



# Post-weaning feed efficiency did not influence female fertility traits of commercial or Lowline Angus heifers

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## Introduction

Seventy-six percent of the beef cattle operations in California represent cattle producers with 1-99 cows (California Department of Food and Agriculture (CDFA), 2019). Accounting for \$67.1 billion in cash receipts, cattle production represented 18% of agricultural commodities in 2018 (United States Department of Agriculture Economic Research Service (USDA), 2019). For small-scale cow-calf operations, over 60 percent utilized production practices to target conventional marketing channels for calves (USDA, 2011). With cattle production profitability depending upon efficient use of feed inputs and reproductive traits, feed efficiency is a targeted trait. At an estimated 60 percent or more of the total, feed inputs account for the largest percent of beef production costs (Arthur et al., 2001). Thus, there is an economic incentive for cattle producers to reduce the total amount of feed required for growth and maintenance of livestock without impacting reproduction, increasing industry sustainability. One performance trait is Residual Feed Intake (RFI) which helped in the determination of efficient cattle. We hypothesized that improved feed efficiency is associated with improved heifer reproduction. Furthermore, it was hypothesized that Lowline-influenced heifers will exhibit improved fertility.

## OBJECTIVE

Determine the phenotypic relationship between post-weaning feed efficiency and female fertility in commercial and half-blood Lowline-influenced Angus heifers.



## Materials and Methods

### Trial:

- Procedures approved by CSU, Chico Institutional Care and Use Committee
- Conducted at CSU, Agriculture Teaching and Research Center (ATRC; Chico, CA)
- Spring born Angus influenced heifers provided by Alturas Ranch
  - Commercial (n=19) vs. Half-blood Lowline (n= 20)
- 24d for cattle to adjust to GrowSafe feed intake system (Airdrie, Alberta, Canada) and diet (TDN: 54%, CP: 14%, and NDF: 39.7%, on a DM basis).

### Feed Protocol:

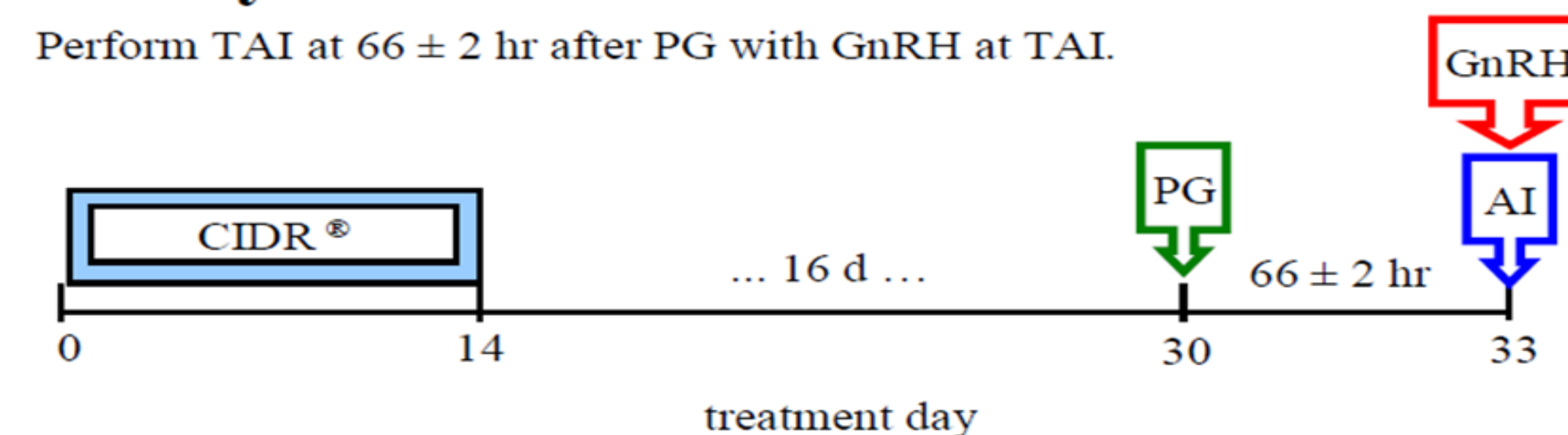
- *Ad libitum* access to forage-based diet (target gain: 0.68 kg/d) and water for 72 days
- Serial weights recorded every 14 to determine initial weight, ADG, MMWT

### Reproduction:

- All heifers synchronized with a 14-day CIDR-PG method and given two estrous cycles to breed AI
- AI 12-hours post standing estrus accompanied with 2cc GnRH injection
- Estrus behavior was observed over 90 hours following PG (Lutalyse; 5cc/head injection)
- Pregnancy examination occurred six months after AI opportunity

### 14-day CIDR®-PG

Perform TAI at 66 ± 2 hr after PG with GnRH at TAI.



**Figure 1.** Estrous synchronization protocol utilized on heifers. Source: Beef Repro Task Force (2019)

### Data Analysis:

- RFI groups determined based on methodology of Basarab et al. (2003).
- Reproductive traits analyzed using GLM procedures of SPSS (binary logistic response), fitting breed type and RFI group as fixed effects.
- Reproduction further analyzed using logistic regression, fitting RFI, ADG and FCR as predictors.
- Trait Legend:

Acronym	Trait
ADG	Average Daily Gain, kg/d
FCR	Feed Conversion Ration. Kg Feed/kg Gain
DMI	Dry Matter Intake kg/d
RFI	Residual Feed Intake, kg/d
FSC	First Service Conception Rate Rate, %
PR	Pregnancy Rate, %
RES	Estrous Synchronization Response Rate, %

## Results

**Table 1. Descriptive statistics for growth and efficiency (Avg ± SD).**

Traits, units	RFI Group			Breed Type	
	Low	Marginal	High	Commercial Angus	Half-Blood Lowline
Initial Weight (kg)	295.15 ± 17.87	296.35 ± 23.84	295.16 ± 21.99	311.86 ± 12.25	280.48 ± 12.38
DMI (kg/day)	10.68 ± 2.37	11.39 ± 2.30	12.47 ± 2.07	12.16 ± 2.31	10.71 ± 2.12
ADG (kg/day)	0.77 ± 0.38	0.90 ± 0.51	1.10 ± 0.64	1.18 ± 0.55	0.65 ± 0.27
RFI (kg)	-1.60 ± 0.55	-0.068 ± 0.39	2.36 ± 1.26	-0.16 ± 1.40	0.15 ± 1.69
FCR (kg feed/kg gain)	7.12 ± 3.86	7.42 ± 4.04	7.53 ± 4.01	6.26 ± 3.67	8.40 ± 3.99

**Table 2. Estimated marginal means (SE) for reproduction by RFI group.**

Traits, %	RFI Group			P - Value
	Low	Marginal	High	
FSC	0.55 (0.152)	0.79 (0.103)	0.63 (0.077)	0.425
PR	0.93 (0.077)	0.85 (0.089)	0.90 (0.102)	0.766
RES	0.63 (0.146)	0.86 (0.081)	0.75 (0.153)	0.394

**Table 3. Estimate marginal means (SE) for reproduction by breed type.**

Traits, %	Breed Type		P - Value
	Commercial Angus	Half-Blood Lowline	
FSC	0.67 (0.124)	0.67 (0.119)	0.995
PR	0.95 (0.047)	0.78 (0.103)	0.128
RES	0.78 (0.101)	0.73 (0.109)	0.724

**Table 4. Odds ratio estimates (ORE) from logistic regression for effects of RFI, DMI and ADG on reproduction.**

Trait	RFI		DMI		ADG	
	ORE	P-Value	ORE	P-Value	ORE	P-Value
FSC	0.88	0.5983	1.28	0.2285	0.590	0.5589
PR	0.92	0.7803	1.11	0.6768	0.790	0.8418
RES	1.04	0.8915	1.61	0.0711	0.500	0.5478

## Conclusion

- There were no significant differences among efficiency groups nor breed type for reproductive traits.
- Logistic regression results support prior data analysis, suggesting no significant associations between growth and feed efficiency with FSC, PR, and RES in this set of heifers.
- Cattle producers can select for RFI without affecting reproductive traits.

## References

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