







**EFFECTS OF TIMING AND DURATION OF TEST PERIOD AND DIET TYPE ON INTAKE AND FEED EFFICIENCY OF CHAROLAIS-SIRED CATTLE**

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**Introduction**

- 10% improvement in feed efficiency = \$1.2 Billion savings in feedlot
  - Weaber et al., 2011
- Intake is key component of feed efficiency
  - Expensive and timely
- Majority of intake evaluations are done on grain
- Does intake and RFI on concentrate relate to forage?


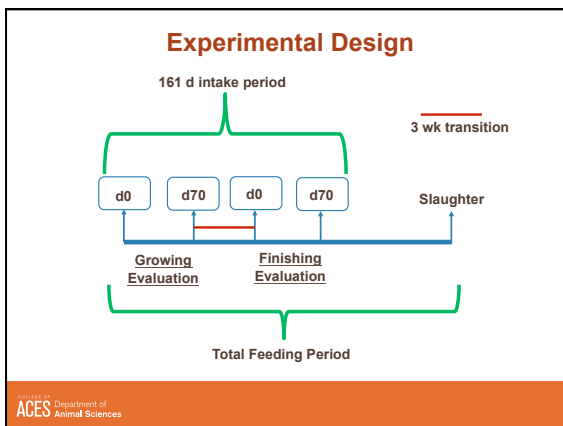
**Introduction**

- **Hypothesis:**
  - Intake and efficiency would be repeatable across differing test periods
  - Intake and efficiency on different diet types would not be related
- **Objectives:**
  - Determine appropriate test length and repeatability of DMI, ADG, and efficiency over different biological timepoints
  - Determine relationship between forage- and grain-fed intake and feed efficiency measures


**Materials and Methods**

- 2 yr study
  - Charolais x SimAngus steers and heifers (n = 628)
- Duration/timing (n = 320 steers)
  - Grain fed growing and finishing
- Diet type (n = 308 heifers)
  - Forage growing
  - Grain finishing

**Growing Diet Composition, %DM**

Item	Year 1		Year 2	
	Forage	Grain	Forage	Grain
High-moisture corn	-	20	-	30
Dry rolled corn	-	30	-	20
Distillers grains with solubles	-	15	-	15
Corn husklage	-	25	-	-
Corn silage	47.5	-	47.5	25
Alfalfa Haylage	47.5	-	47.5	-
Supplement	5	10	5	10




### Finishing Diet Composition, %DM

Item	Year 1	Year 2
High-moisture corn	20	30
Dry rolled corn	30	20
Distillers grains with solubles	15	15
Corn husklage	25	-
Corn silage	-	25
Supplement	10	10

### Calculation of Feed Efficiency

- RFI = Actual – Predicted DMI
  - Predicted DMI = MMW + ADG+ BF + pen (random)
- Feed efficiency traits measured
  - Growing
  - Finishing
  - 161 d intake period (steers)
  - Total feeding period (steers)

Predicted DMI R<sup>2</sup>:  
0.42 – 0.79



### Days Required for Intake Evaluation

- Grain-fed steers only
- Individual growing DMI divided into 7 d increments from d 0 and from d 70:
  - d 0 – 7            d 70 – 63
  - d 0 – 14           d 70 – 56
  - d 0 – 21           d 70 – 49
  - d 0 – 28           d 70 – 42
  - d 0 – 35           d 70 – 35
  - d 0 – 42           d 70 – 28
  - d 0 – 49           d 70 – 21
  - d 0 – 56           d 70 – 14
  - d 0 – 63           d 70 – 7
  - d 0 – 70           d 70 – 0

### Statistical Analysis

- CORR procedure of SAS to test relationships of performance, intake, and efficiency
  - Growing
  - Finishing
  - 161 d intake period
  - Total feeding period
- CORR procedure of SAS used to test relationship of different intake evaluation periods

## Performance, Intake, and Efficiency In Different Test Periods

### Simple Statistics, Steers

Item	Mean	SD	Min	Max
<i>Growing phase</i>				
DMI, kg	7.6	1.19	2.9	10.5
ADG, kg	1.8	0.25	0.6	2.4
RFI, kg	0.0	0.56	-1.5	1.5
<i>Finishing phase</i>				
DMI, kg	9.8	1.02	6.1	13.1
ADG, kg	1.8	0.24	0.8	2.4
RFI, kg	0.0	0.65	-1.6	2.8

**Repeatability (Grow – Finish)**

Item	Grow DMI	Grow ADG	Grow RFI	Finish DMI	Finish ADG	Finish RFI
Grow DMI	1	0.64	0.49	0.56	-0.02	0.27
Grow ADG		1	0.00	0.29	0.11	-0.04
Grow RFI			1	0.38	-0.06	0.63
Finish DMI				1	0.49	0.66
Finish ADG					1	0.00
Finish RFI						1

**|R| values in bold are significant ( $P \leq 0.05$ )**

**Test Period Duration**

**Simple linear phenotypic correlations during different durations of mean DMI observations from the beginning of the 70d growing phase in grain fed steers<sup>a</sup>**

Item	0-70DMI	FDMI <sup>1</sup>	161DMI <sup>2</sup>
0-7DMI	0.81	0.43	0.72
0-14DMI	0.87	0.46	0.76
0-21DMI	0.89	0.48	0.79
0-28DMI	0.92	0.47	0.80
0-35DMI	0.96	0.48	0.83
0-42DMI	0.97	0.49	0.84
0-49DMI	0.98	0.50	0.86
0-56DMI	0.99	0.52	0.87
0-63DMI	1	0.54	0.89
0-70DMI	1	0.56	0.90
FDMI <sup>1</sup>		1	0.85
161DMI <sup>2</sup>			1

<sup>a</sup> |R| values in bold are significant ( $P < 0.05$ )  
<sup>1</sup> Finishing period DMI  
<sup>2</sup> 161 d intake period DMI

**Simple phenotypic correlations during different durations of mean DMI observations from the end of the 70d growing period in grain fed steers<sup>a</sup>**

Item	70-0DMI	FDMI <sup>1</sup>	161DMI <sup>2</sup>
70-63DMI	0.88	0.58	0.86
70-56DMI	0.87	0.62	0.87
70-49DMI	0.89	0.62	0.88
70-42DMI	0.92	0.61	0.89
70-35DMI	0.95	0.61	0.90
70-28DMI	0.97	0.58	0.89
70-21DMI	0.98	0.56	0.89
70-14DMI	0.99	0.56	0.90
70-7DMI	1	0.56	0.90
70-0DMI	1	0.56	0.90
FDMI <sup>1</sup>		1	0.85
161DMI <sup>2</sup>			1

<sup>a</sup> |R| values in bold are significant ( $P < 0.05$ )  
<sup>1</sup> Finishing period DMI (d91-161DMI)  
<sup>2</sup> 161 d intake period DMI (d0-161DMI)

**Simple phenotypic correlations between measurements of ADG during different feeding periods and biological timepoints<sup>a</sup>**

Item	Growing	Finishing	161ADG <sup>1</sup>	R_FPADG <sup>2</sup>	FPADG <sup>3</sup>
Growing	1	0.11	0.57	0.58	0.58
Finishing		1	0.76	0.69	0.58
161ADG <sup>1</sup>			1	0.96	0.81
R_FPADG <sup>2</sup>				1	0.85
FPADG <sup>3</sup>					1

<sup>a</sup> |R| values in bold are significant ( $P < 0.05$ )  
<sup>1</sup> 160 d intake period  
<sup>2</sup> Total feeding period (regressed ADG)  
<sup>3</sup> Total feeding period

**Performance, Intake, and Efficiency On Different Diet Types**

### Simple Statistics, Heifers

Item	Mean	SD	Min	Max
<b>Forage</b>				
DMI, kg	6.1	1.14	3.3	14.7
ADG, kg	0.8	0.24	0.2	1.7
RFI, kg	0.0	0.76	-2.5	6.5
<b>Grain</b>				
DMI, kg	9.3	1.06	5.9	12.6
ADG, kg	1.8	0.26	0.9	2.6
RFI, kg	0.0	0.67	-2.9	2.4

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### Forage – Grain

Item	Forage DMI	Forage ADG	Forage RFI	Grain DMI	Grain ADG	Grain RFI
Forage DMI	1	0.25	0.67	0.58	-0.01	0.24
Forage ADG		1	0.00	0.16	-0.30	-0.03
Forage RFI			1	0.26	0.00	0.42
Grain DMI				1	0.36	0.64
Grain ADG					1	0.00
Grain RFI						1

|R| values in bold are significant ( $P \leq 0.05$ )

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- ### Summary
- Intake is repeatable
  - Gain is not repeatable between test periods
    - 70d test period ADG is correlated to total feeding period ADG
  - Shorter duration intakes are strongly correlated to total feeding period intake
  - Intake of forage is correlated to intake of grain
    - Efficiency also related
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- ### Implications
- Shorter test periods (35 or less?) are accurate in predicting DMI, but not ADG
    - Decoupling
  - Intake and efficiency derived in the feedlot may have application to forage-fed cattle
    - Developing heifers
    - Cow-calf?
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