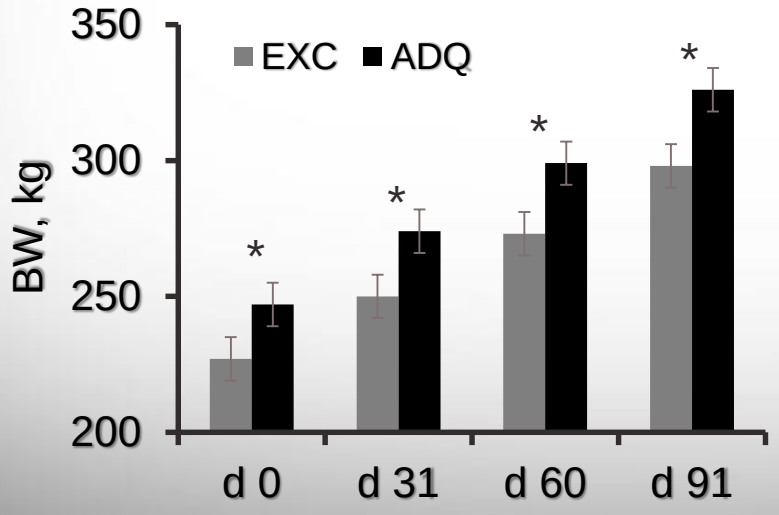


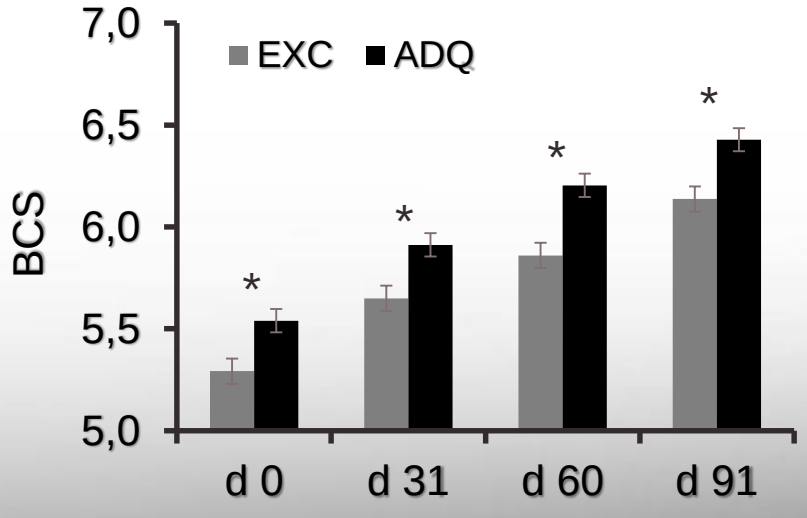
As expected and previously reported, EXC heifers had greater plasma cortisol during handling compared with ADQ

Results and Discussion

- Growth responses (*reduced in EXC heifers)*

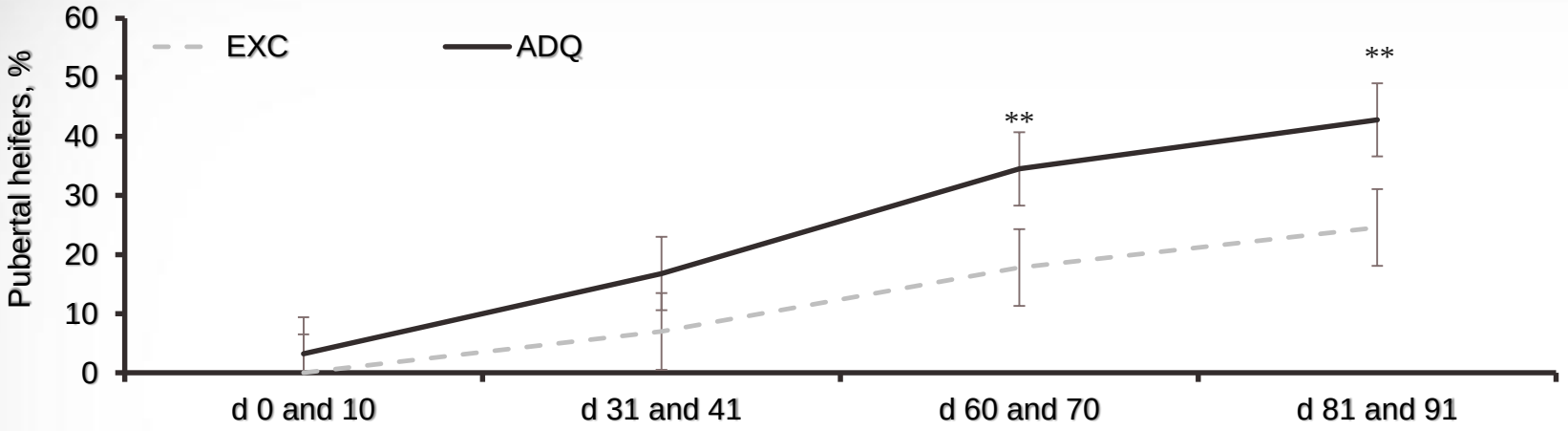
Item	Temperament type		SEM	P =
	ADQ (n = 96)	EXC (n = 74)		
Age (d 0), d	369	369	5	0.97
ADG (d 0 to 91), kg/d	0.86	0.78	0.02	< 0.01
Mean BCS, 1 to 9	6.02	5.73	0.05	< 0.01





Results and Discussion

- Puberty attainment



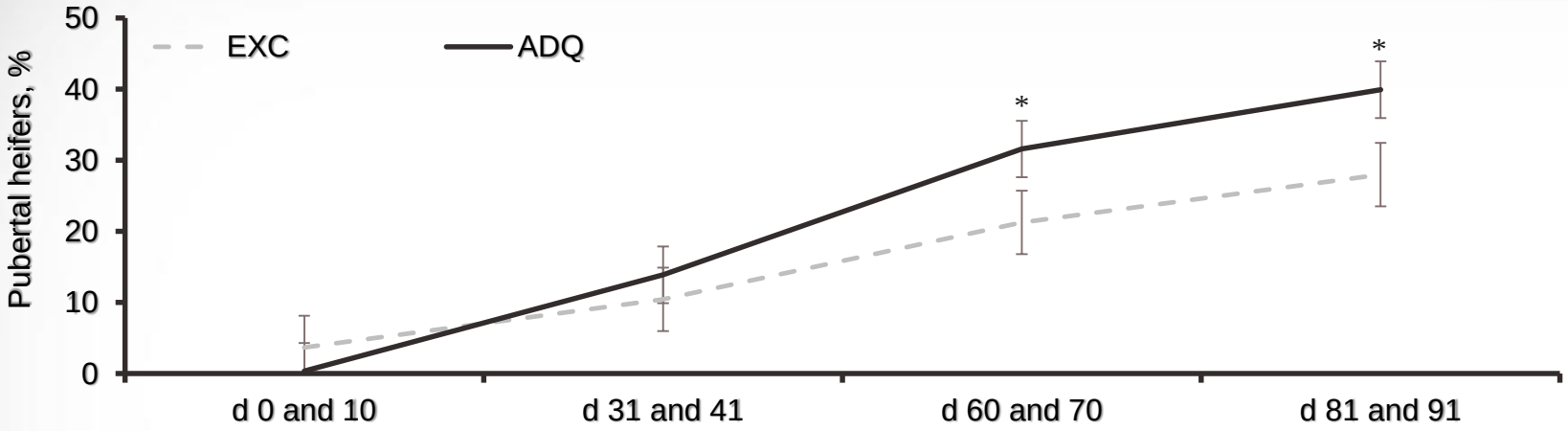
- Delayed puberty as hypothesized.
- Mainly due to BW and ADG?
- Key drivers of puberty

Pubertal EXC heifers lighter at puberty compared with ADQ

Pubertal	ADQ	EXC	SEM	P =
Age, d	429	433	9	0.60
BW, kg	307	283	10	0.02

Results and Discussion

- Puberty attainment *(BW as covariate)*



- Delayed puberty in EXC heifers
  - Not determined by heifer BW or age
  - Increased cortisol? Perhaps, but during handling only
  - Additional mechanism?
    - Genetic and innate deficiencies within developmental and reproductive system in EXC females?

Summary and Conclusions

- Novel info for *Bos indicus* heifers
- Classified for temperament by initial EV(ES)
  - Predicted EV(ES) during future handling events
    - Potential tool for heifer selection
- EXC heifers gained less BW, increased cortisol
- Puberty delayed in EXC heifers
  - Not fully attributed to reduced BW gain
  - Not all due to increased cortisol – handling only
  - Potential genetic and innate mechanisms?

Final Conclusions

Temperament has direct implications and should be considered when selecting replacement heifers in cow-calf system based on *B. indicus* females

Thank you!

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