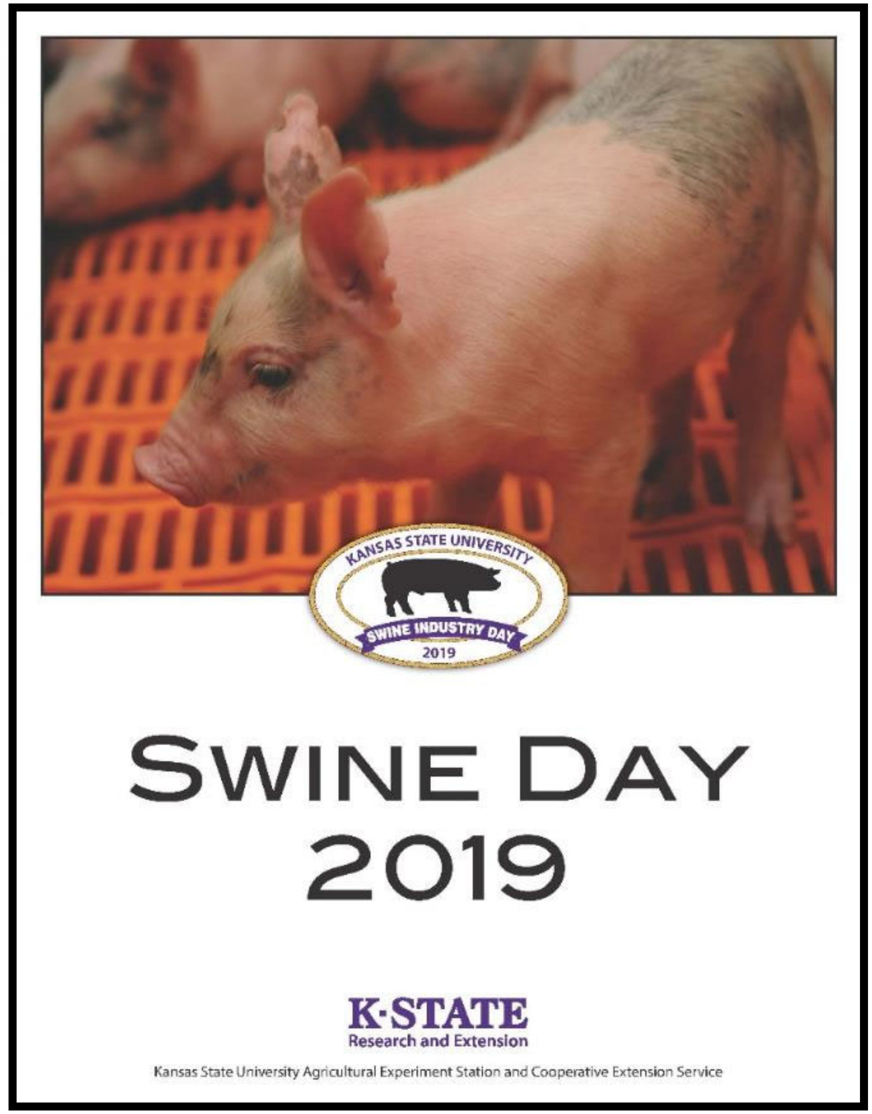
2019 Swine Day

available at:
www.KSUswine.org

- 38 papers
- 45 experiments
- > 36,000 pigs



Modeling standardized ileal digestible lysine requirements during gestation on gilts and sows from a commercial production system

Kansas State University | applied swine nutrition

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T.L.C.
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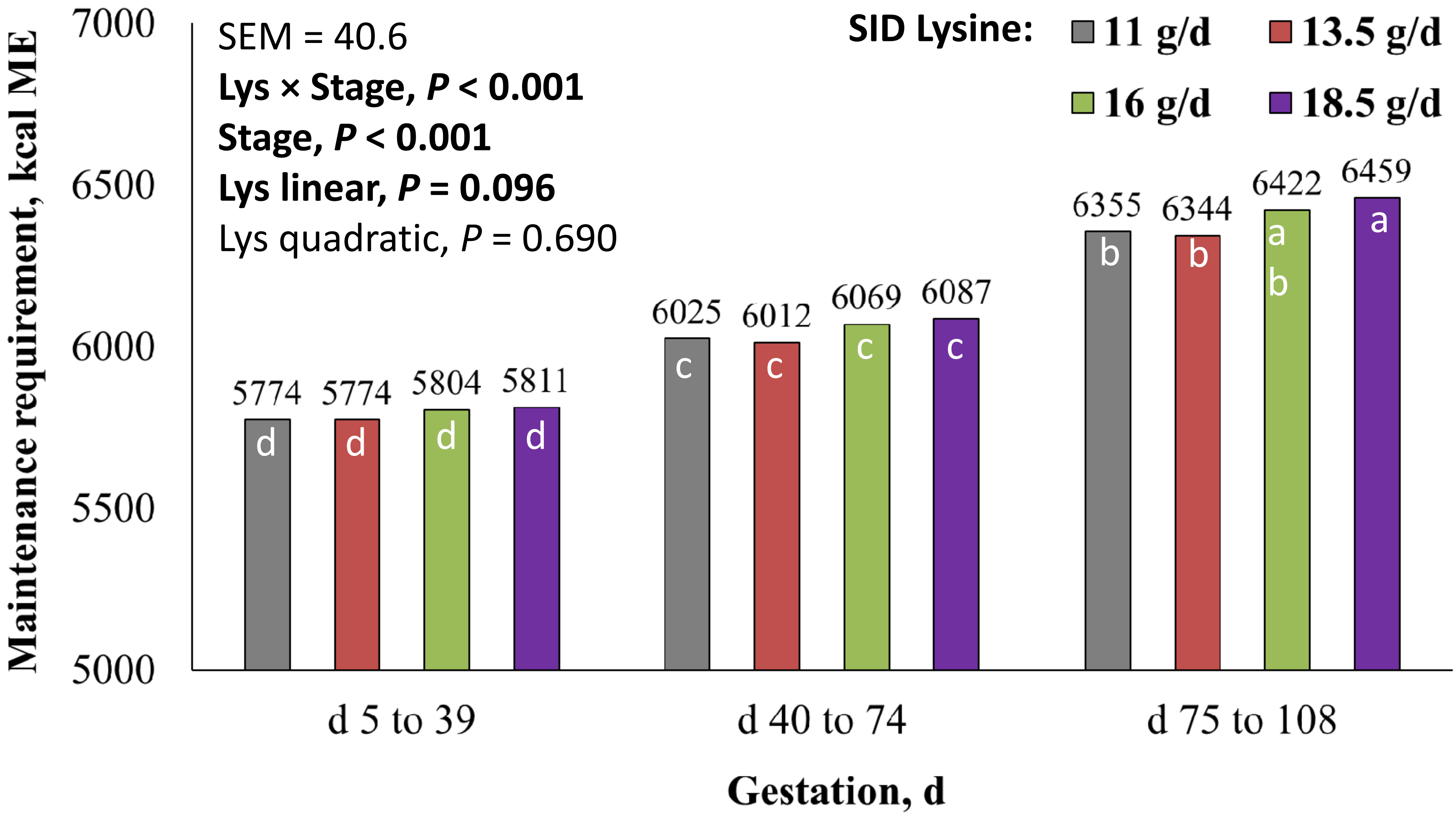
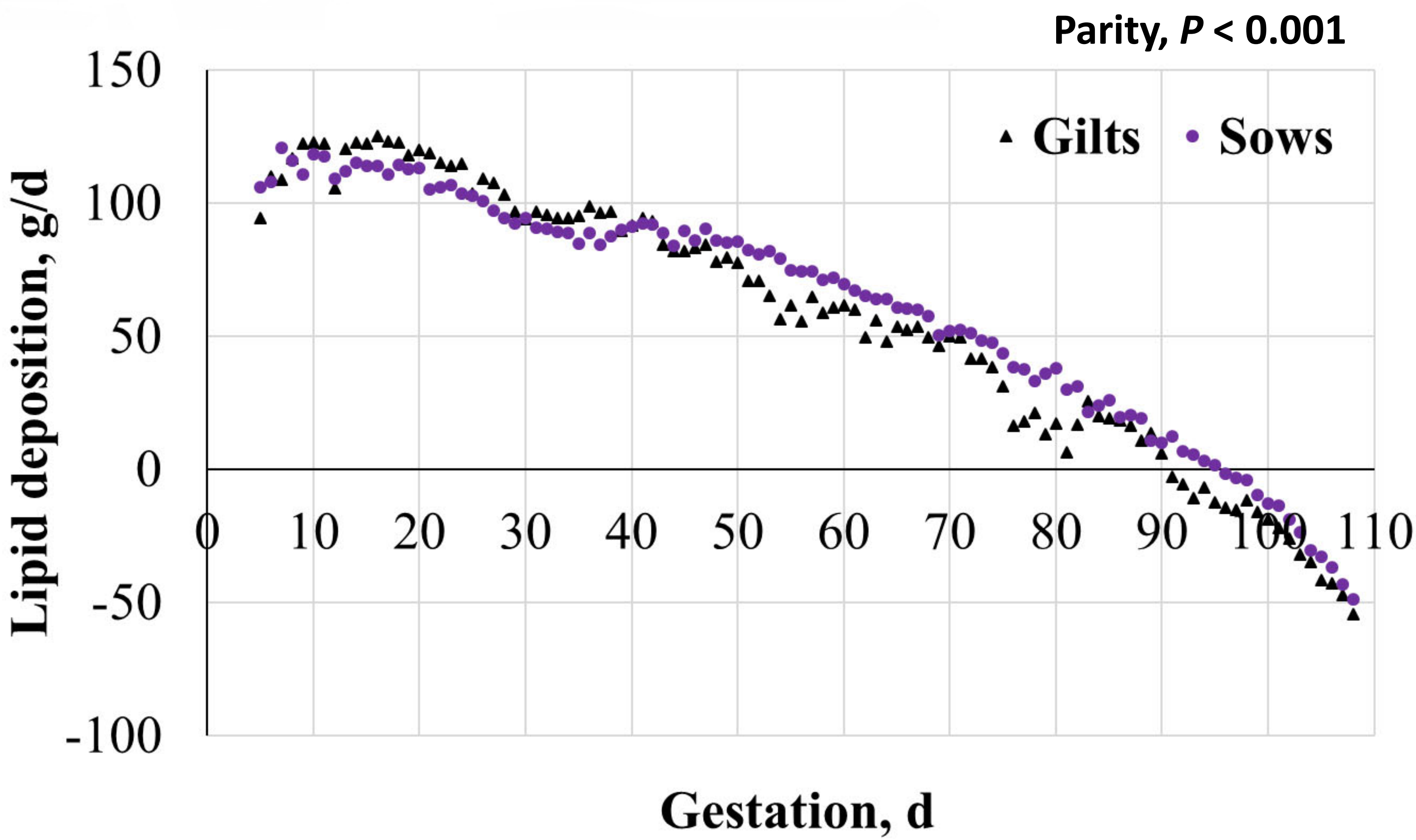
Sow maintenance energy requirements

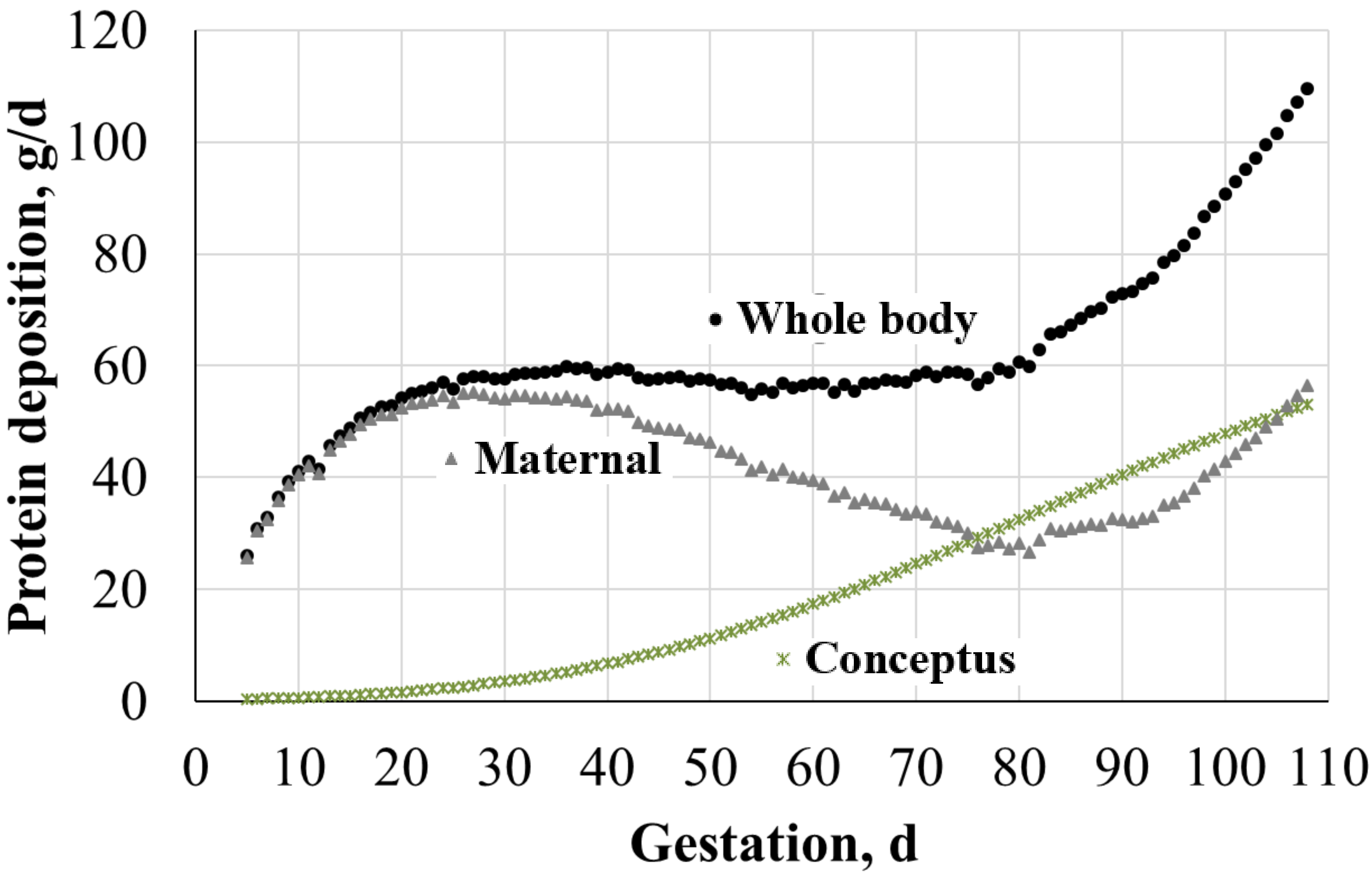


Daily maternal lipid deposition



Thomas et al., 2019

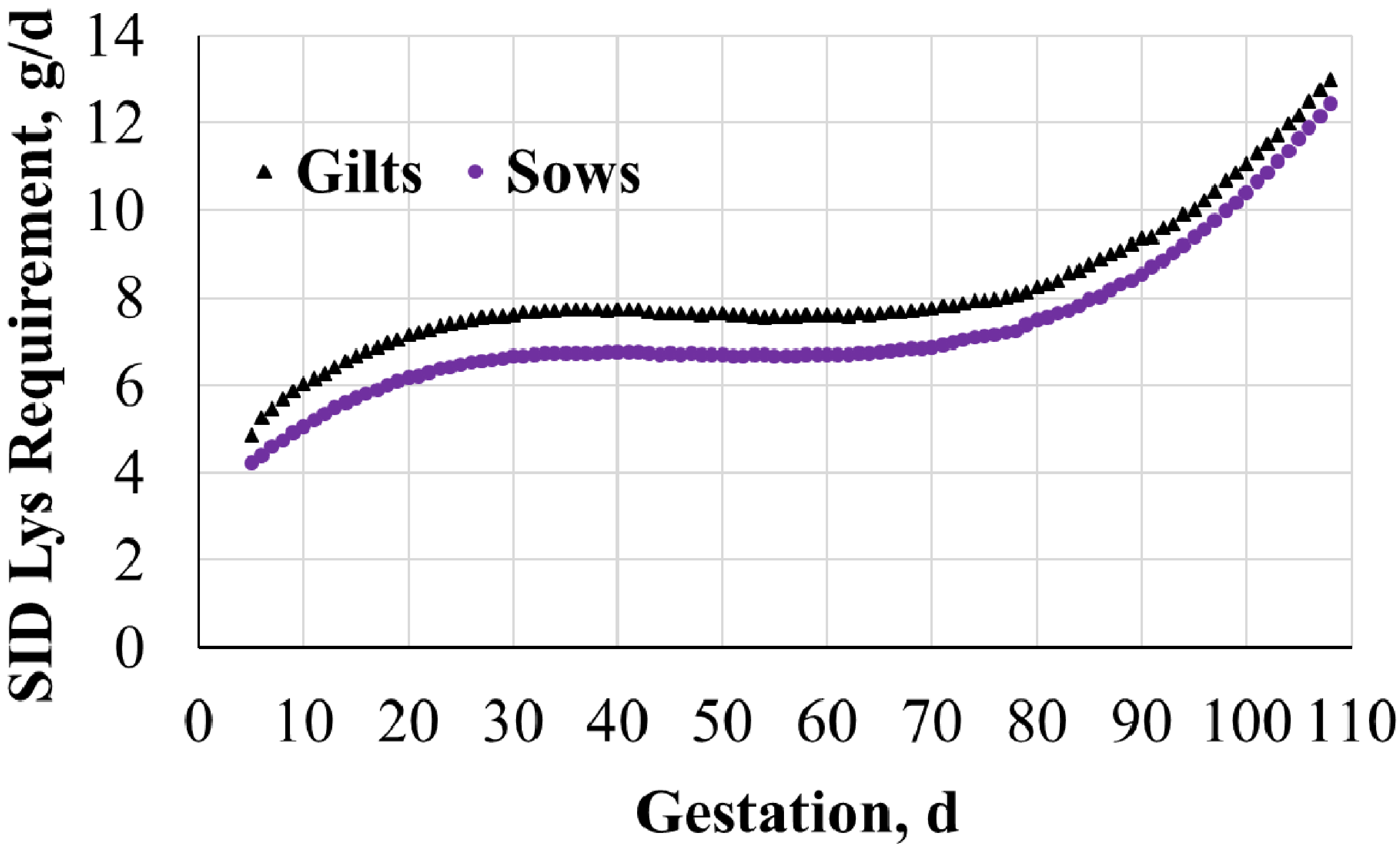
Daily gilt protein deposition



Thomas et al., 2019

Daily SID lysine requirements for protein deposition

Parity, *P* < 0.001



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Thomas et al., 2019

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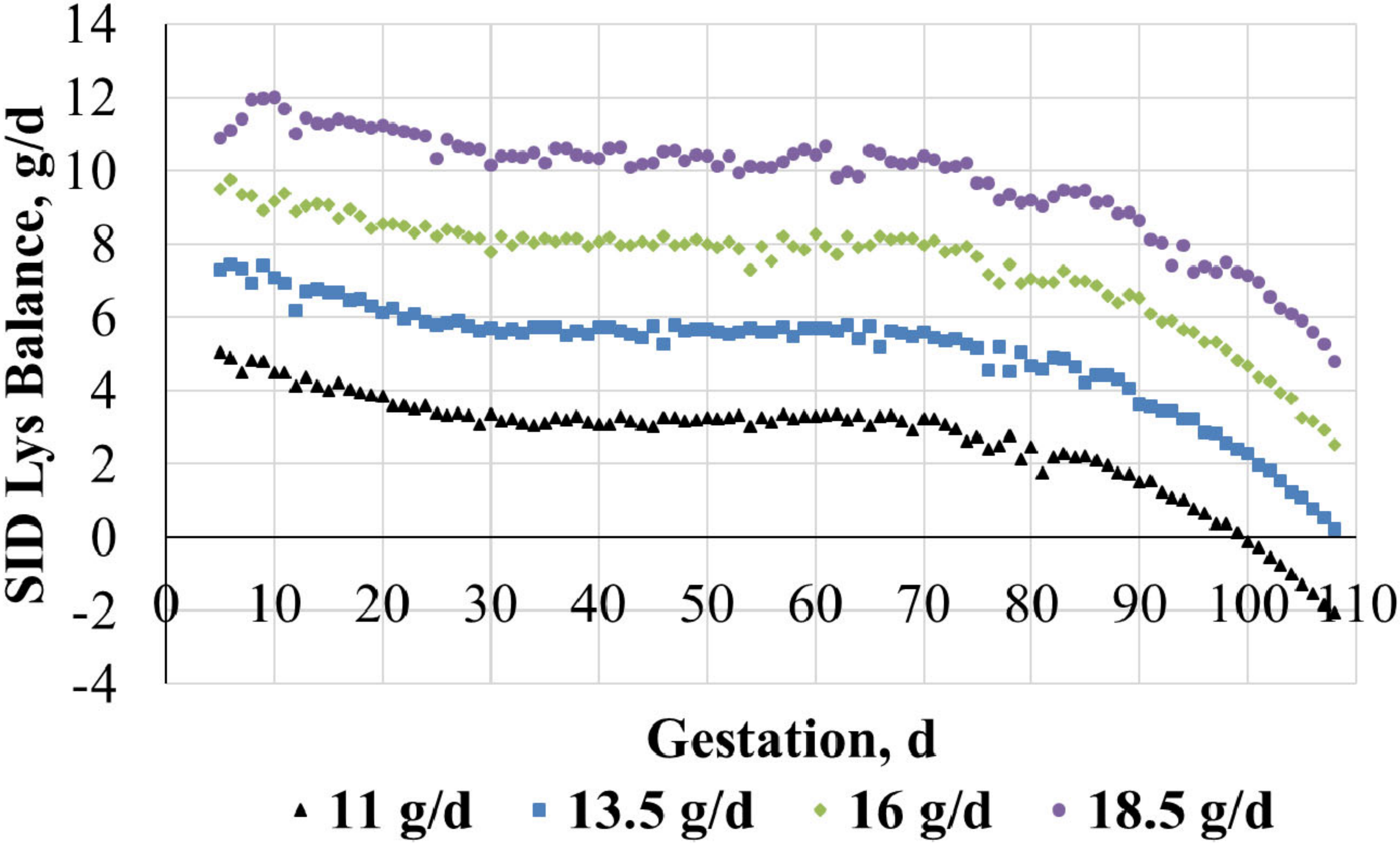
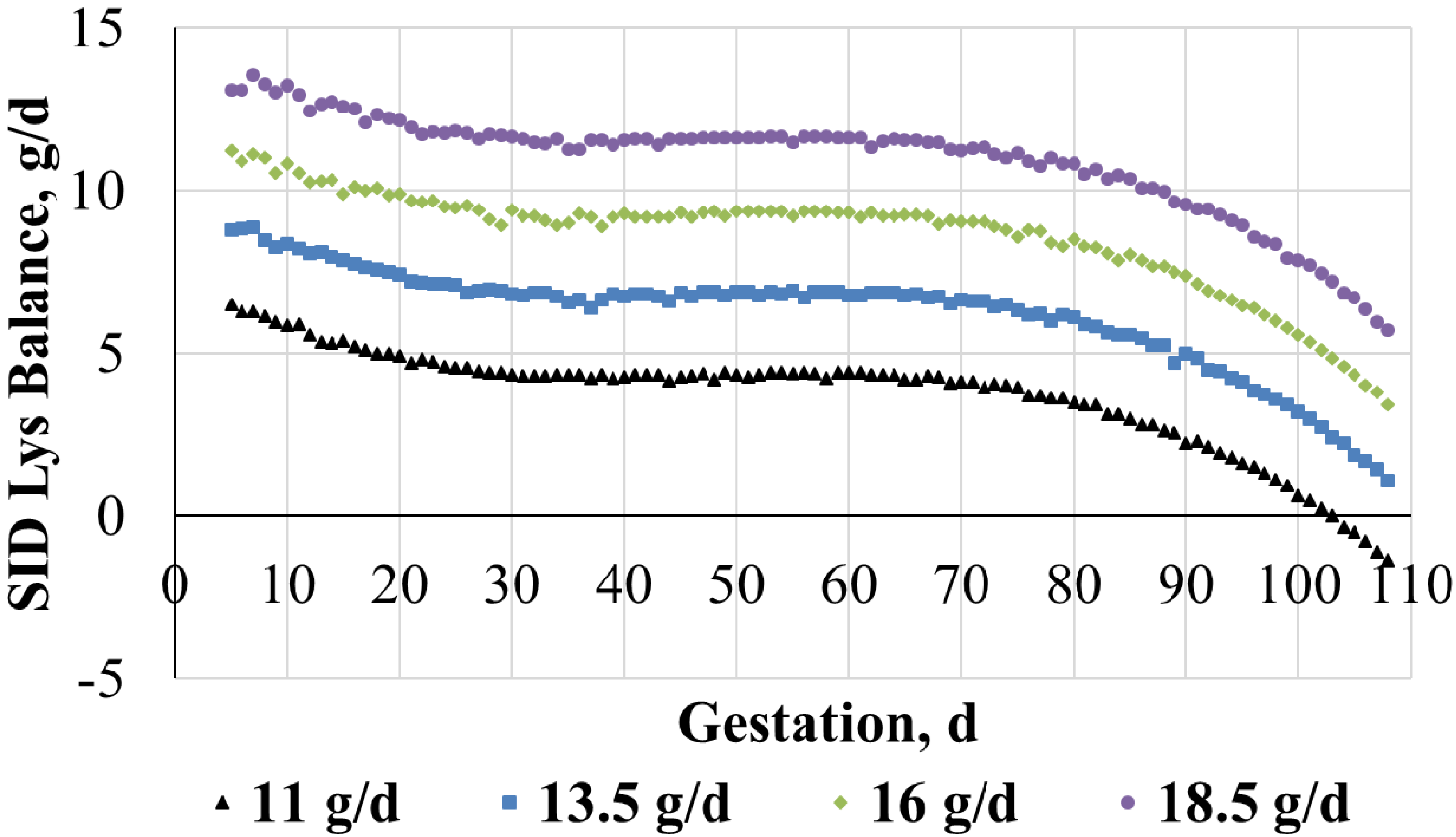
Daily gilt SID lysine balance by dietary treatment



Thomas et al., 2019

Daily sow SID lysine balance by dietary treatment



Thomas et al., 2019

Increasing feeding duration of high dietary lysine and energy before farrowing on sow and litter performance

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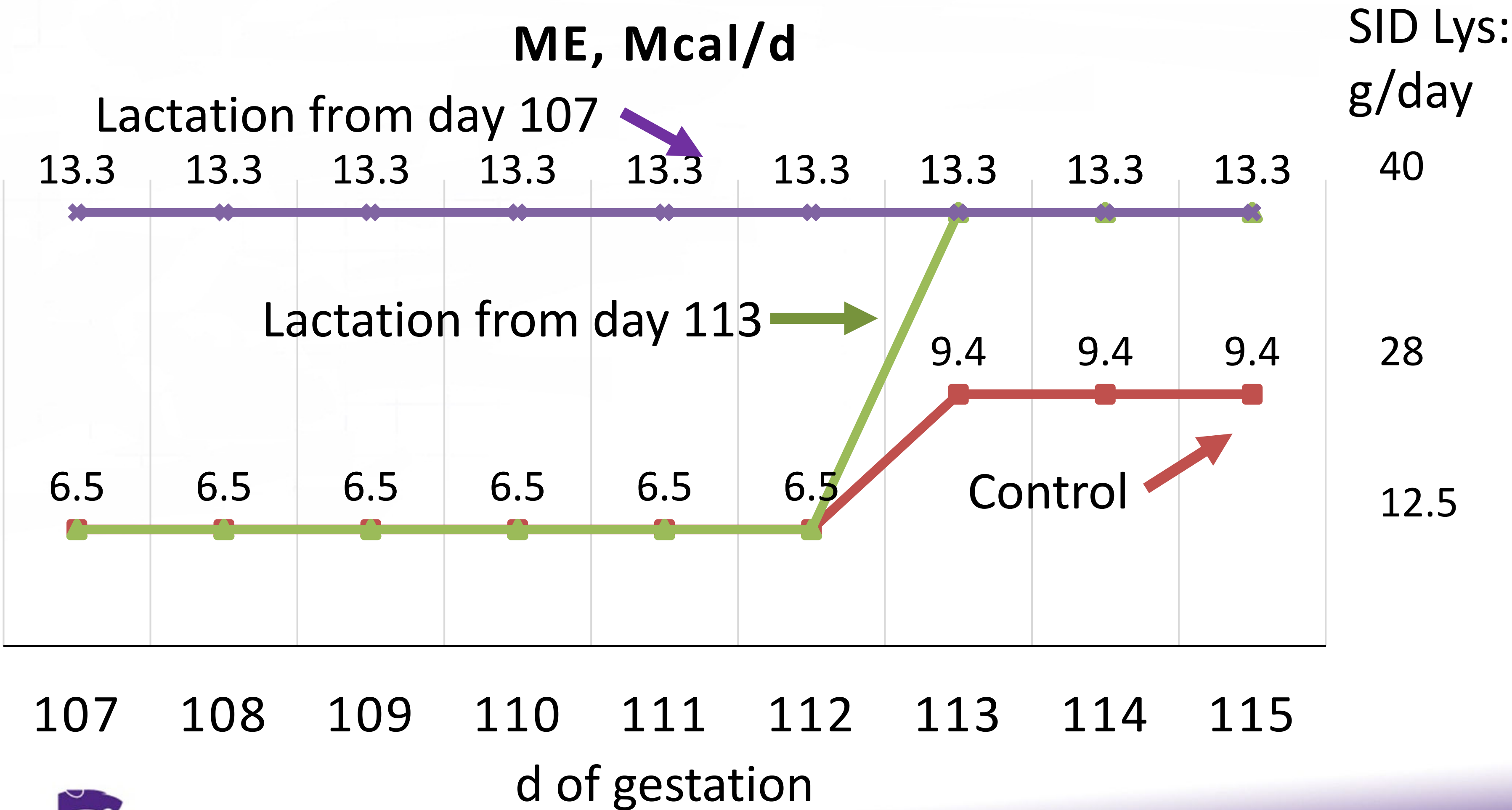
Increasing feeding duration of high dietary lysine and energy before farrowing



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Gourley et al., 2019

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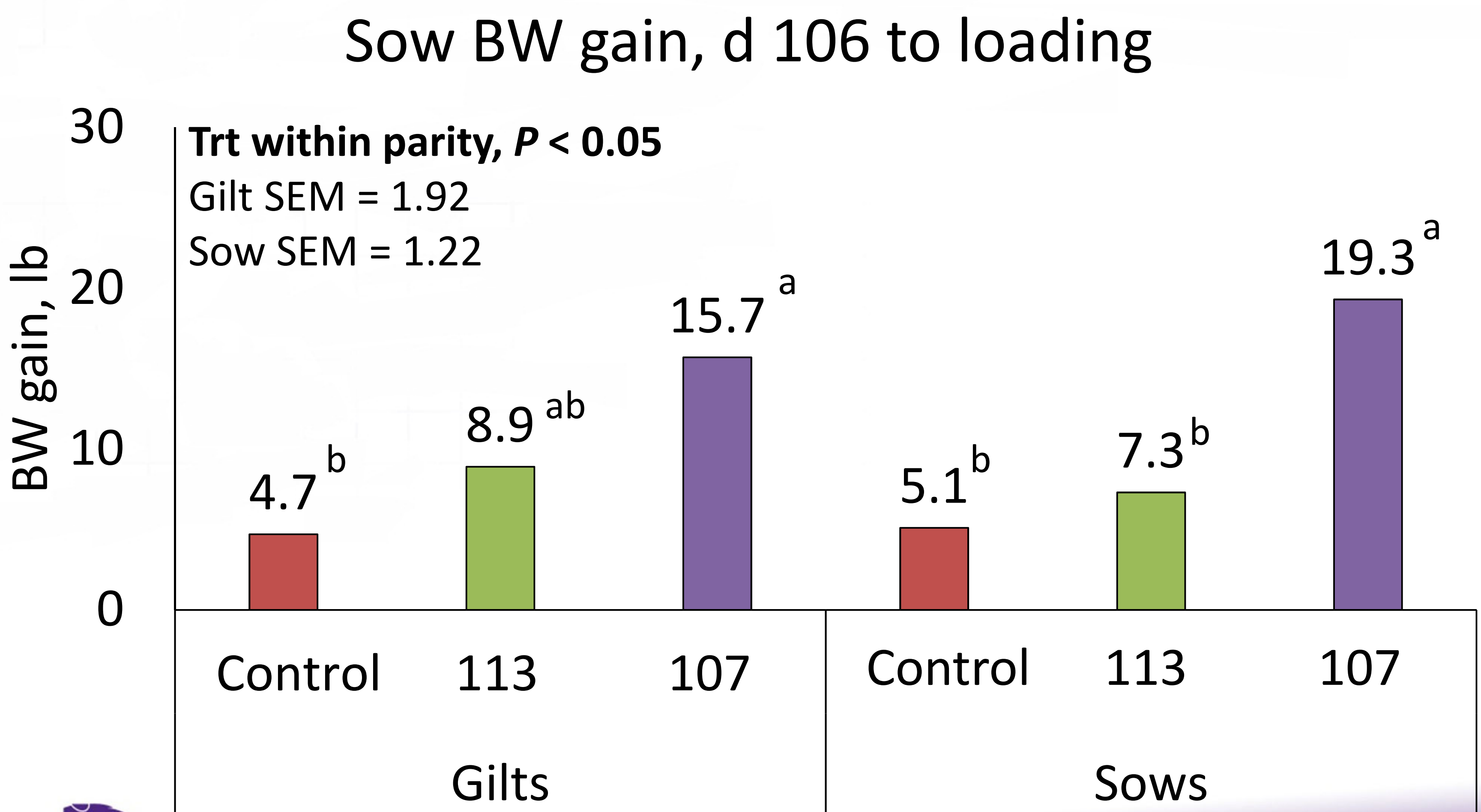
Increasing feeding duration of high dietary lysine and energy before farrowing



Gourley et al., 2019

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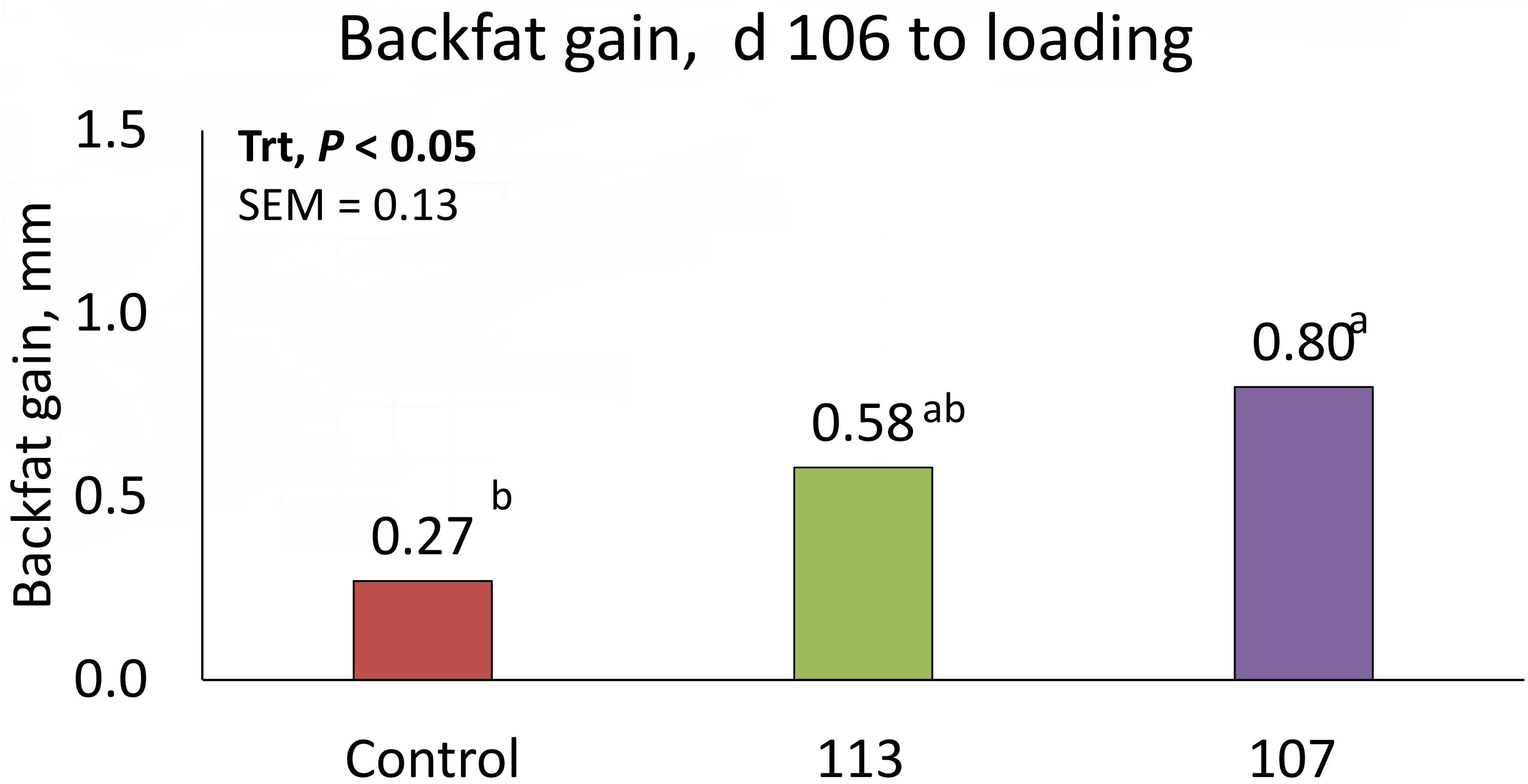
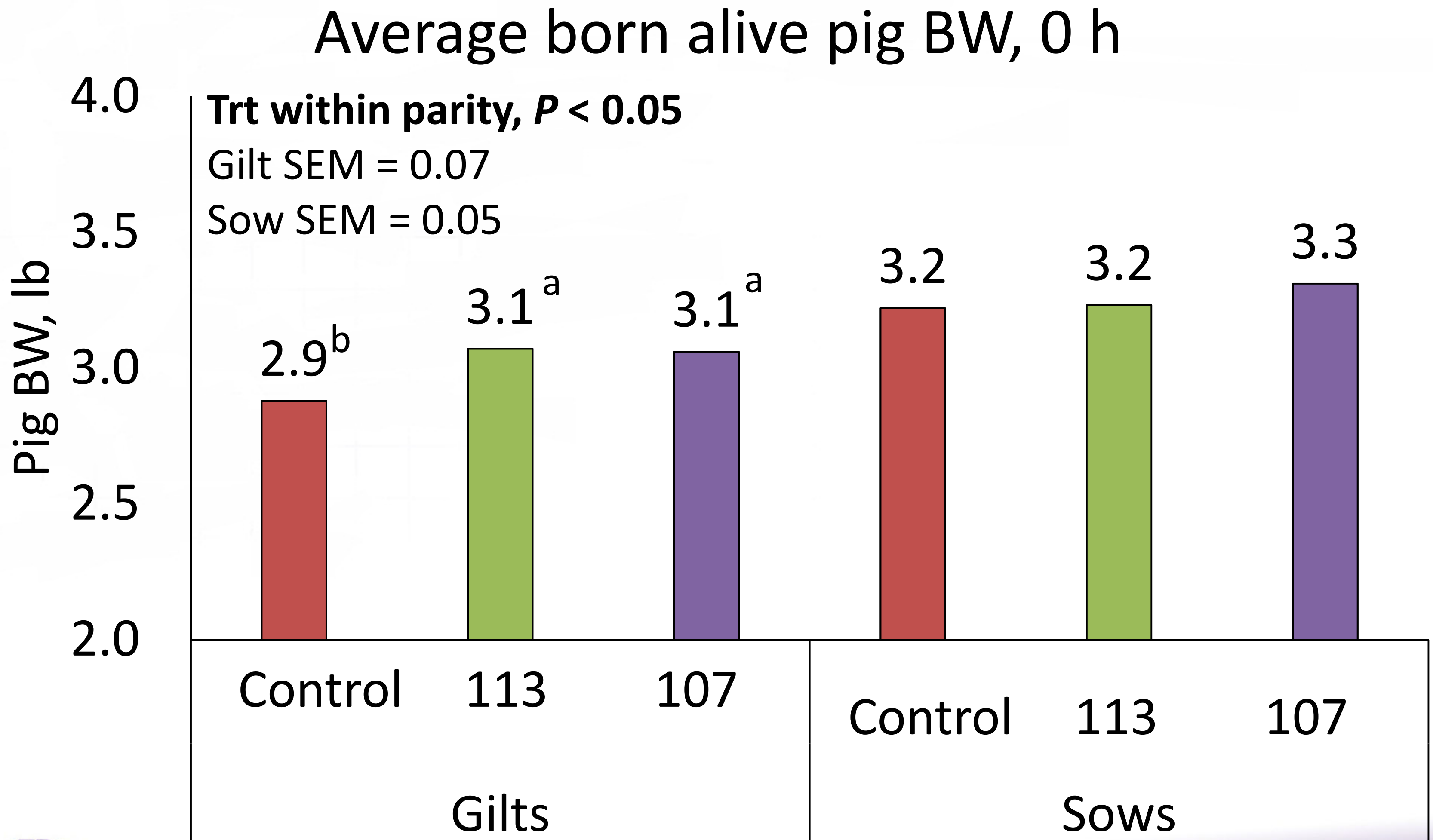
Increasing feeding duration of high dietary lysine and energy before farrowing



Gourley et al., 2019

Increasing feeding duration of high dietary lysine and energy before farrowing



Gourley et al., 2019

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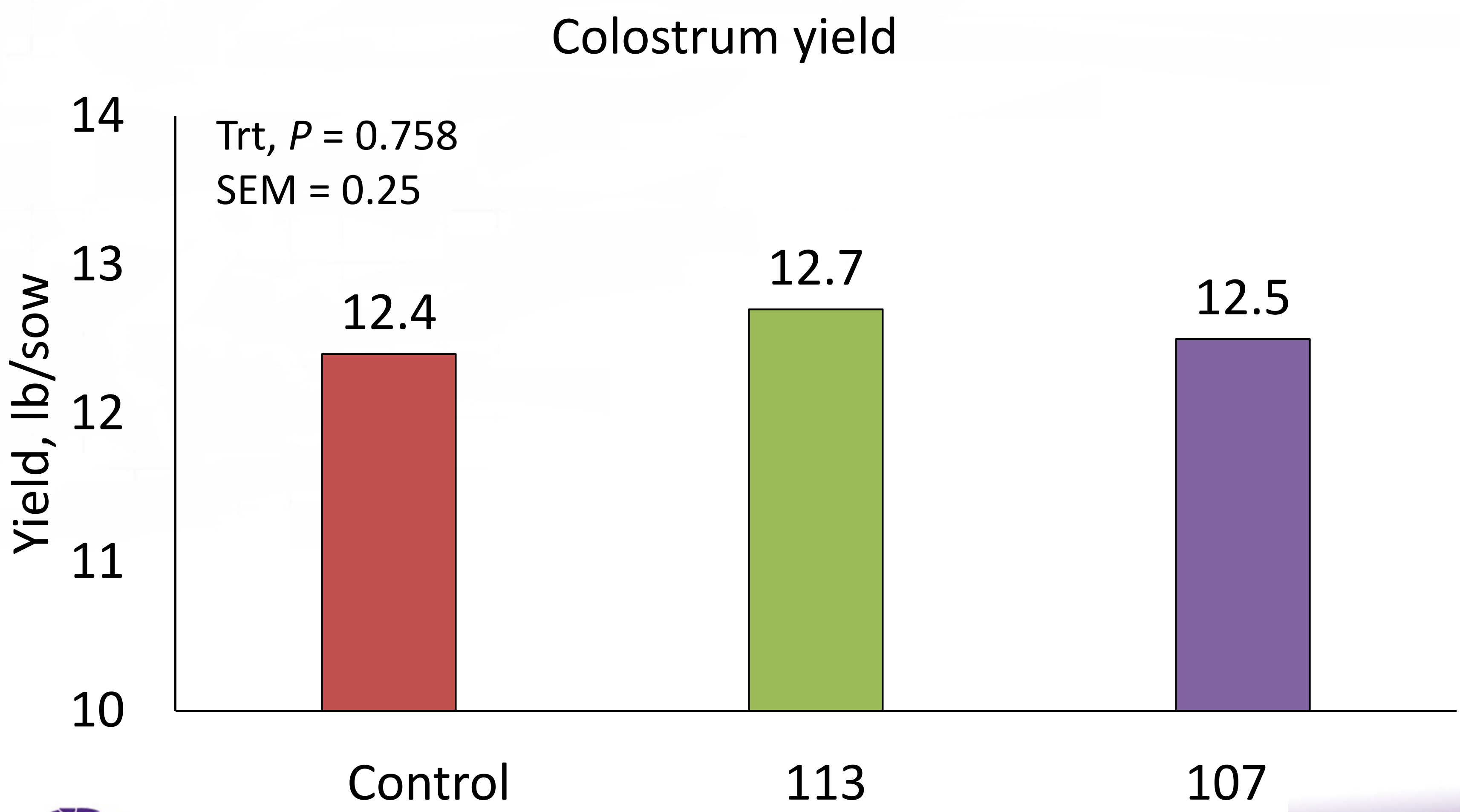
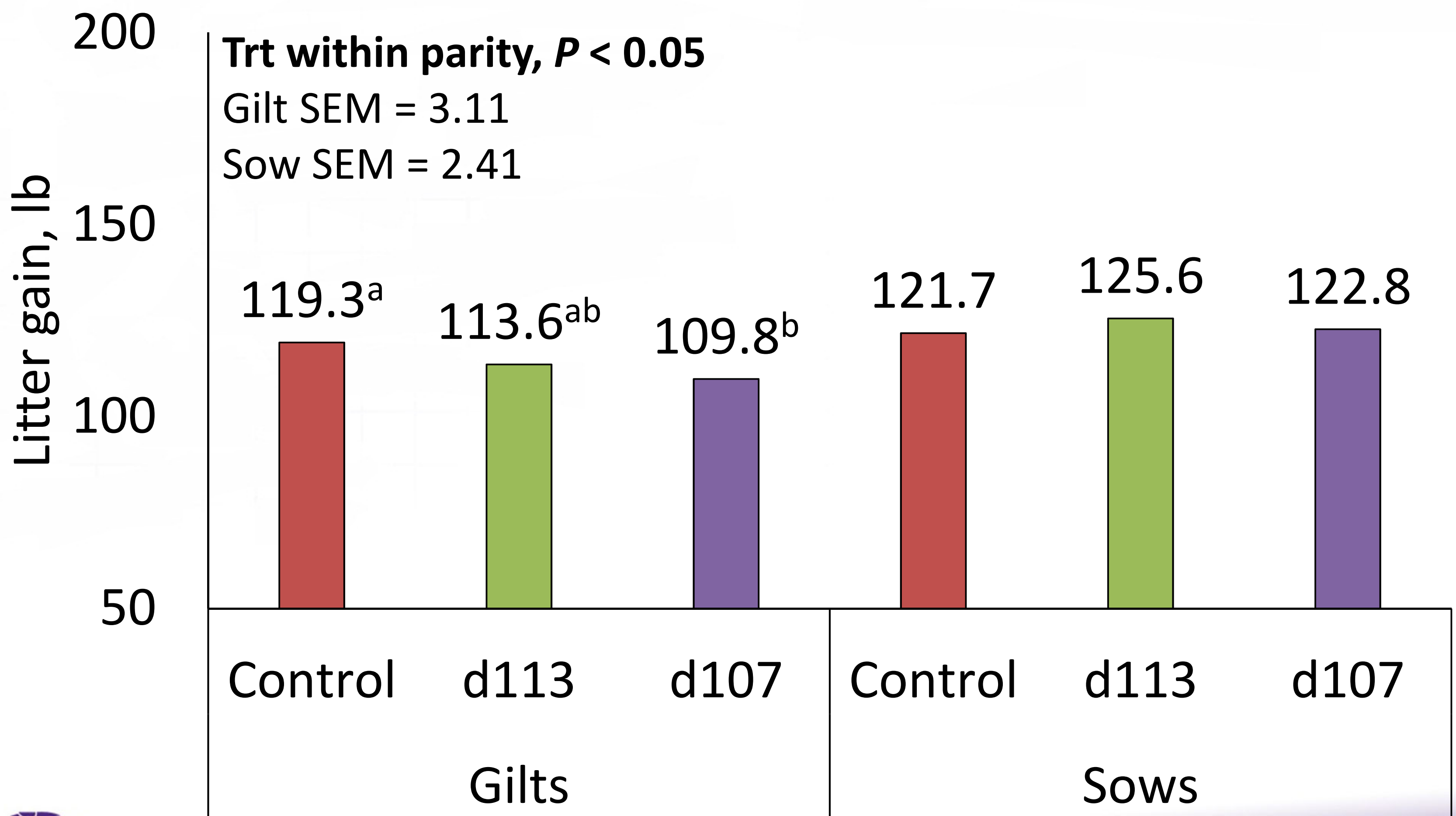
Increasing feeding duration of high dietary lysine and energy before farrowing



Gourley et al., 2019

Litter gain, cross-foster to weaning



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Gourley et al., 2019

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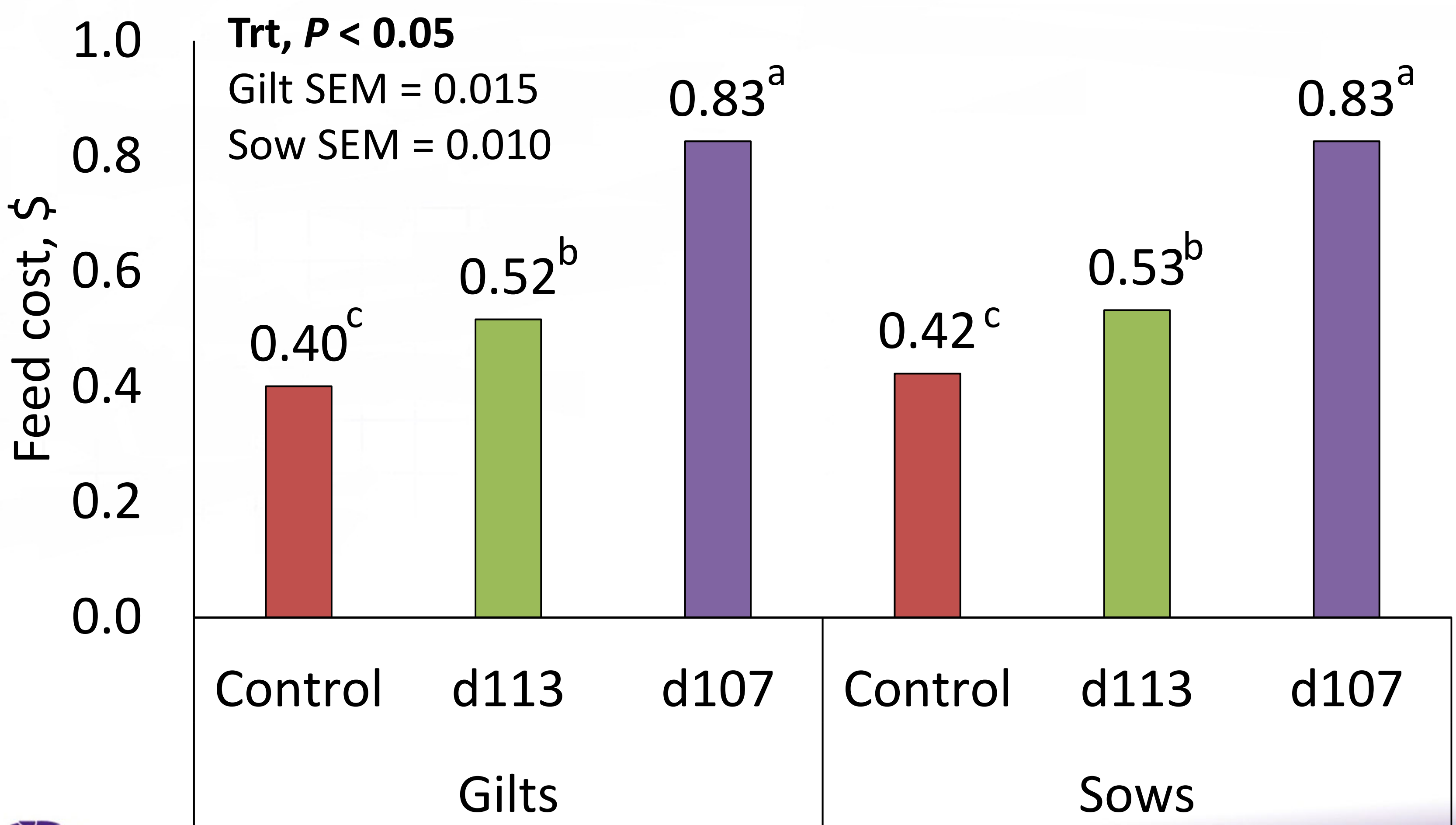
Feed cost per weaned pig



Gourley et al., 2019

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Effects of Amount of Feed Offered Pre-Farrow on Sow and Litter Performance

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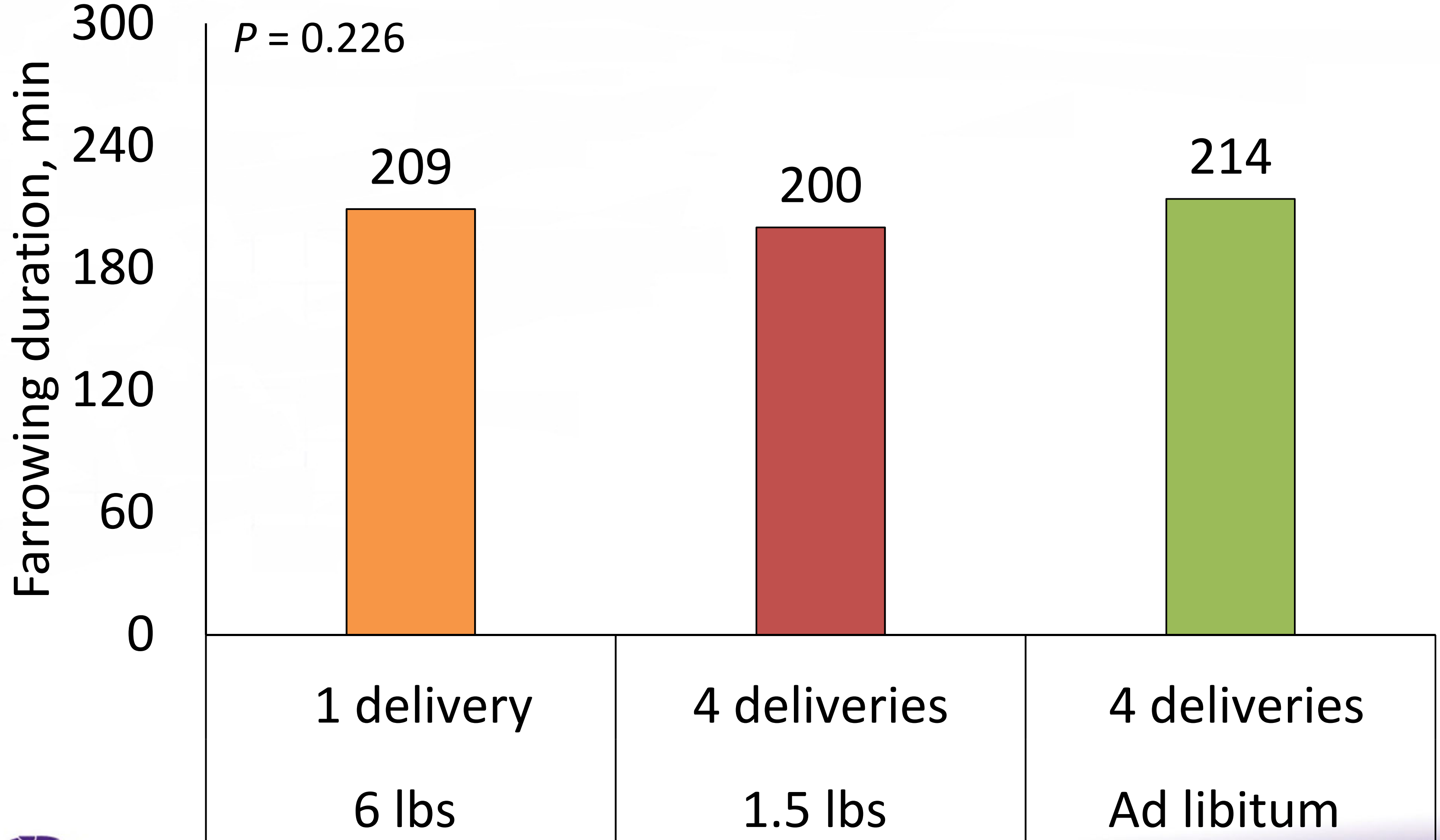
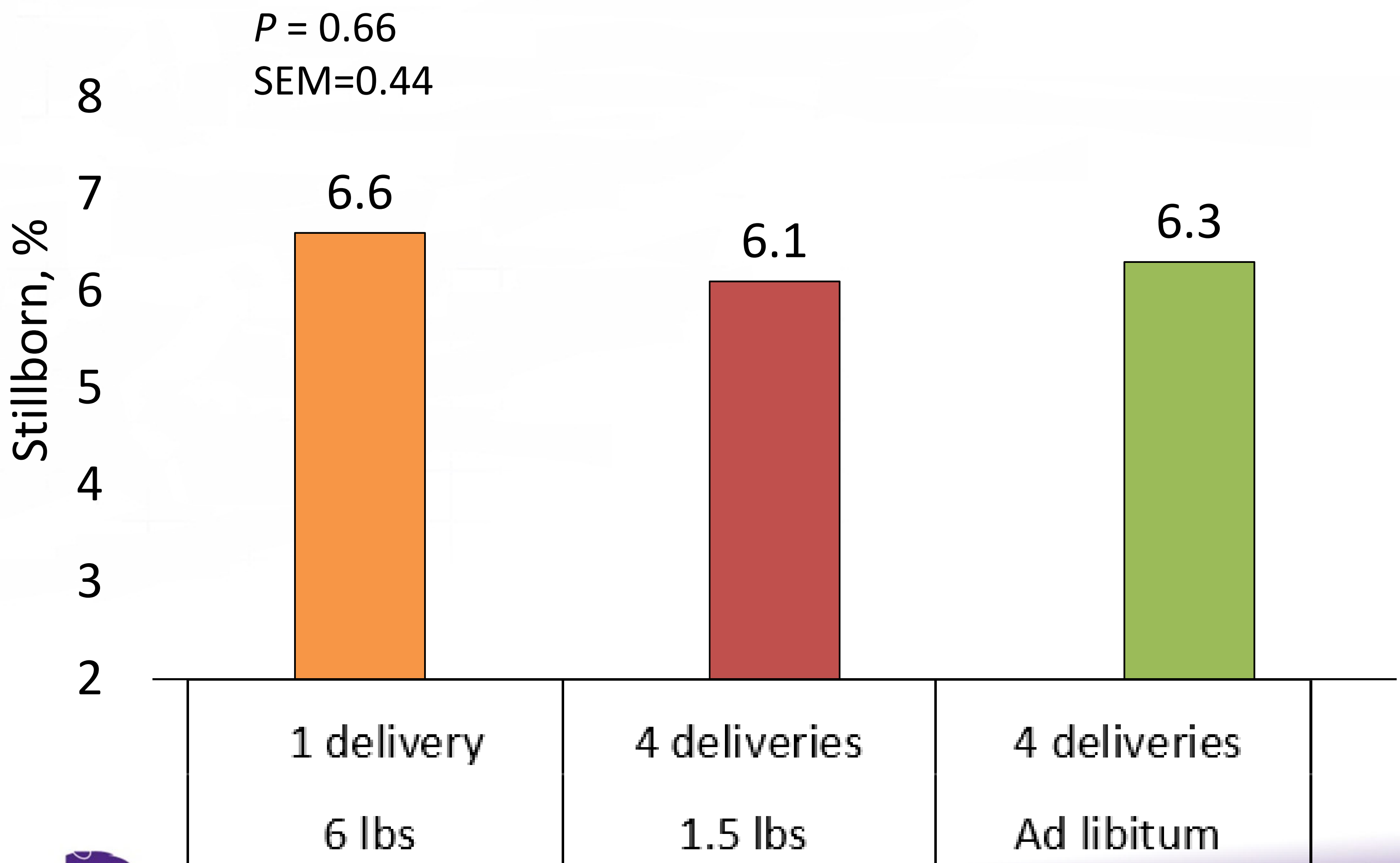
Farrowing duration



Gourley et al., 2020

Stillborn, %



Gourley et al., 2020

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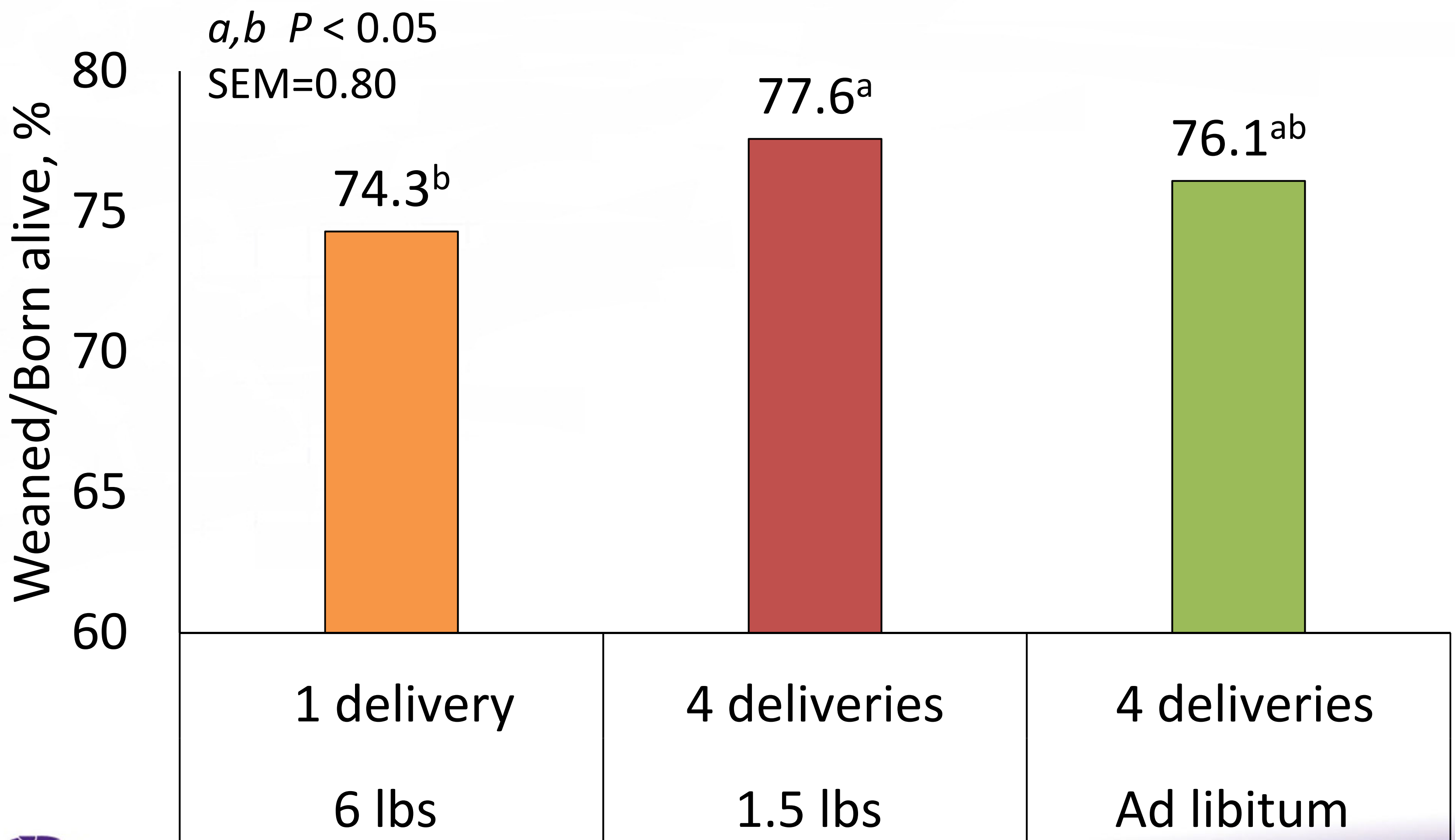
Survived to weaning



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Gourley et al., 2020

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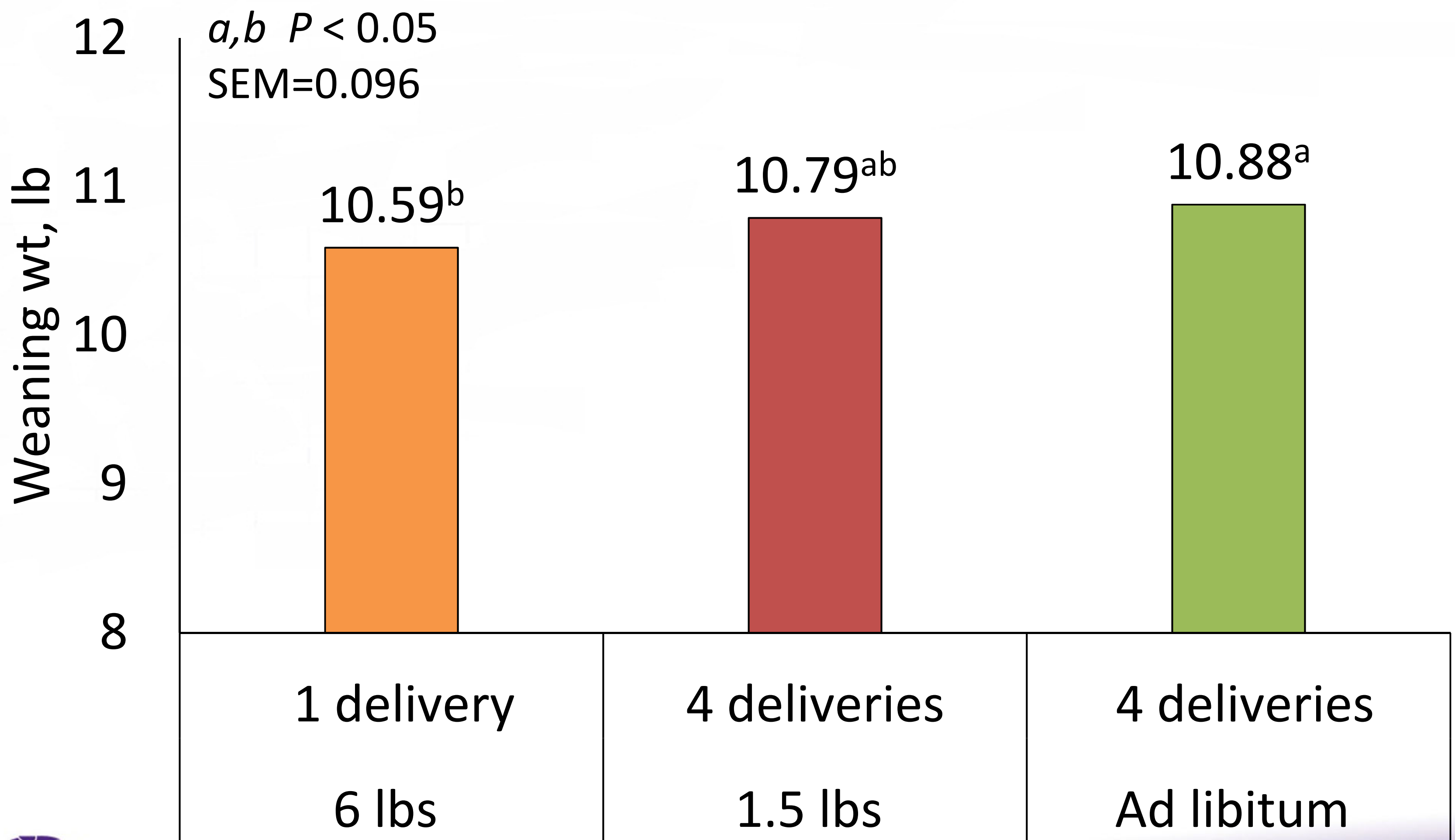
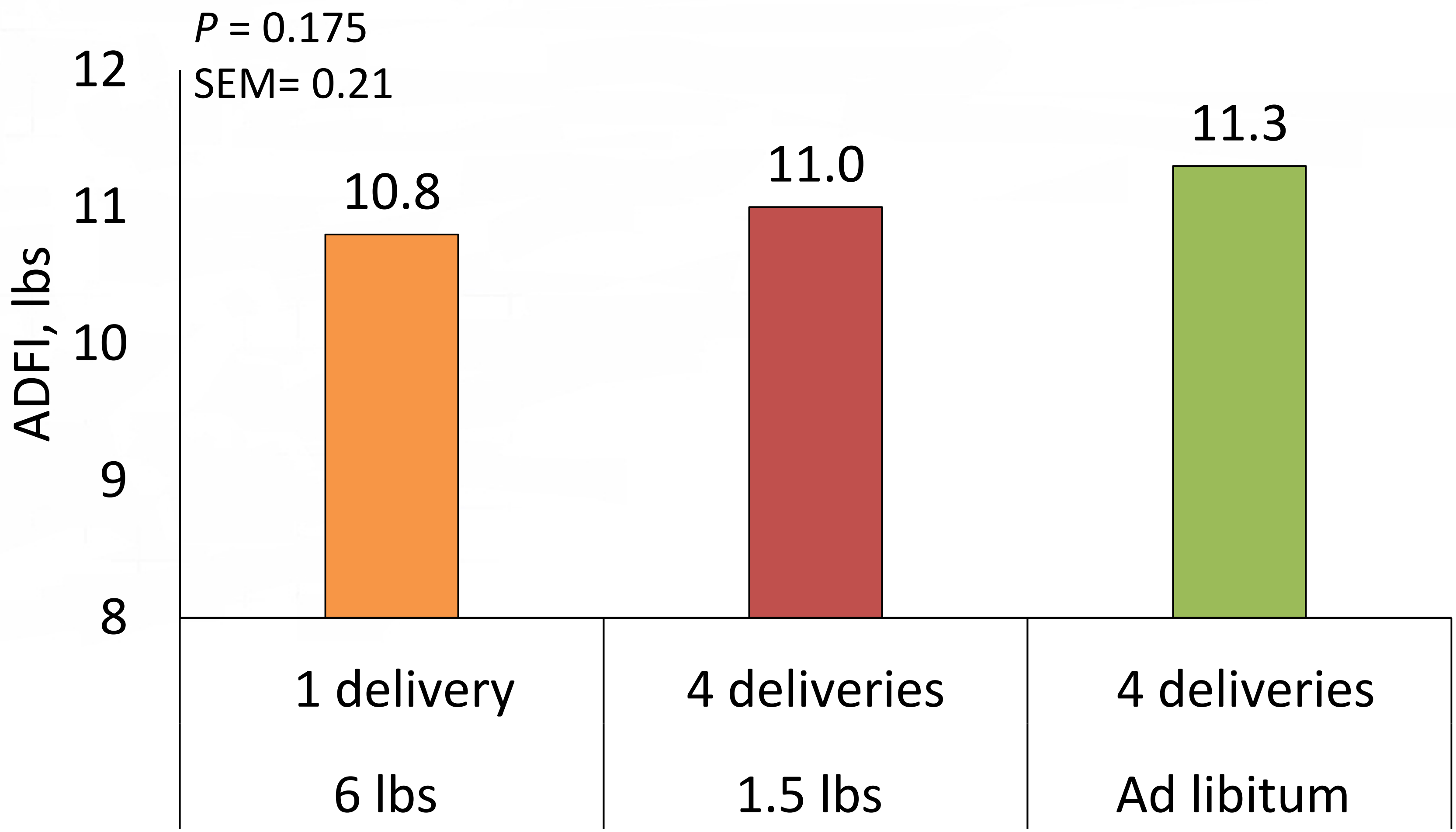
Piglet weaning weight



Gourley et al., 2020

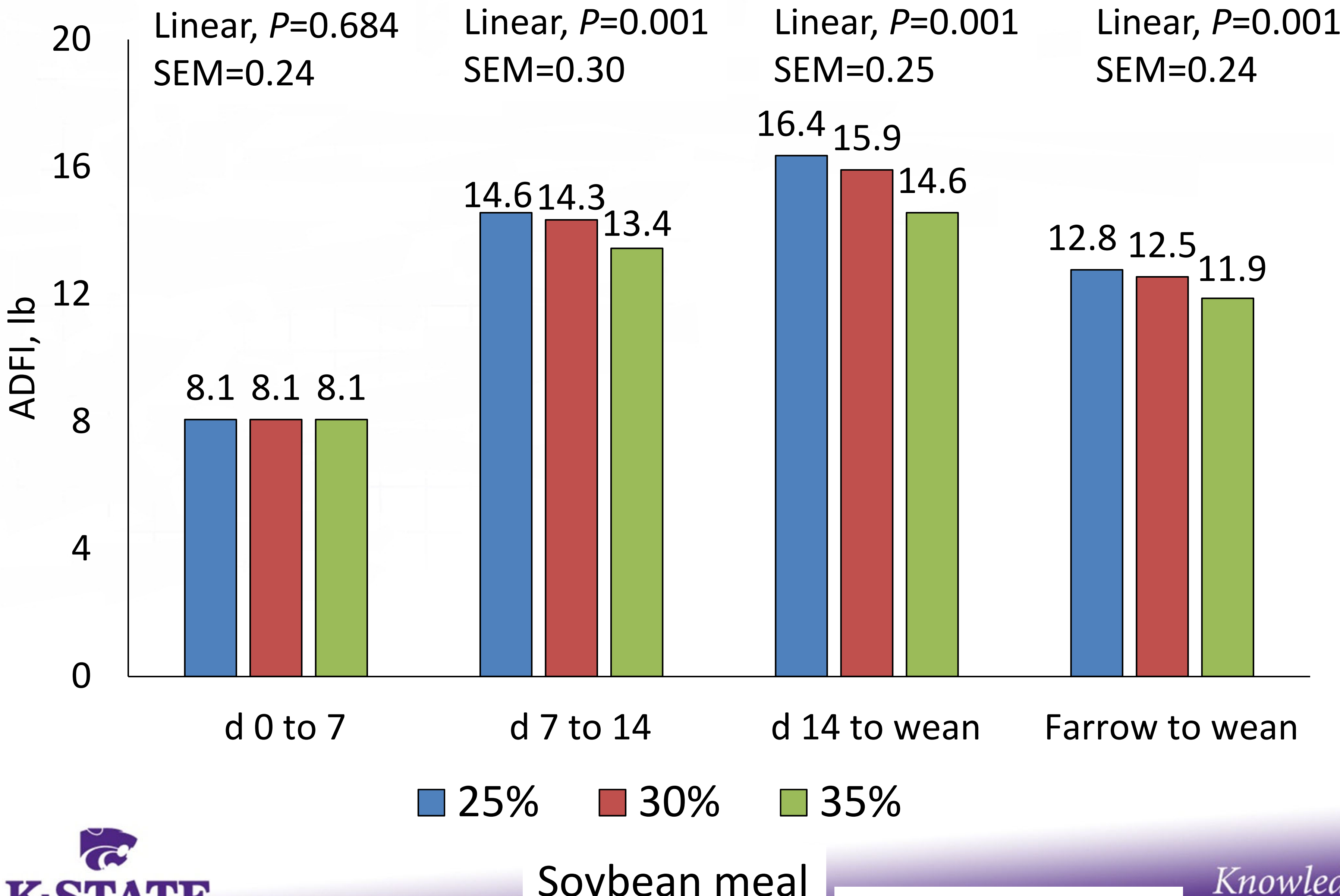
Sow lactation ADFI



Gourley et al., 2020

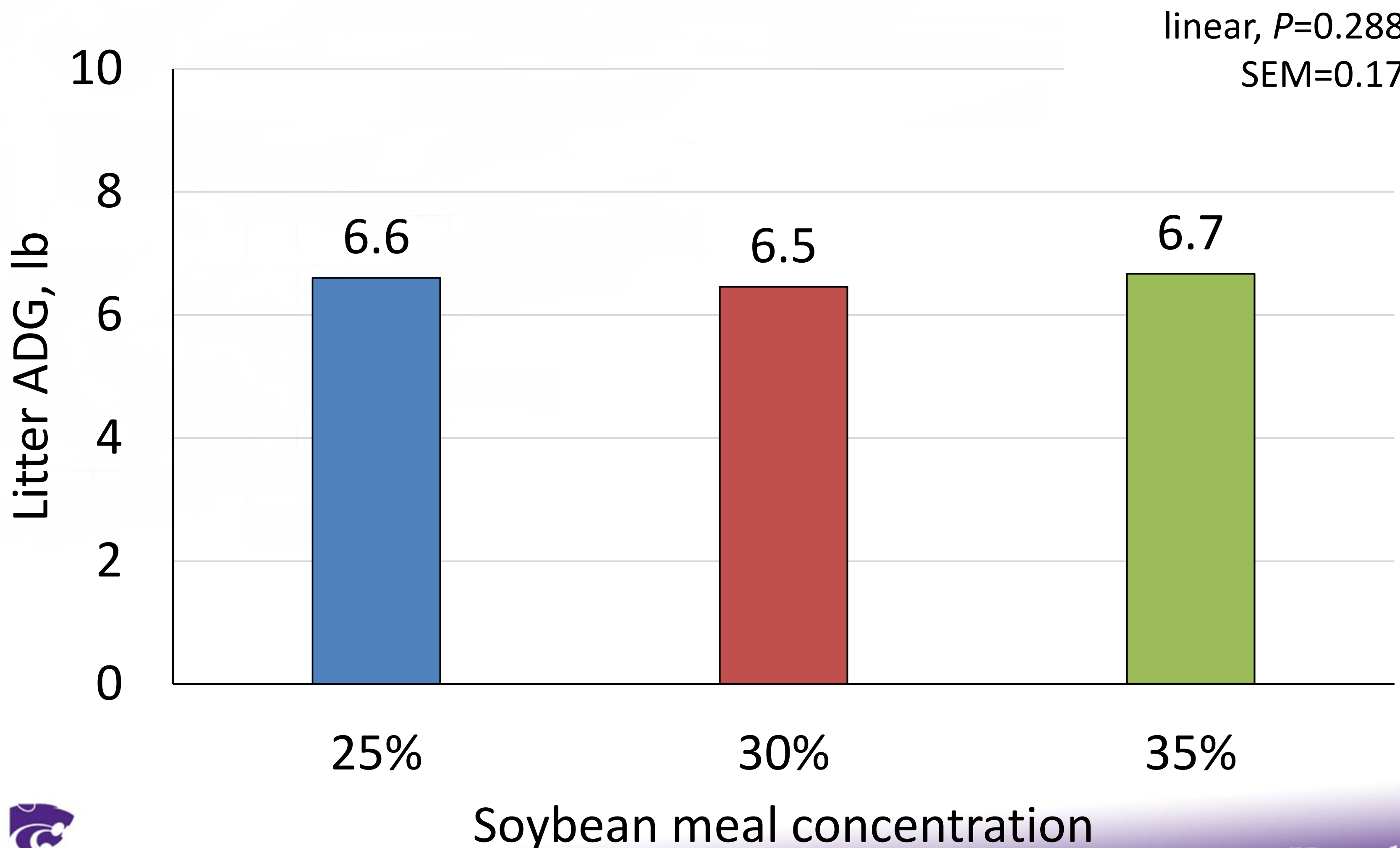
Effect of soybean meal concentration on lactating sow diets on sow and litter performance

Effects of increasing soybean meal in lactation diets



Gourley et al., 2019

Effects of increasing soybean meal in lactation diets



Gourley et al., 2019

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Effects of a dietary blended seaweed product on sow and progeny performance, fecal consistency, and fecal microbiota during gestation, lactation, nursery and grow-finish

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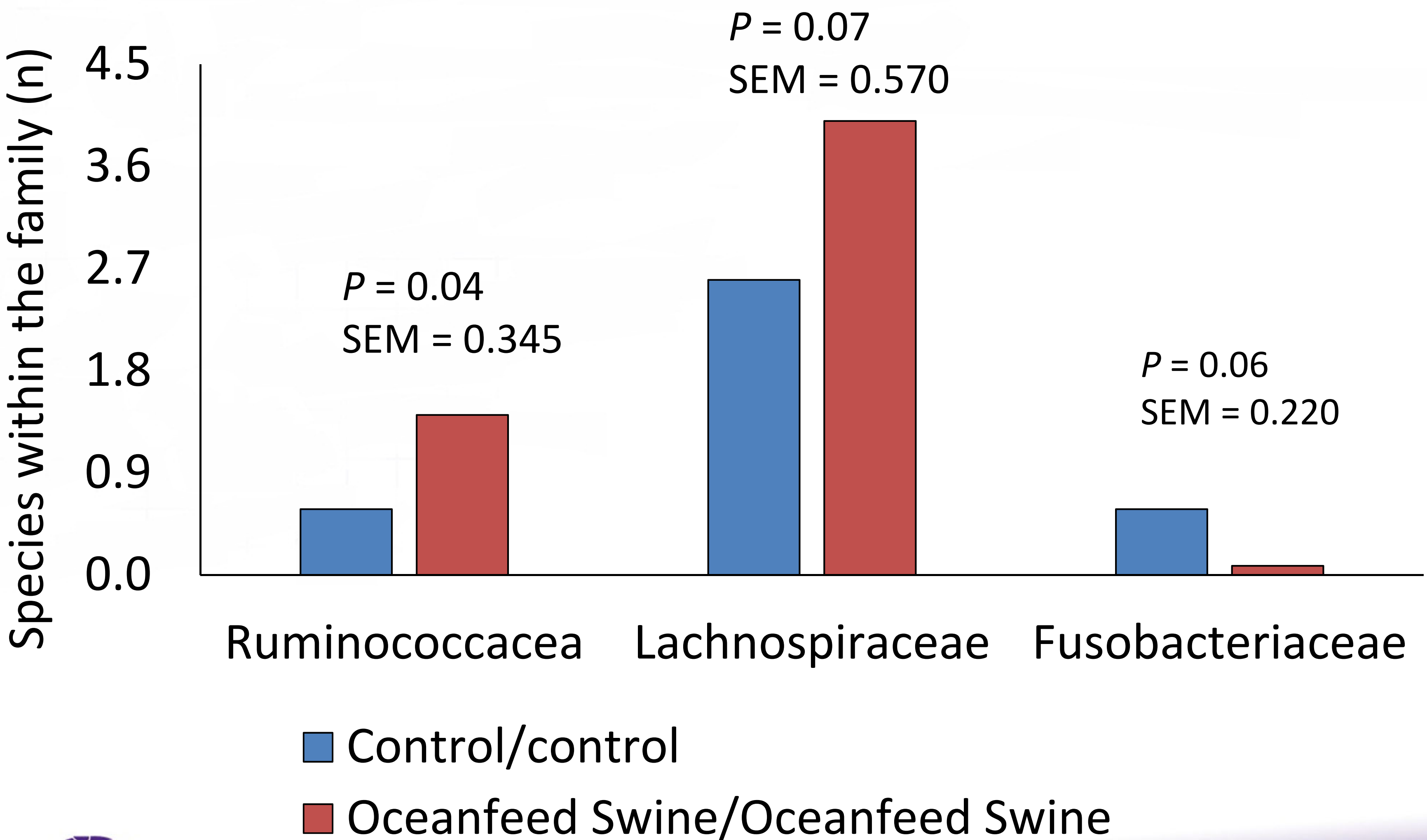
Fecal Microbiota Analysis
(d 56 after wean)



Del Tuffo et al., 2019

Effects of Weaning Age and Antibiotic Use on Pig Performance in a Commercial System

HOLDEN farms

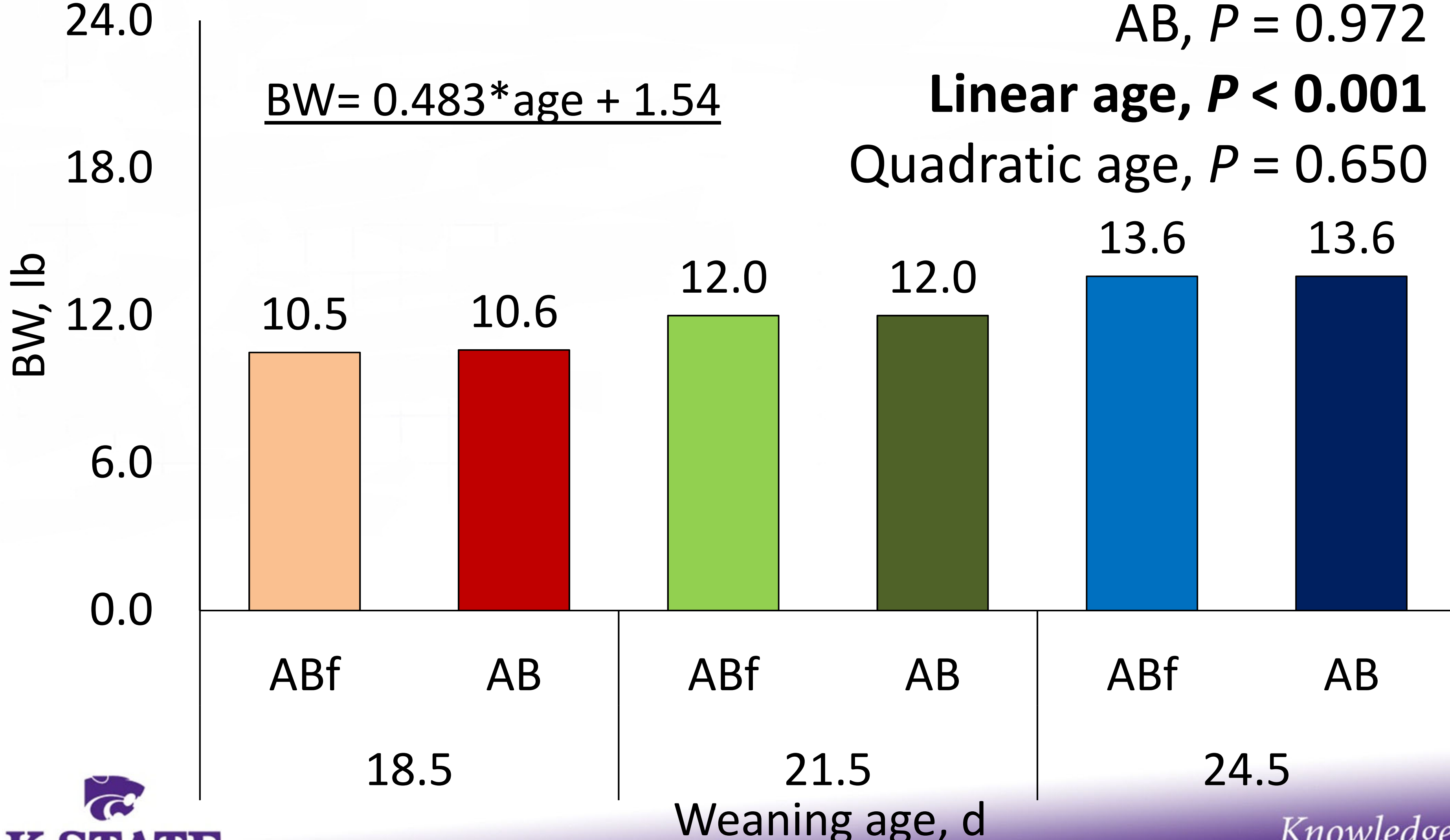
Body weight at weaning

SEM = 0.09

AB, *P* = 0.972

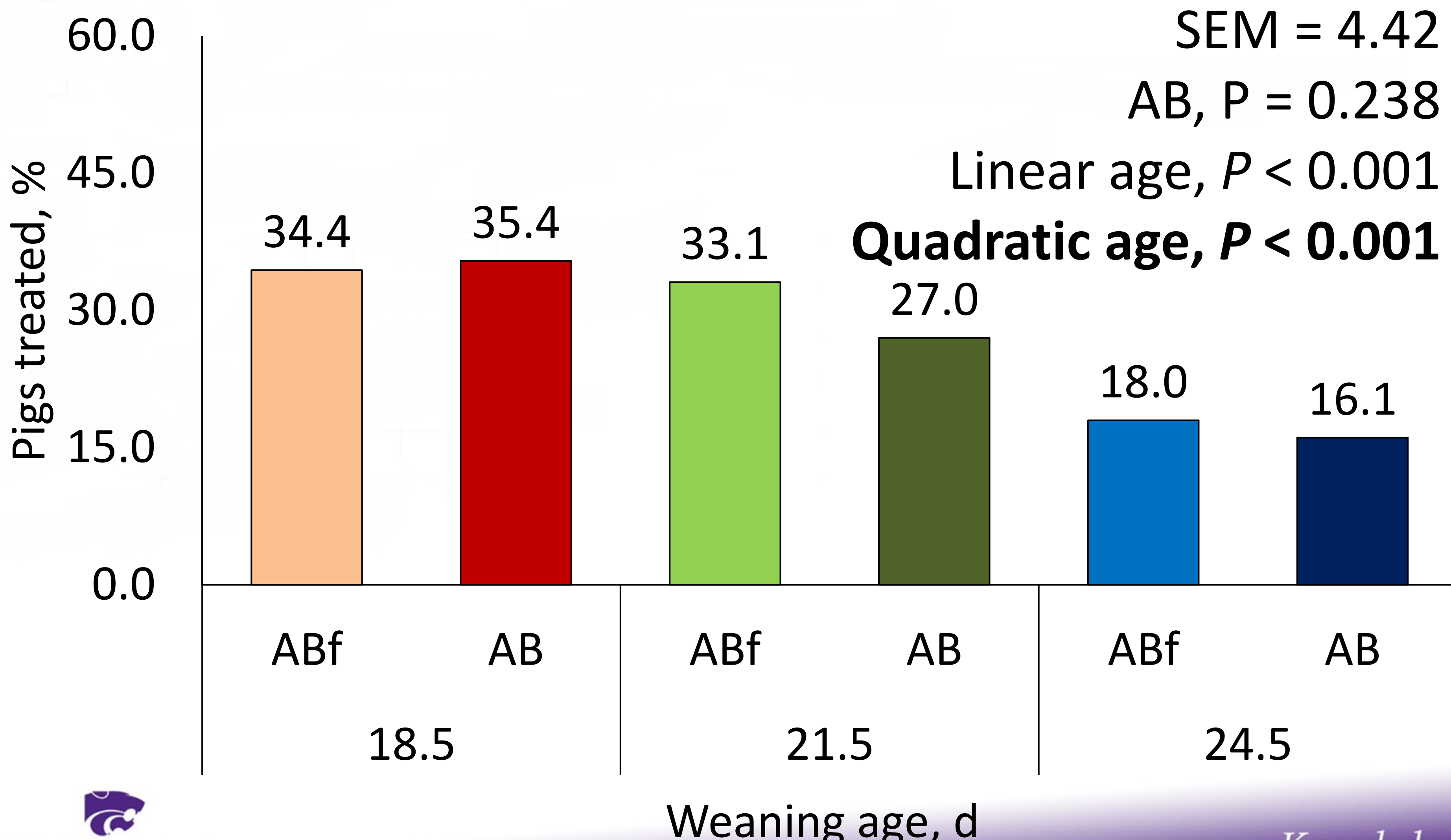
Linear age, *P* < 0.001

Quadratic age, *P* = 0.650



Faccin et al., 2019

Injectable antibiotics – weaning to 197 d



Faccin et al., 2019

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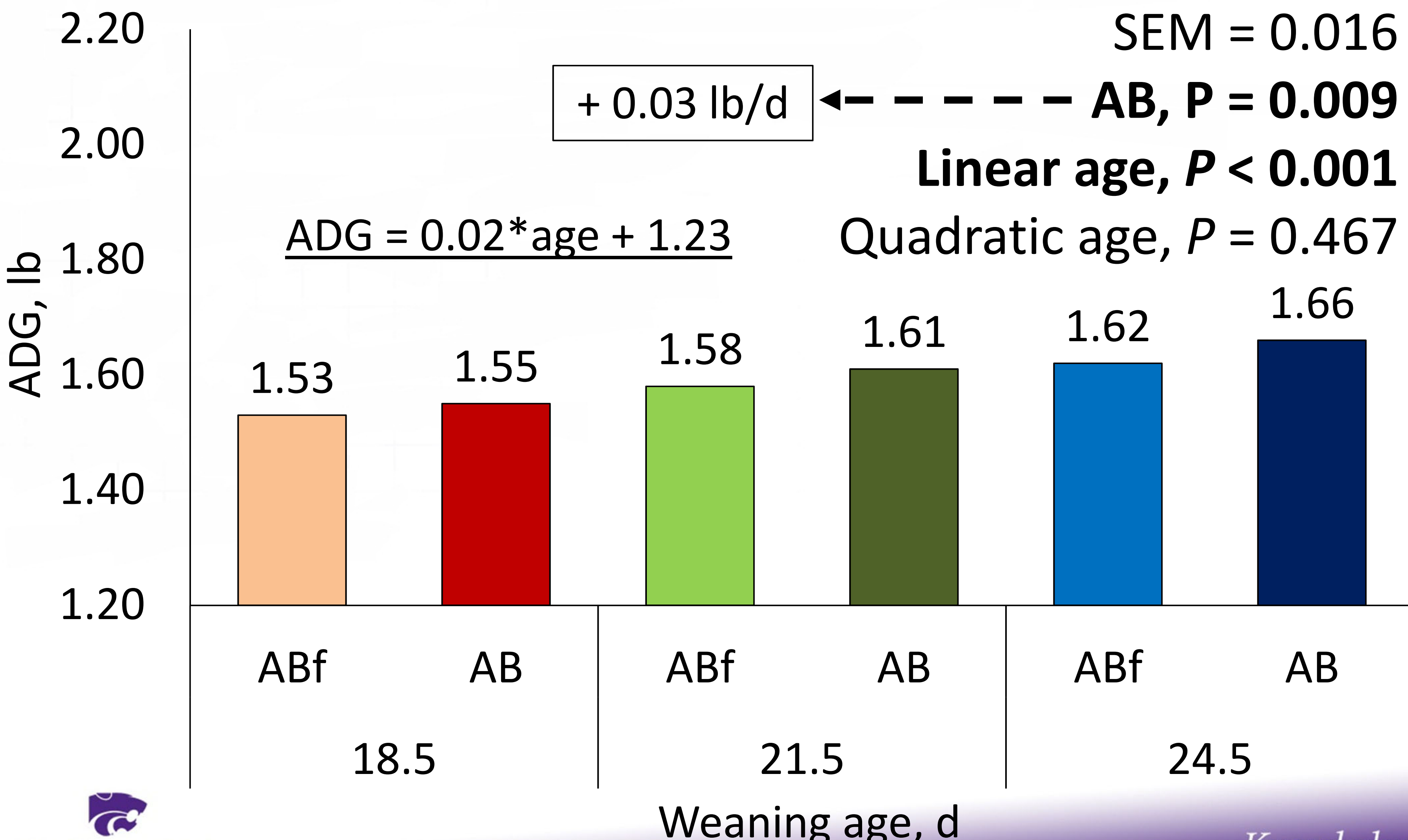
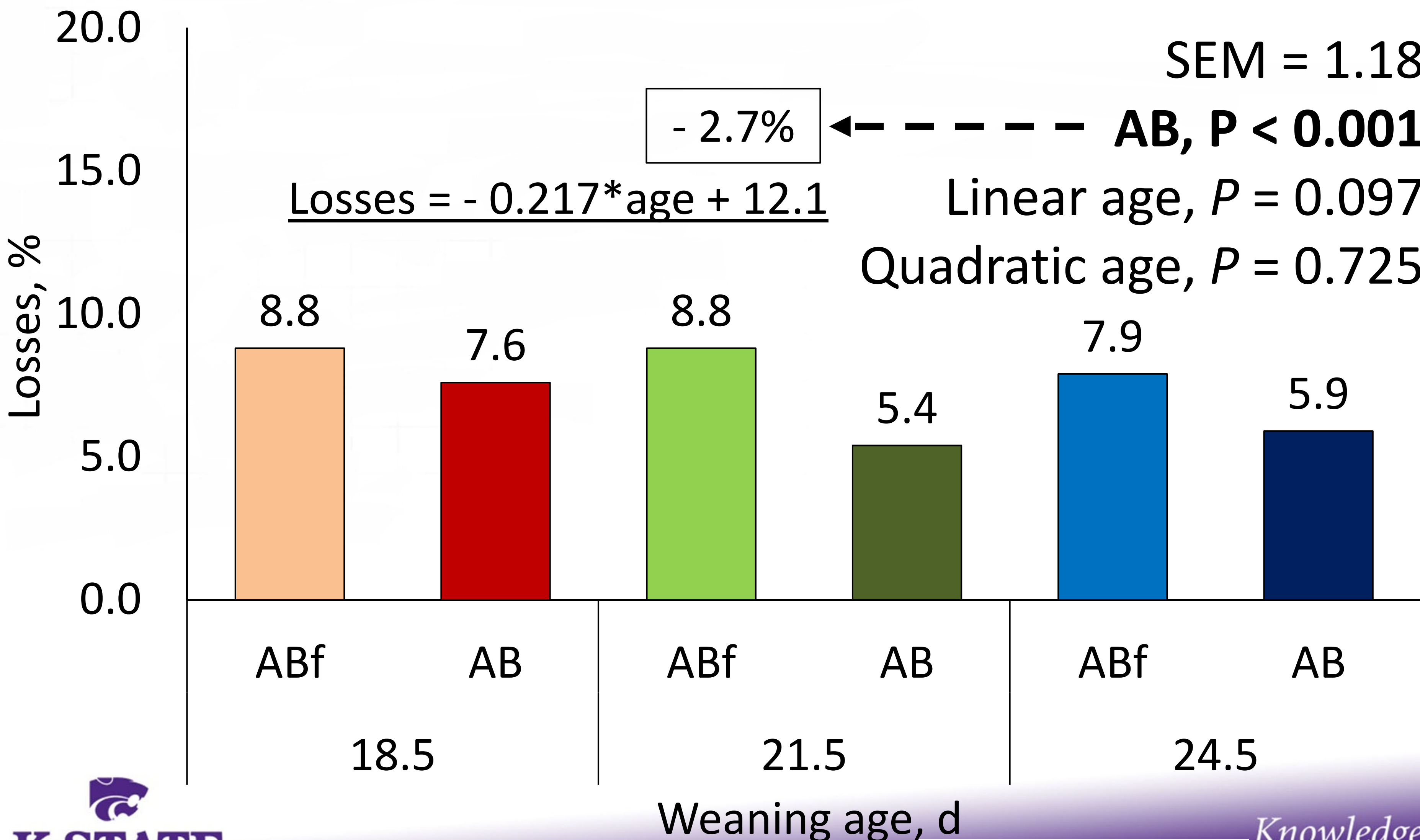
Growth rate from weaning to 197 d



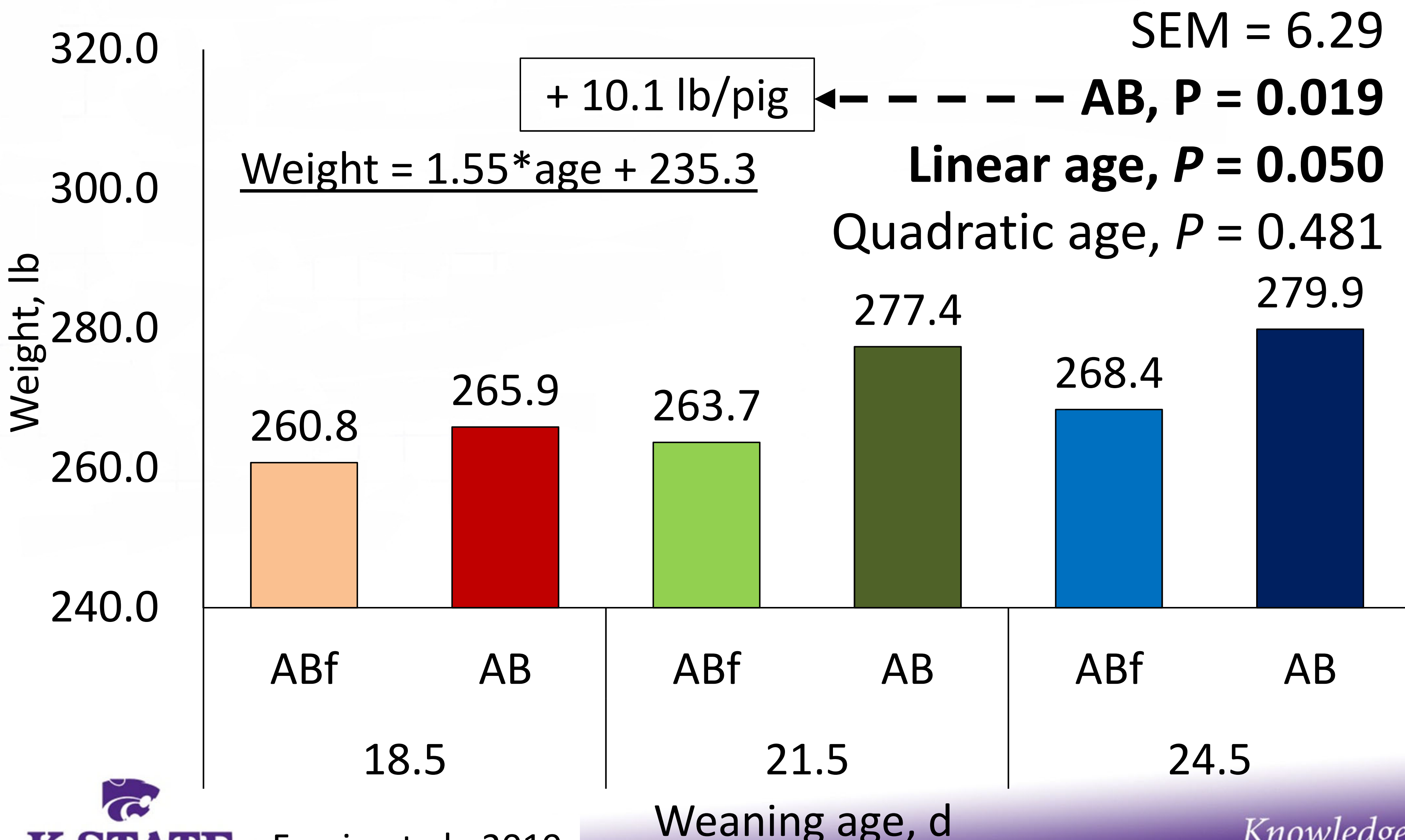
Faccin et al., 2019

Removals and Mortality – 197 d of age



Faccin et al., 2019

Weight sold per pig weaned



Faccin et al., 2019

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Graduate Student Achievements

- **Kelsey Batson** – Nemechek Graduate Student Swine Scholarship
- **Michaela Braun** - Poultry Sci. Assoc. Student Research Paper Certificate of Excellence
- **Henrique Cemin** – Midwest ASAS Young Scholar
- **Kara Dunmire** - Cain Land and Grain Value Added Agriculture Scholarship
- **Caitlyn Evans** – Int’l Poultry Scientific Forum Award for Excellence
- **Jordan Gebhardt** - John S. Koen Memorial Award; Wayne and Druecillia Burch Scholarship; Dr. Steve and Nancy Slusher Scholarship; Nemechek Graduate Student Swine Scholarship
- **Julia Holen** - K-State Donoghue Graduate Scholarship
- **Wade Hutchens** - K-State Donoghue Graduate Scholarship
- **Haden Kerkaert** – Bob and Karen Thaler Swine Nutrition Scholarship
- **Kiah Gourley** – K-State Donoghue Graduate Scholarship; Australian Pig Science Association travel Scholarship
- **Annie Lerner** – 3rd Place PhD oral presentation Midwest ASAS
- **Gage Nichols** – Int’l Poultry Scientific Forum Award for Excellence
- **Zhong-Xing Rao -** Nemechek Graduate Student Swine Scholarship
- **Madie Wensley -** K-State Donoghue Graduate Scholarship; Nemechek Graduate Student Swine Scholarship
- **Hayden Williams** - International Ingredients Pinnacle Award

Swine Nutrition Graduate Students

- 12-15 high functioning MS and PhD students

Most recent graduates currently or will be employed by:

Hubbard Feeds, PIC, JYGA Technologies (Gestal), Holden Farms, Schwartz Farms, Pipestone Grow-Finish, Seaboard Foods,

JBS Live Pork, Ajinomoto Animal Nutrition, Zinpro,

Pillen Family Farms, DSM

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Effects of soybean meal and distillers dried grains on growth performance of nursery and finishing pigs

Henrique Cemin and Zhong-Xing (Johnson) Rao

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Background

Practical nursery diets today

- Formulated with increasing amounts of feed-grade amino acids and DDGS
- Replacing intact protein sources, e.g. soybean meal

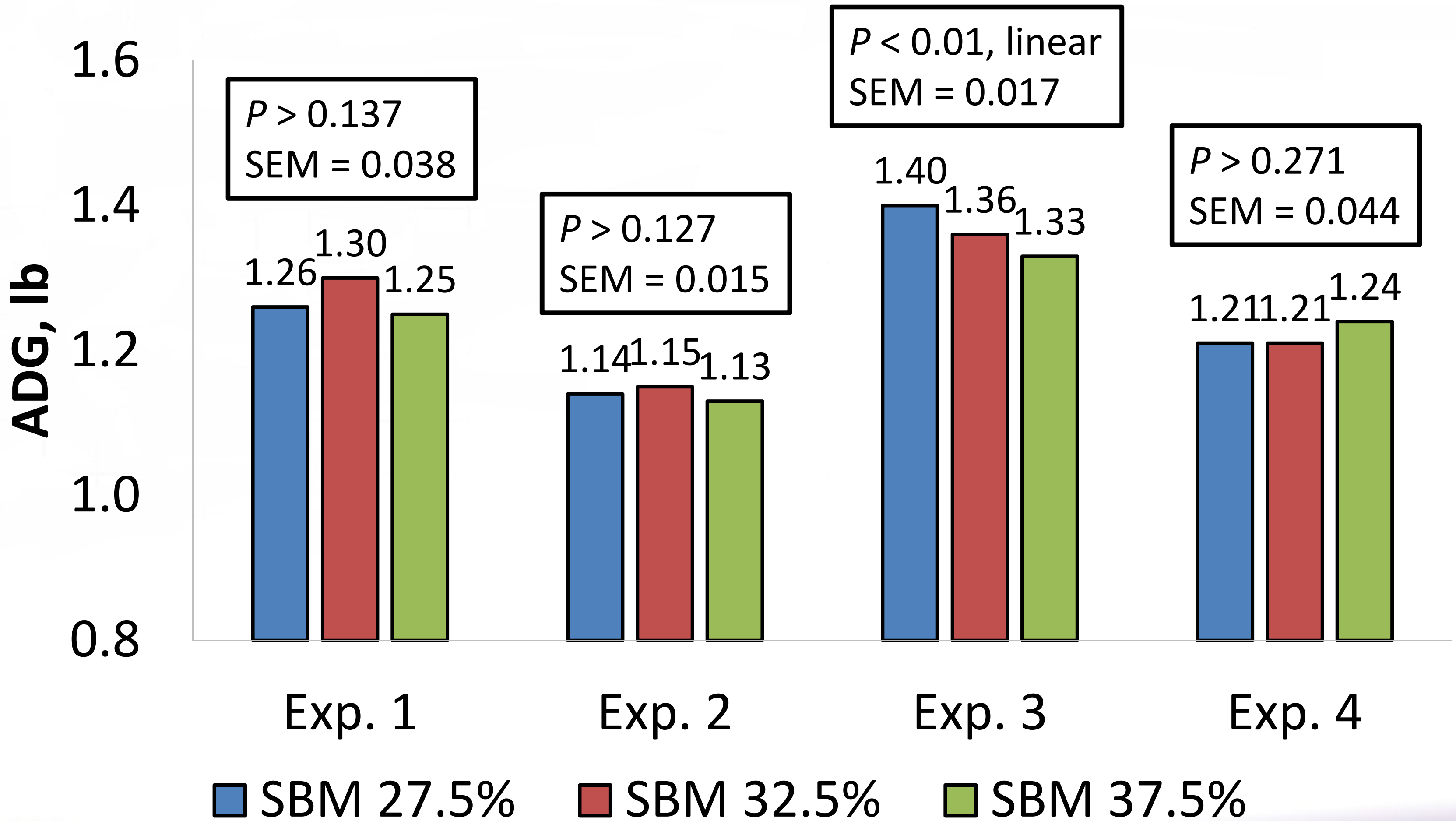
There may be additional benefits of feeding soybean meal

- PRRS positive pigs present improved performance
- Bioactive components (isoflavones, saponins)?

Rocha et al., 2013
Rochell et al., 2015

Effects of soybean meal level on ADG

25 to 50 lb BW



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Cemin et al., 2019

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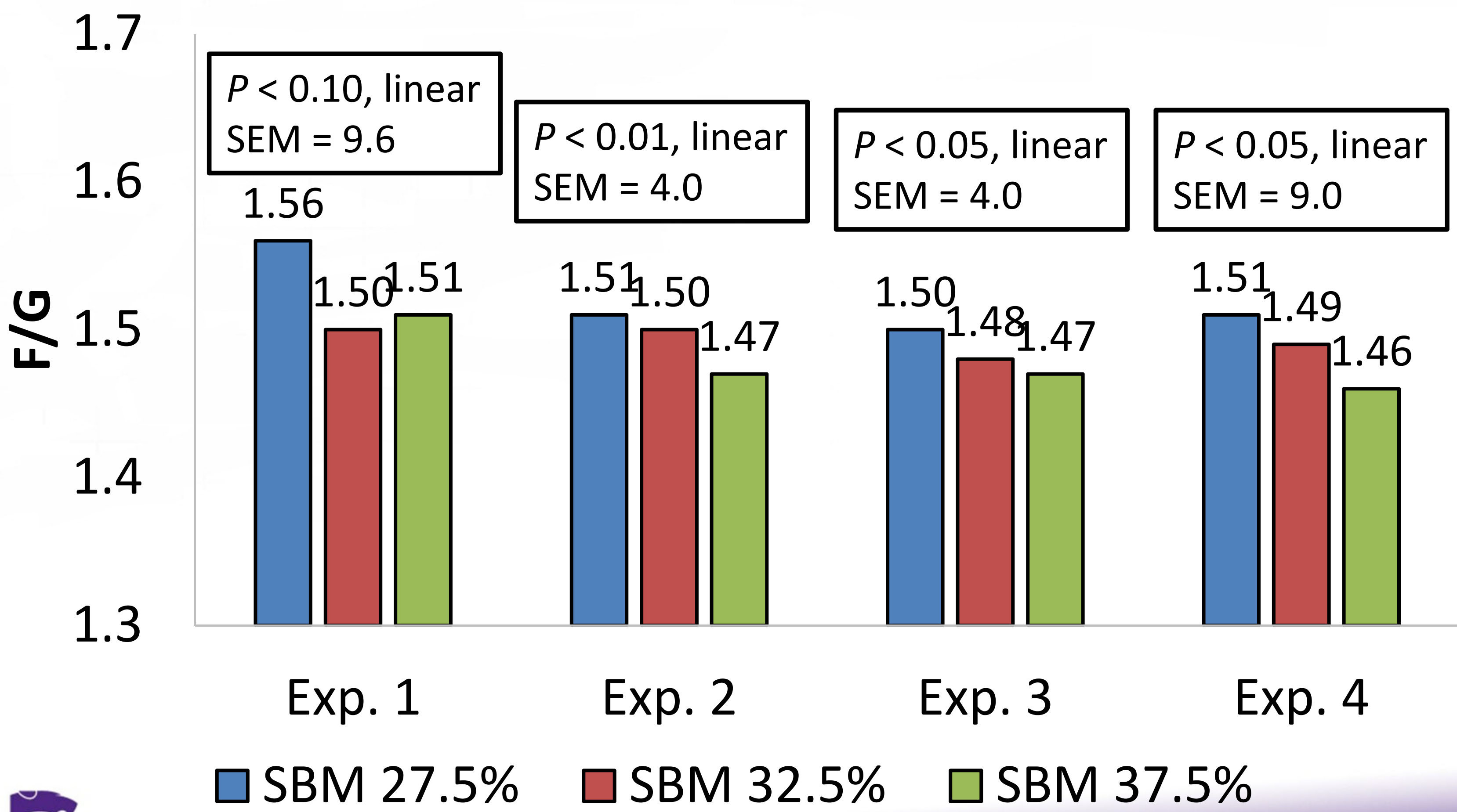
Effects of soybean meal level on F/G

25 to 50 lb BW



Cemin et al., 2019

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Slope-ratio assay to determine the energy value of soybean meal relative to corn and its effects on growth performance of nursery pigs

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Background

Soybean meal consistently improved G:F

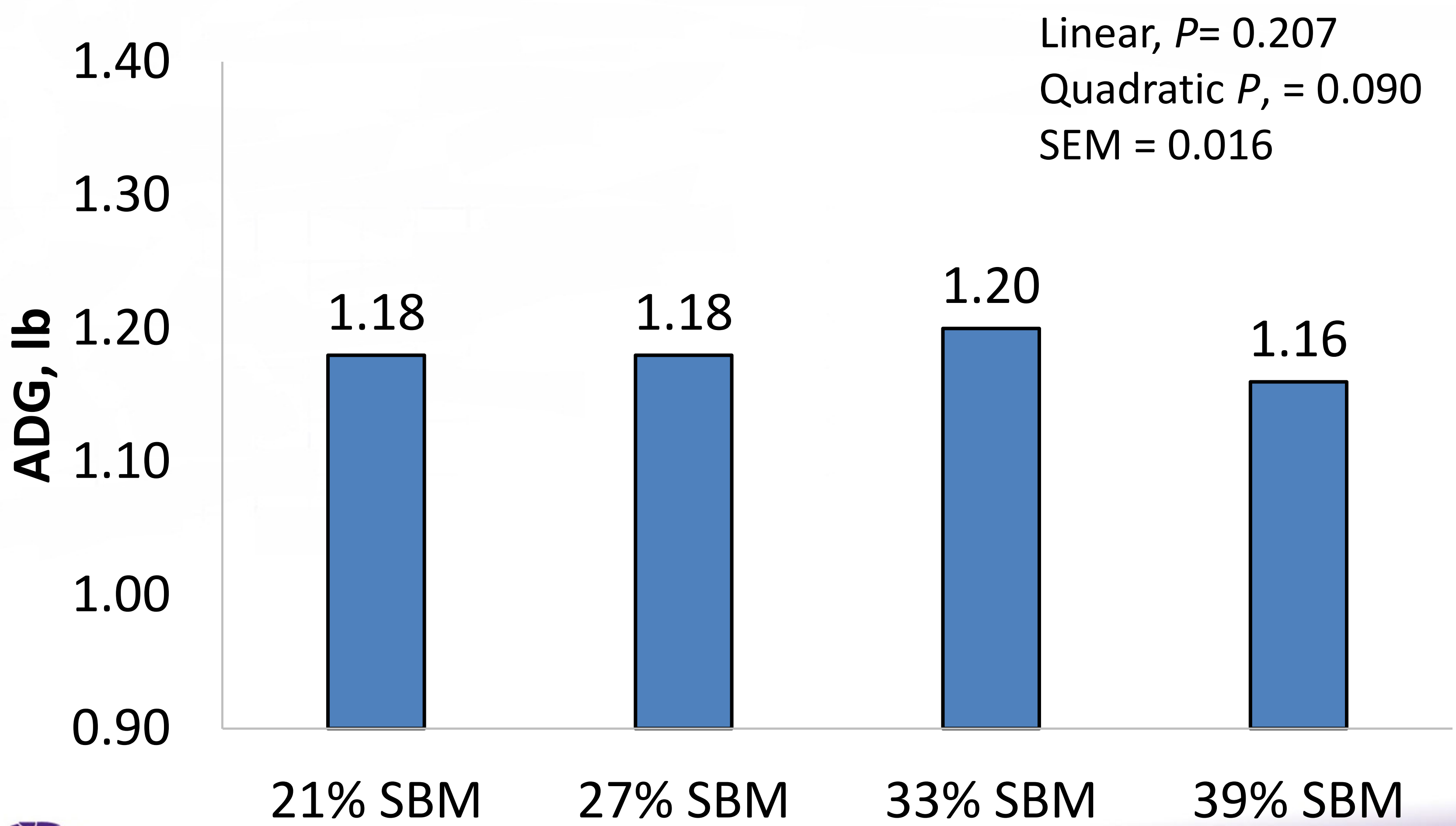
- Does the NRC (2012) underestimate soybean meal NE?
- DE = 105% of corn
- ME = 97% of corn
- NE = 78% of corn

Calorimetry trials required highly specialized equipment

- Practical approach is using caloric efficiency to estimate NE
- Conducted under field conditions

Effects of soybean meal on ADG

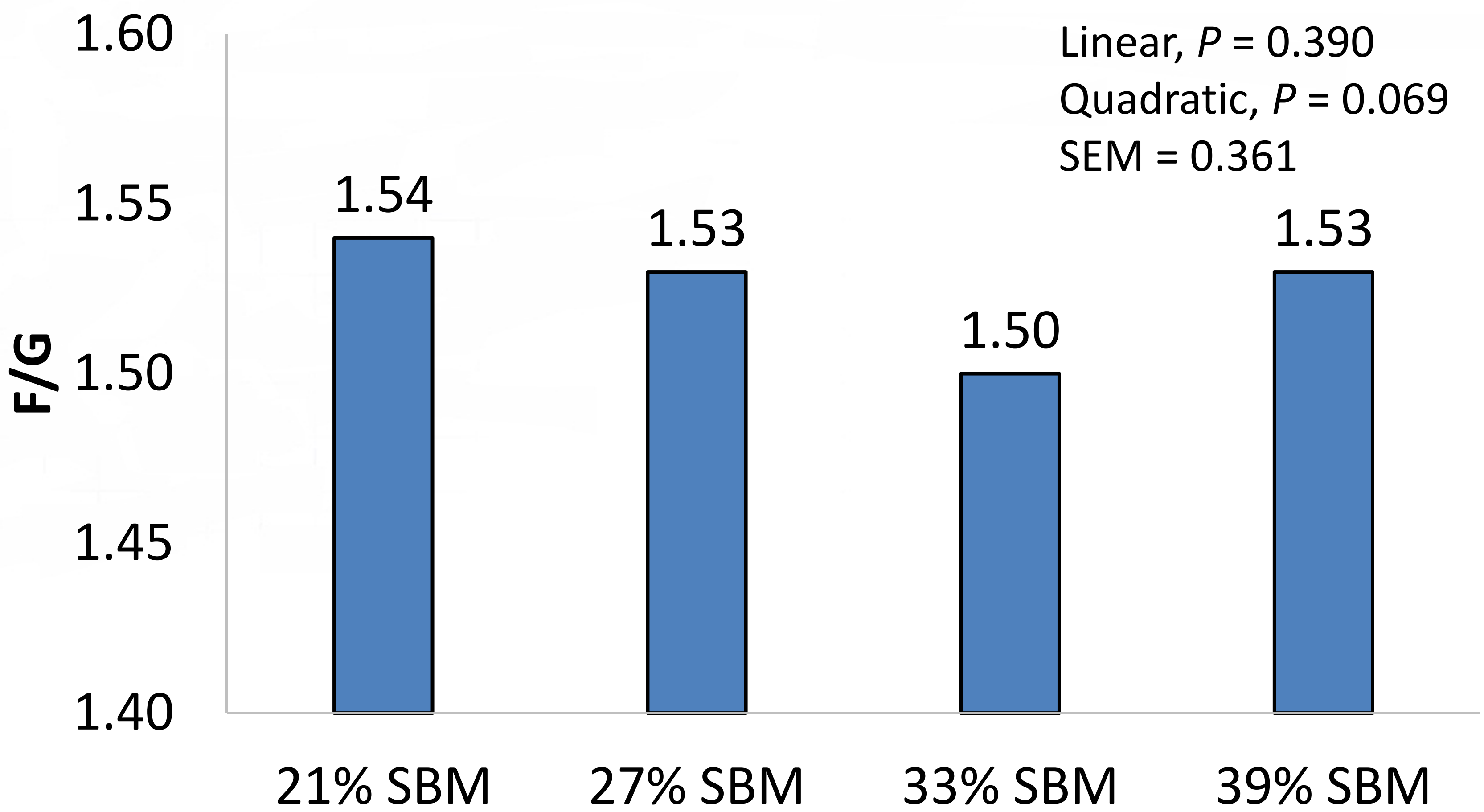
25 to 50 lb BW



Cemin et al., 2019

Effects of soybean meal on F/G

25 to 50 lb BW



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Cemin et al., 2019

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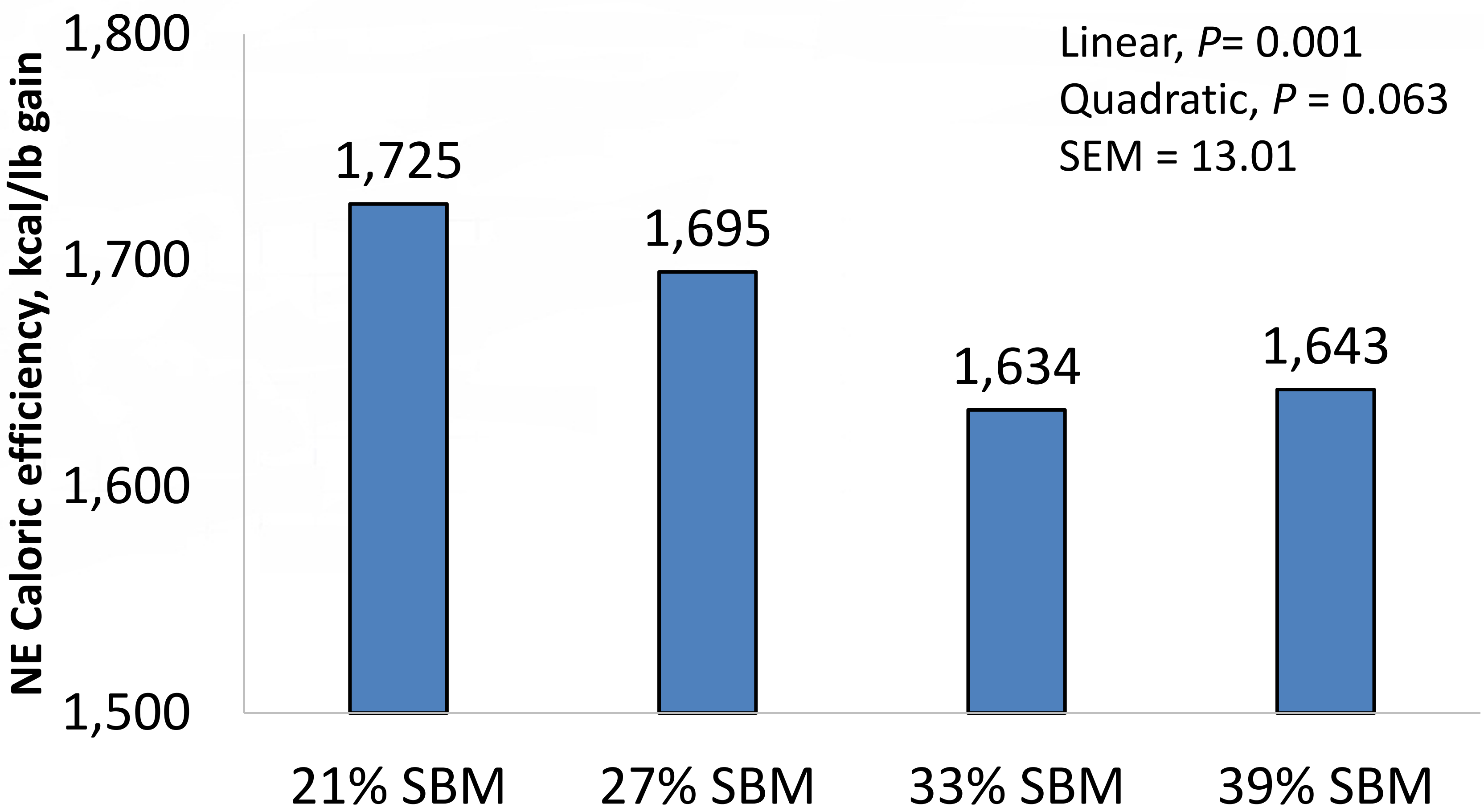
Effects of soybean meal on Caloric Efficiency

25 to 50 lb BW



Cemin et al., 2019

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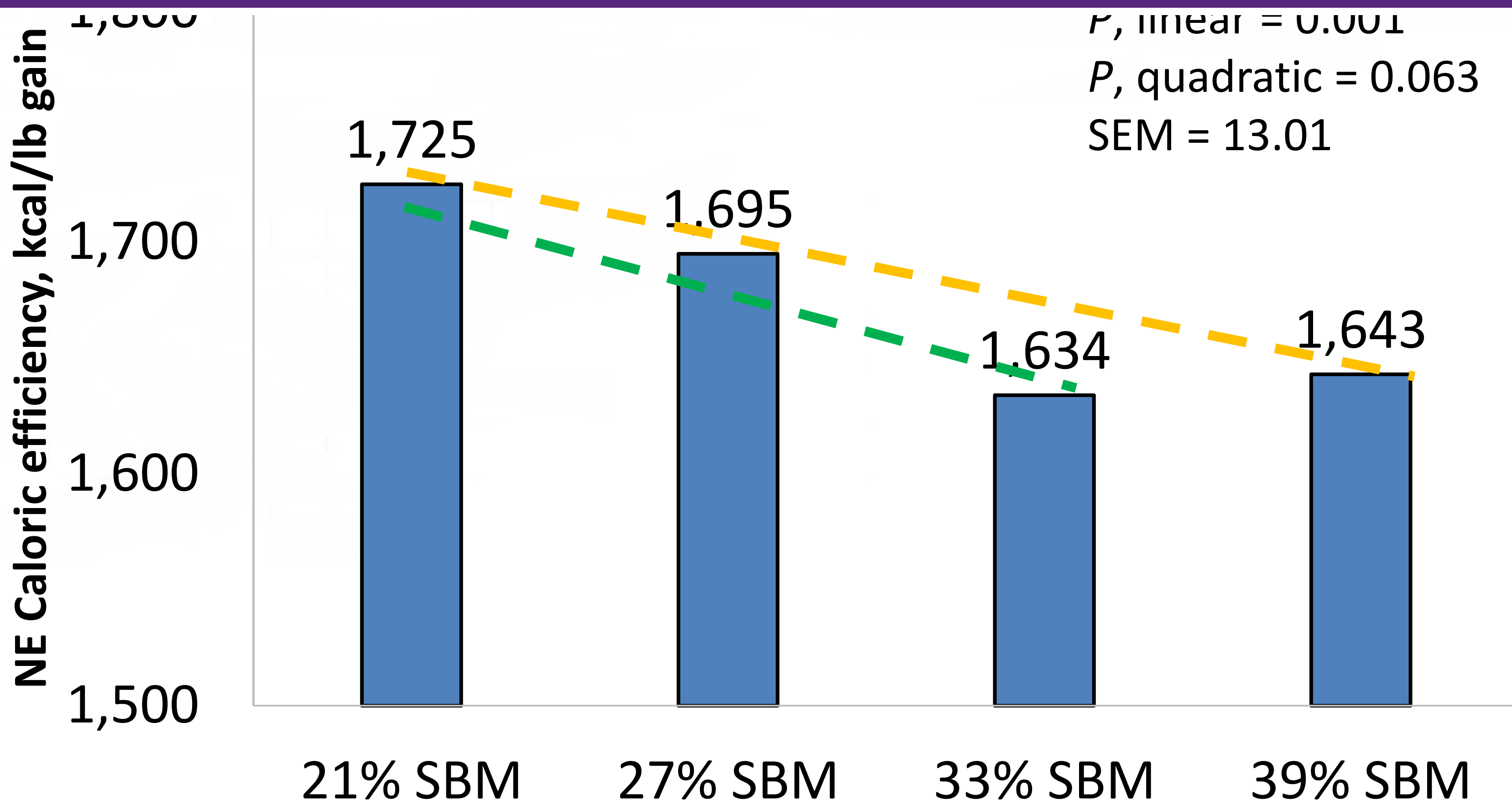
Energy estimate

NRC = 78% corn or 2,087 kcal/kg NE

Using all data points = 105% corn or 2,816 kcal/kg NE

Using linear portion = 121% corn or 3,236 kcal/kg NE



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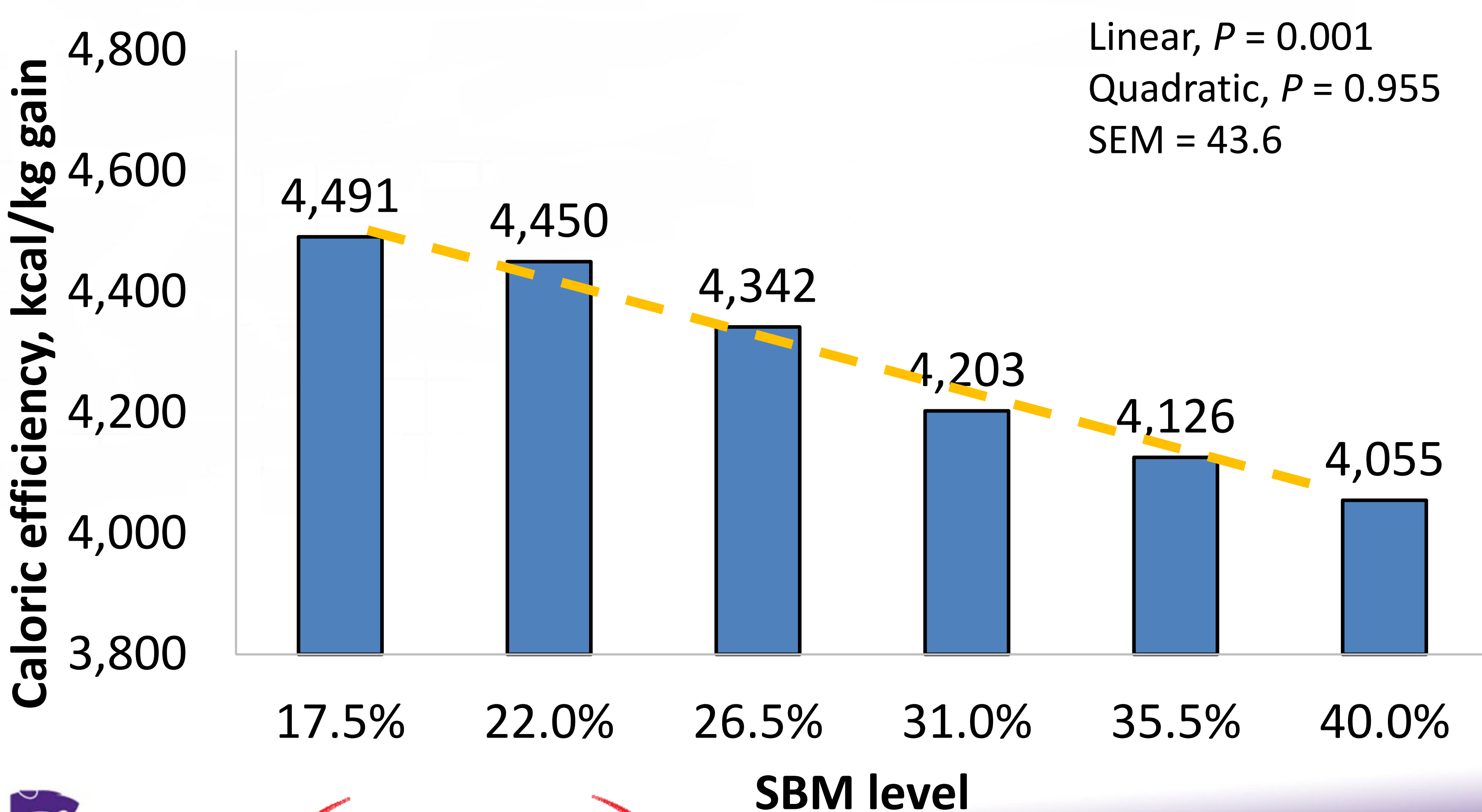
Energy estimate
125% of corn or 3,332 kcal/kg NE



Carrender et al., 2019

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Evaluating the productive energy content of high-protein distillers dried grains in swine diets

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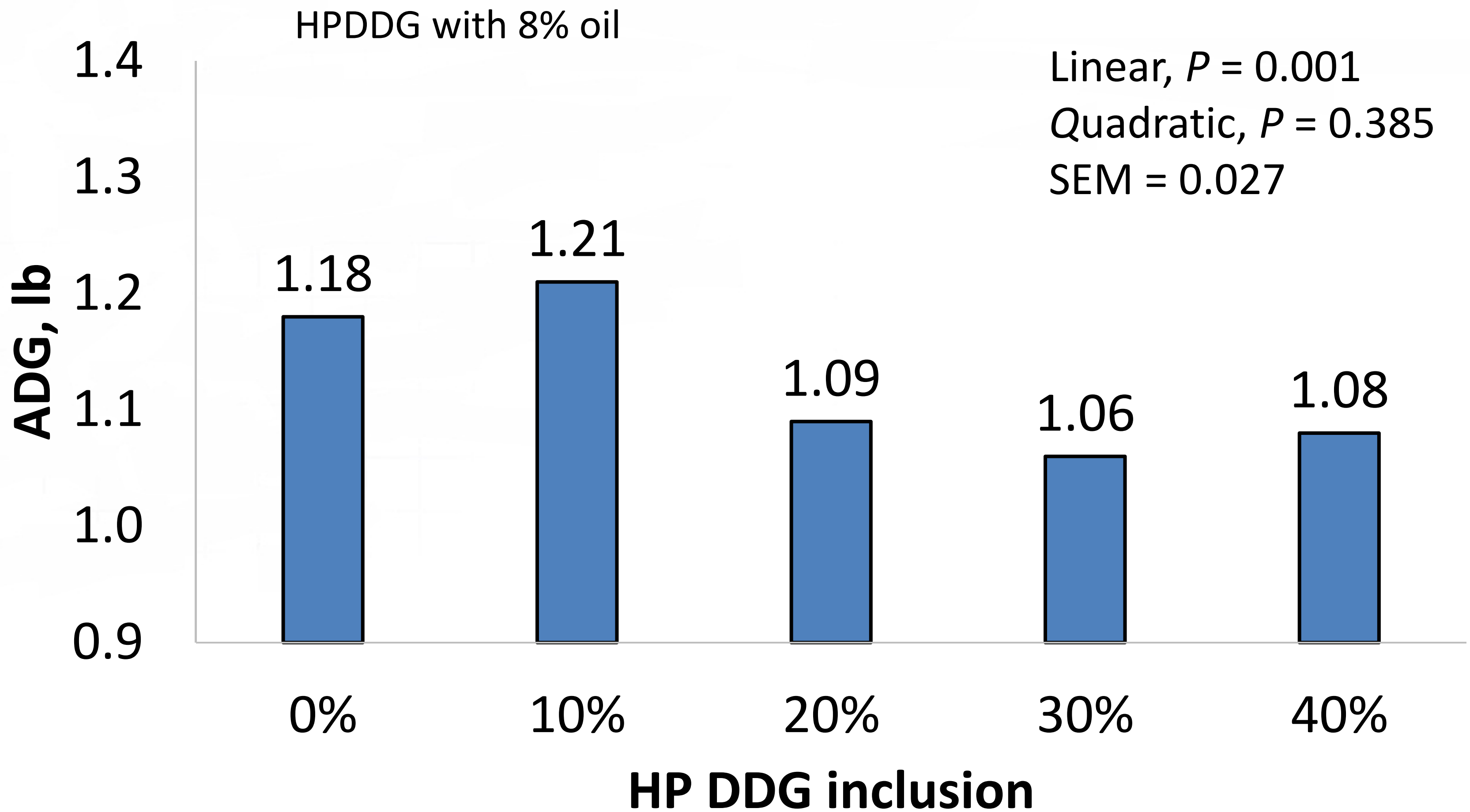
Effects of HPDDG on ADG
25 to 50 lb



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Cemin et al., 2019

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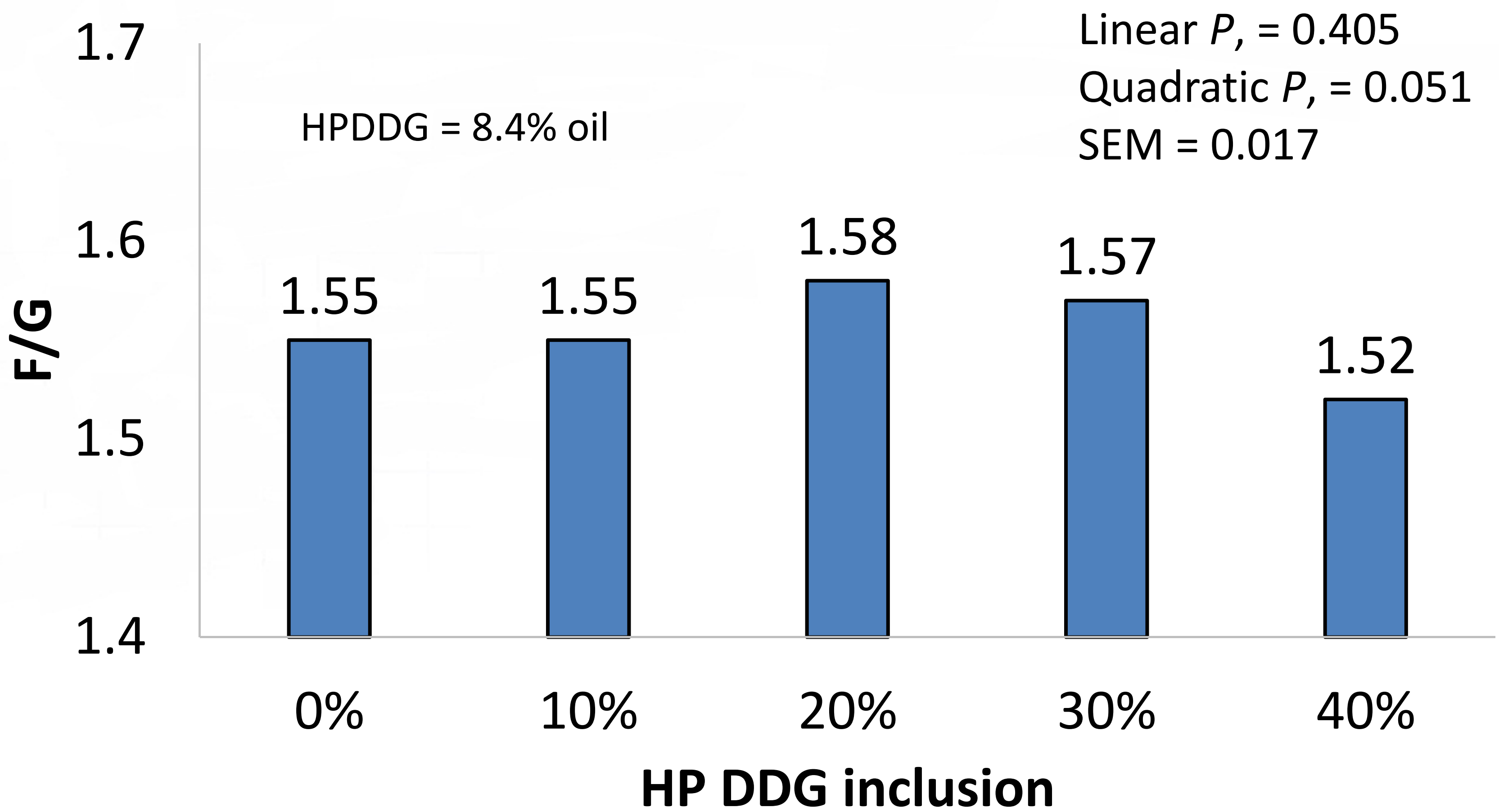
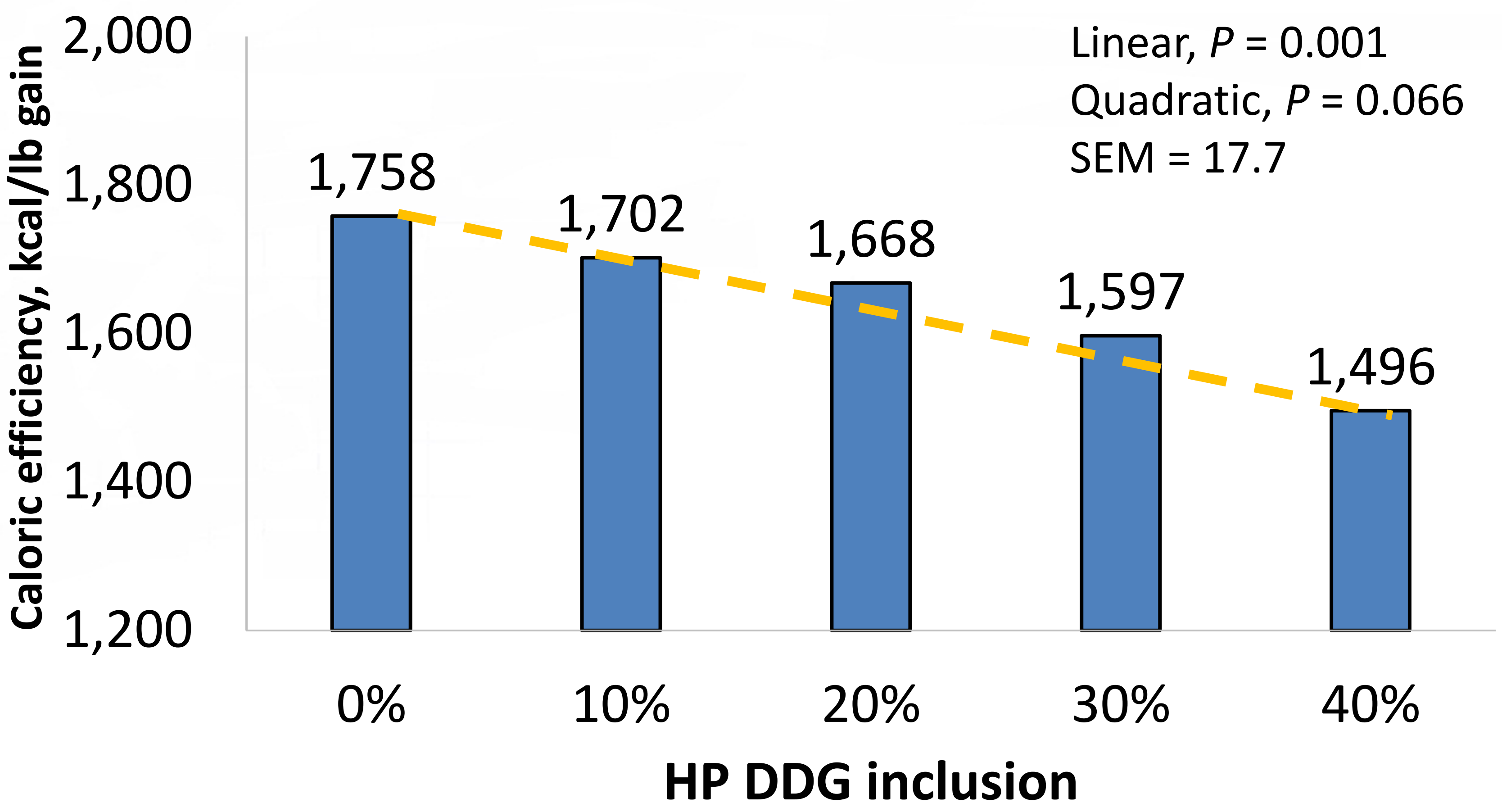
Effects of HPDDG on F/G
25 to 50 lb



Cemin et al., 2019

Effects of HPDDG on caloric efficiency

HPDDG = 97% of corn NE



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Cemin et al., 2019

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A comparison between conventional DDGS and HPDDG on finishing pig growth performance

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Chemical Analysis of Ingredients (as-fed basis)

	Corn	Conventional DDGS	HP DDG
Amino acid, %			
Isoleucine	0.23	1.17	1.53
Leucine	0.71	3.30	4.74
Lysine	0.23	1.03	1.48
Met + Cys	0.27	1.13	1.63
Threonine	0.22	1.12	1.50
Tryptophan	0.05	0.21	0.32
Valine	0.30	1.48	2.05

Rao et al., 2019

Chemical Analysis of Ingredients (as-fed basis)

	Corn	Conventional DDGS	HP DDG
Item, %			
Crude protein	7.0	29.2	39.2
NDF	6.8	29.3	30.6
Oil	3.2	8.0	10.3

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Rao et al., 2019

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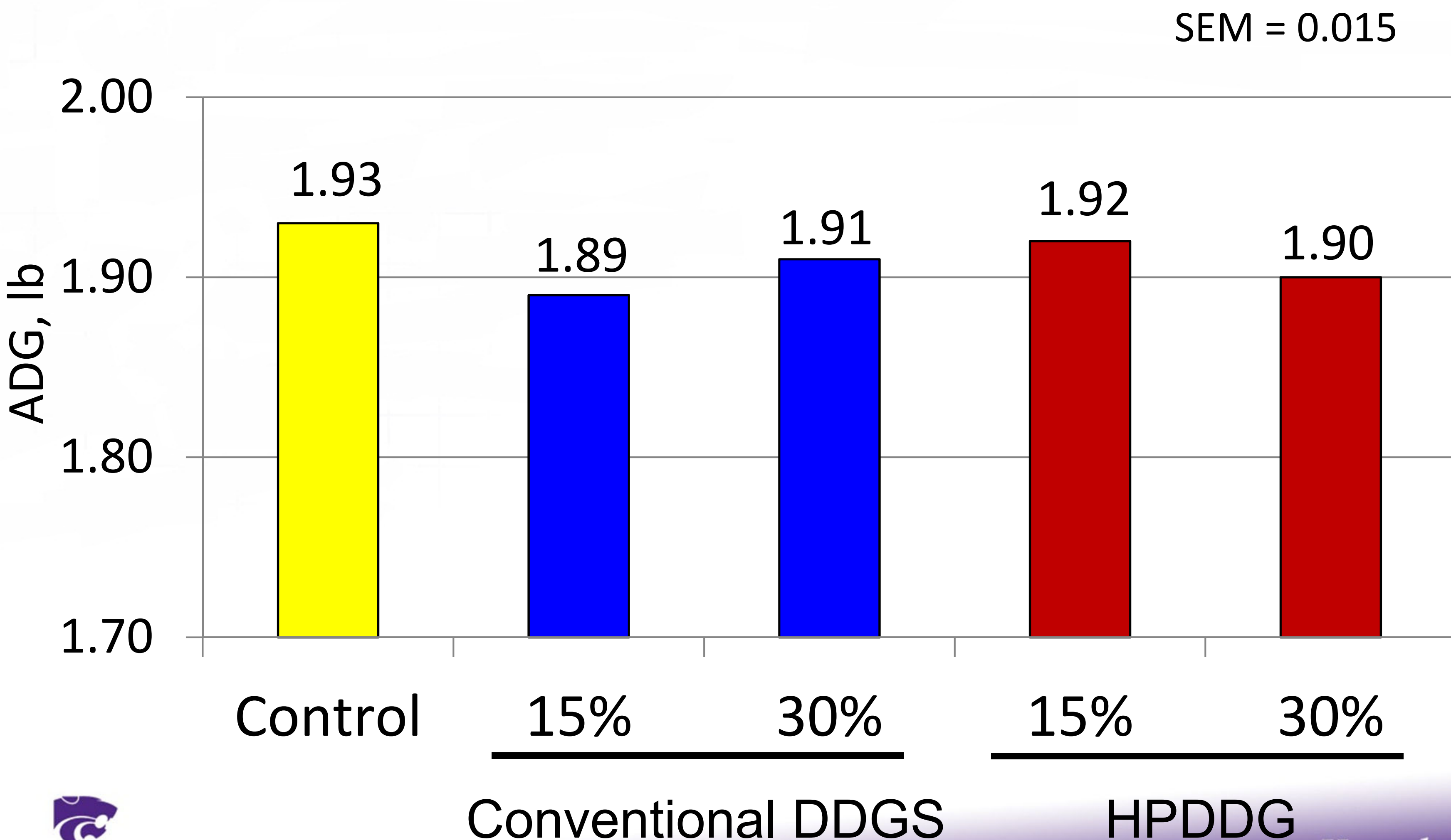
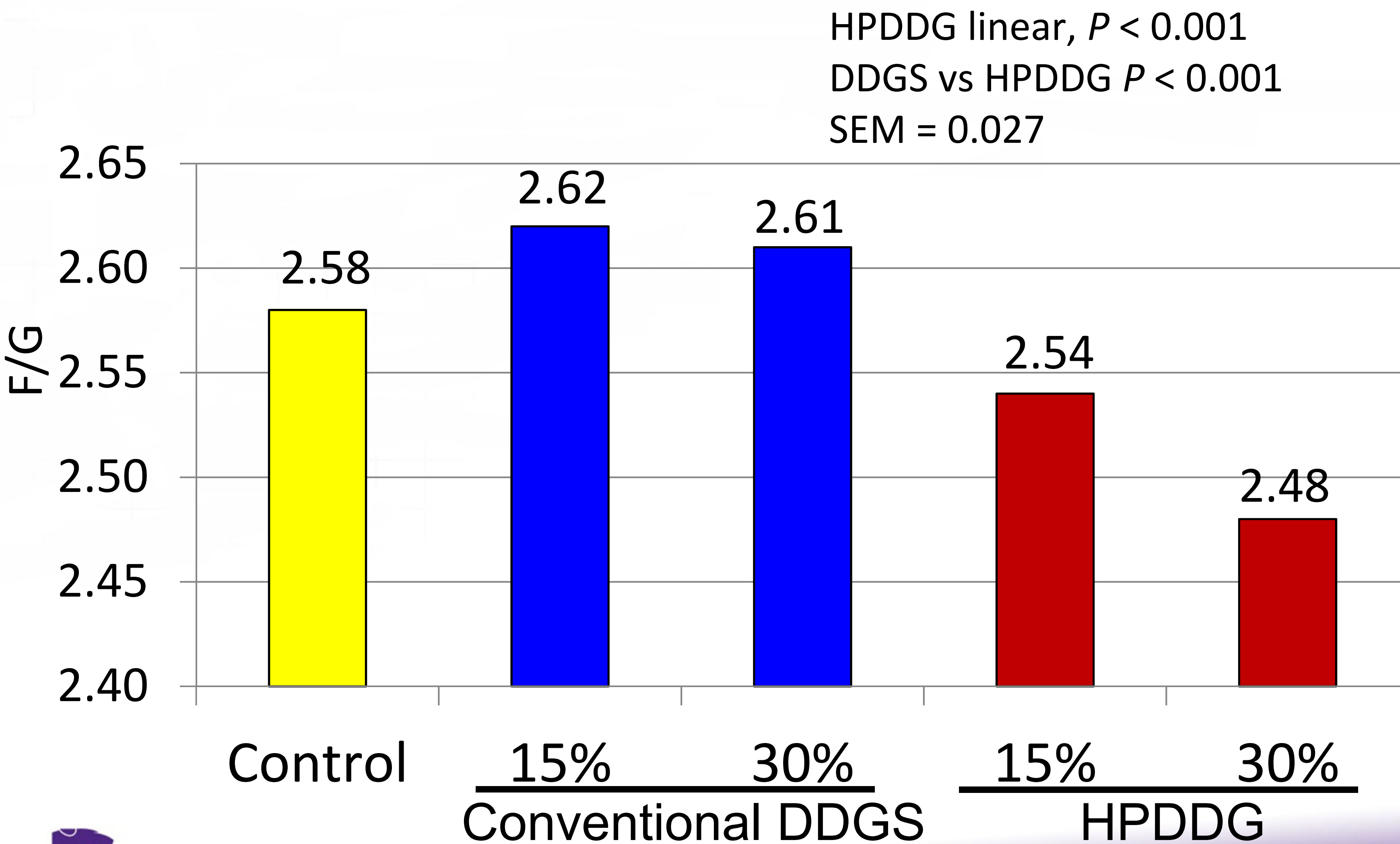
Effects of DDG Source and Level on Average Daily Gain



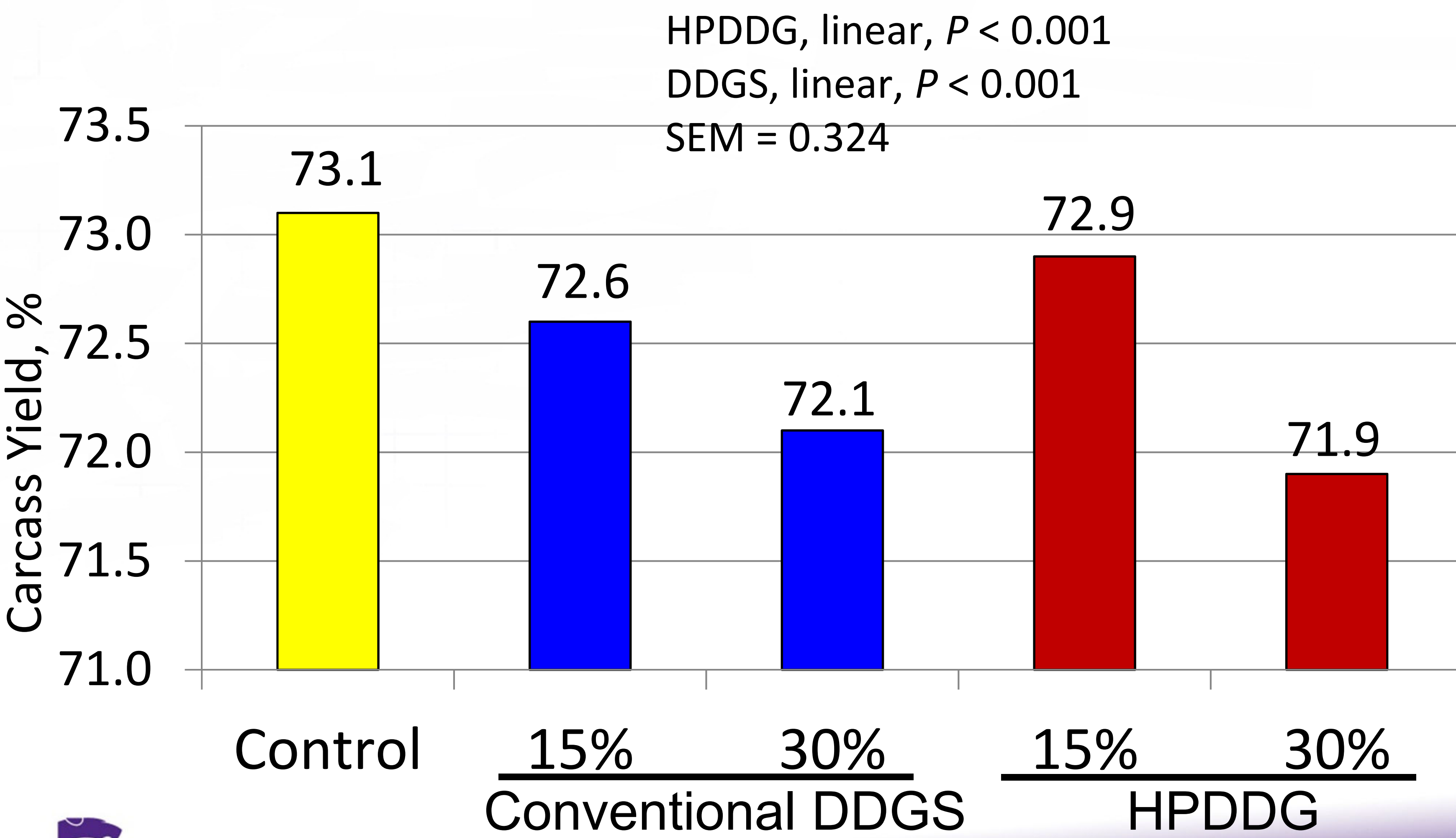
Rao et al., 2019

Effects of DDG Source and Level on F/G



Rao et al., 2019

Effects of DDG Source and Level on Carcass Yield



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Rao et al., 2019

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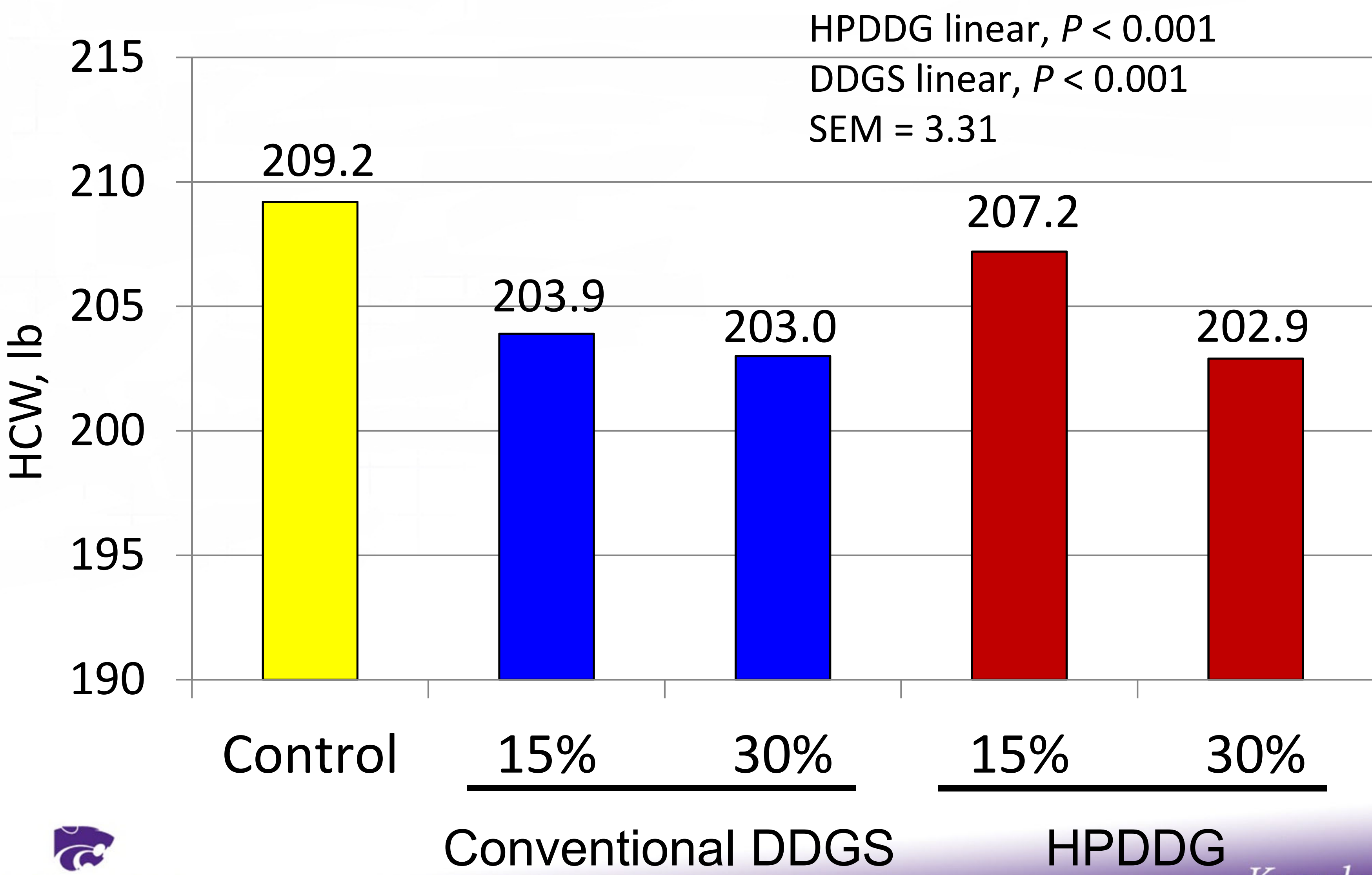
Effects of DDG Source and Level on HCW



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Rao et al., 2019

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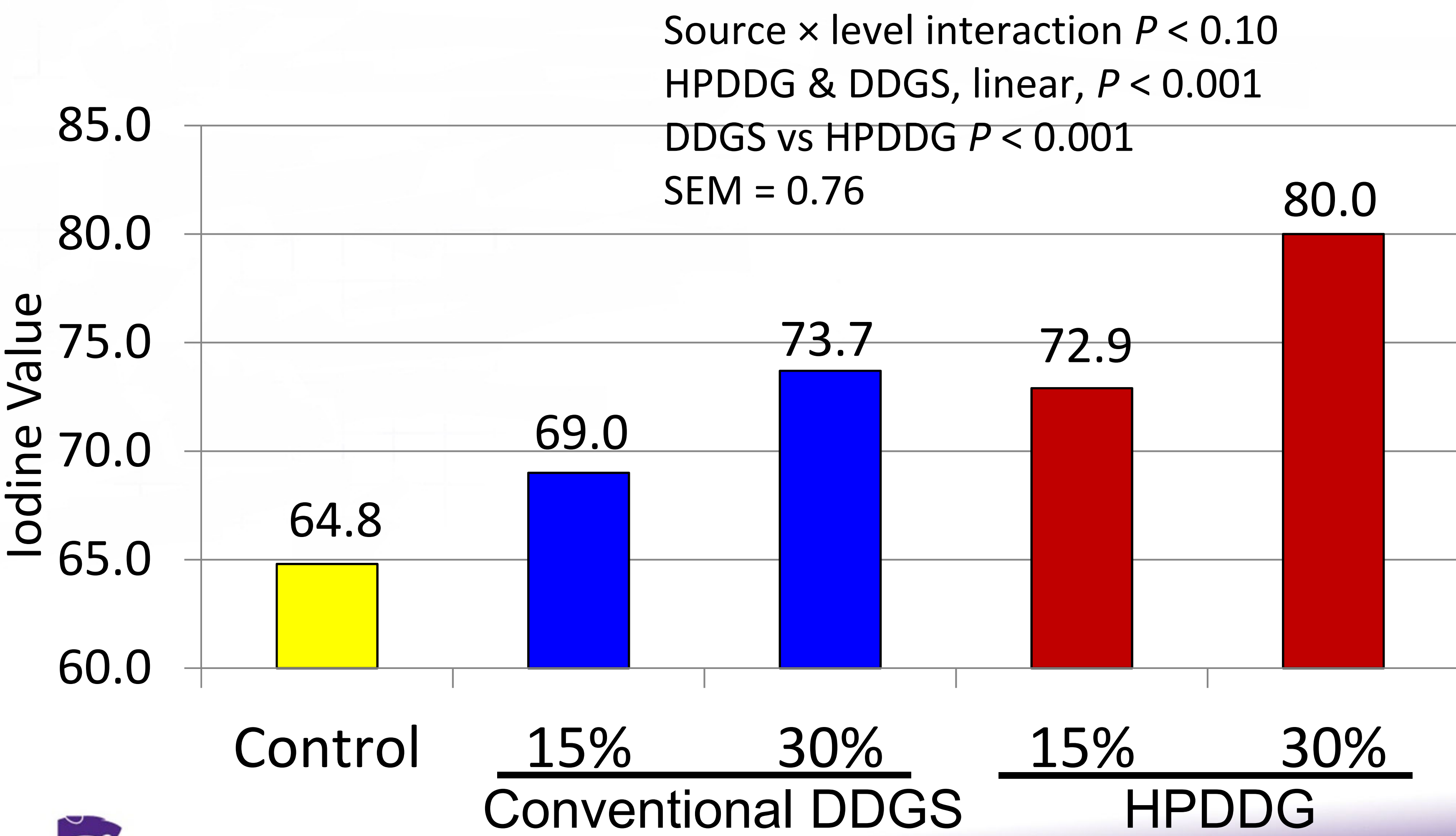
Effects of DDG Source and Level on Iodine Value



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Rao et al., 2019

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Take Home Messages

- The energy content of SBM is greater than previously estimated – 105 to 125% of corn NE
- HPDDG = 8.4% oil = 97% the energy content as corn
- HPDDG is a viable replacement for conventional DDGS
- Like all DDG sources we need to check
  - Lysine content and other nutrient loadings
  - Oil content for energy
  - Mycotoxins

Determining the Effects of Tryptophan Biomass on Growth Performance of 25- to 50-lb Nursery Pigs

Madison R. Wensley*[1], Jason C. Woodworth[1], Joel M. DeRouchey[1], Steve S. Dritz[1], Mike D. Tokach[1], Robert D. Goodband[1], and Keith D. Haydon[2]

[1] Kansas State University, Manhattan
[2] CJ America-Bio, Downers Grove, IL

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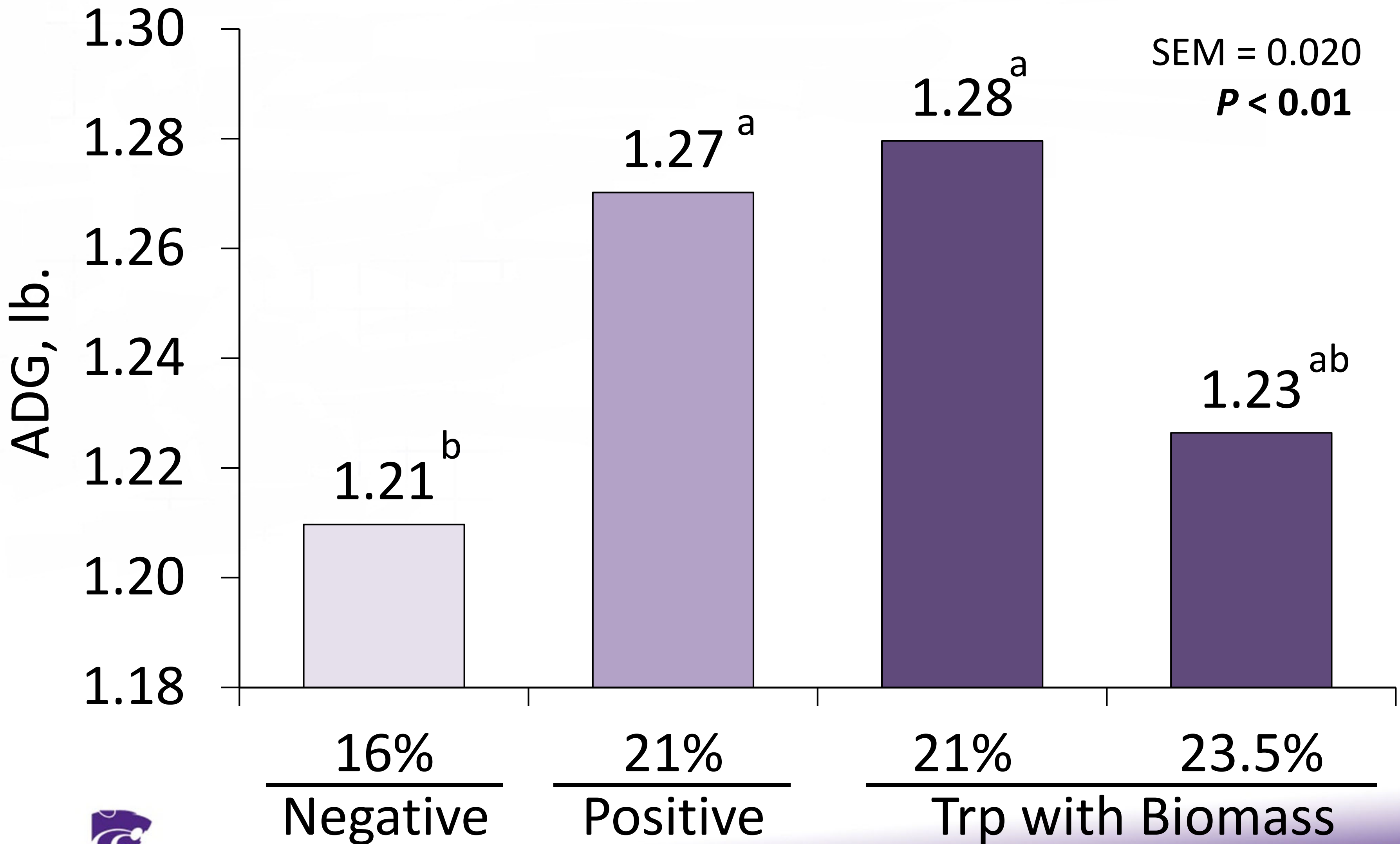
Average Daily Gain, d 0 to 21



Wensley et al., 2019

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Fumonisin in 2018 corn crop

- Fumonisin
  - High levels in large portion of Kansas – 10 to 40 ppm
    - < 20 ppm - No signs
    - 50 to 100 ppm – Low feed intake, low growth, immunosuppression
    - > 100 ppm – severe lung lesions, labored breathing, cyanosis, death
  - We conducted series of 3 experiments to determine:
    - Response to fumonisin level
    - Potential benefit of feed additives in high Fumonisin diets

FUM level in diets

Table. Dietary mycotoxin level (as-fed basis, ppm)					
Item	7.2 ppm	14.7 ppm	21.9 ppm	32.7 ppm	35.1 ppm
Fumonisin B1	5.7	11.7	17.3	25.2	27.5
Fumonisin B2	1.5	3.0	4.5	7.5	7.5
Fumonisin B1 & B2	7.2	14.7	21.9	32.7	35.1

- Diet mycotoxin concentration was analyzed at North Dakota State University with LC/MS assay.

- Aflatoxin, HT-2 toxin, T-2 toxin, Ochratoxin, Sterigmatocystin, Zearalenone and Vomitoxin were below detectable level.

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Rao et al., 2019

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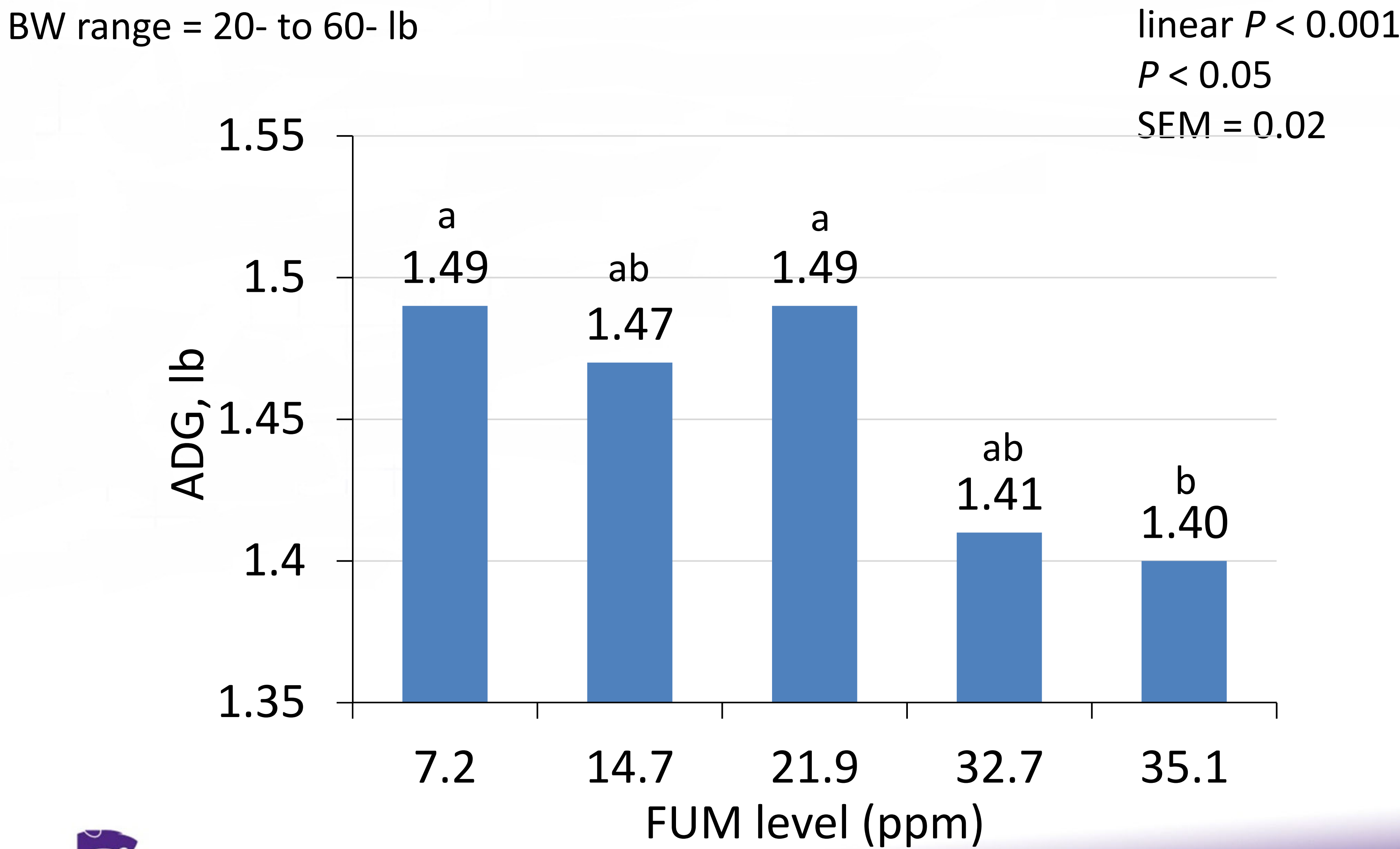
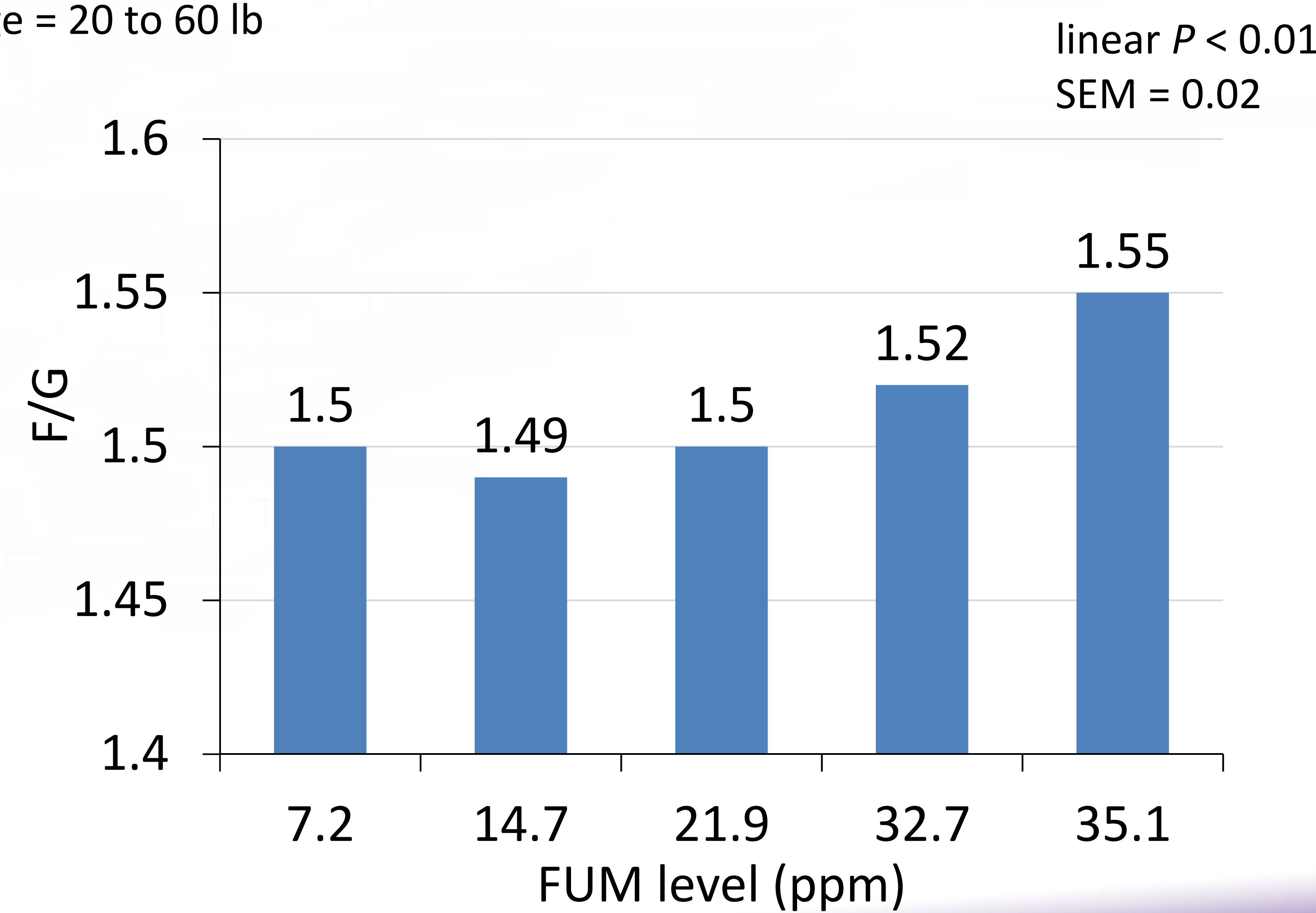
Effects of FUM level on ADG of nursery pigs



Rao et al., 2019

Effects of FUM level on F/G of nursery pigs

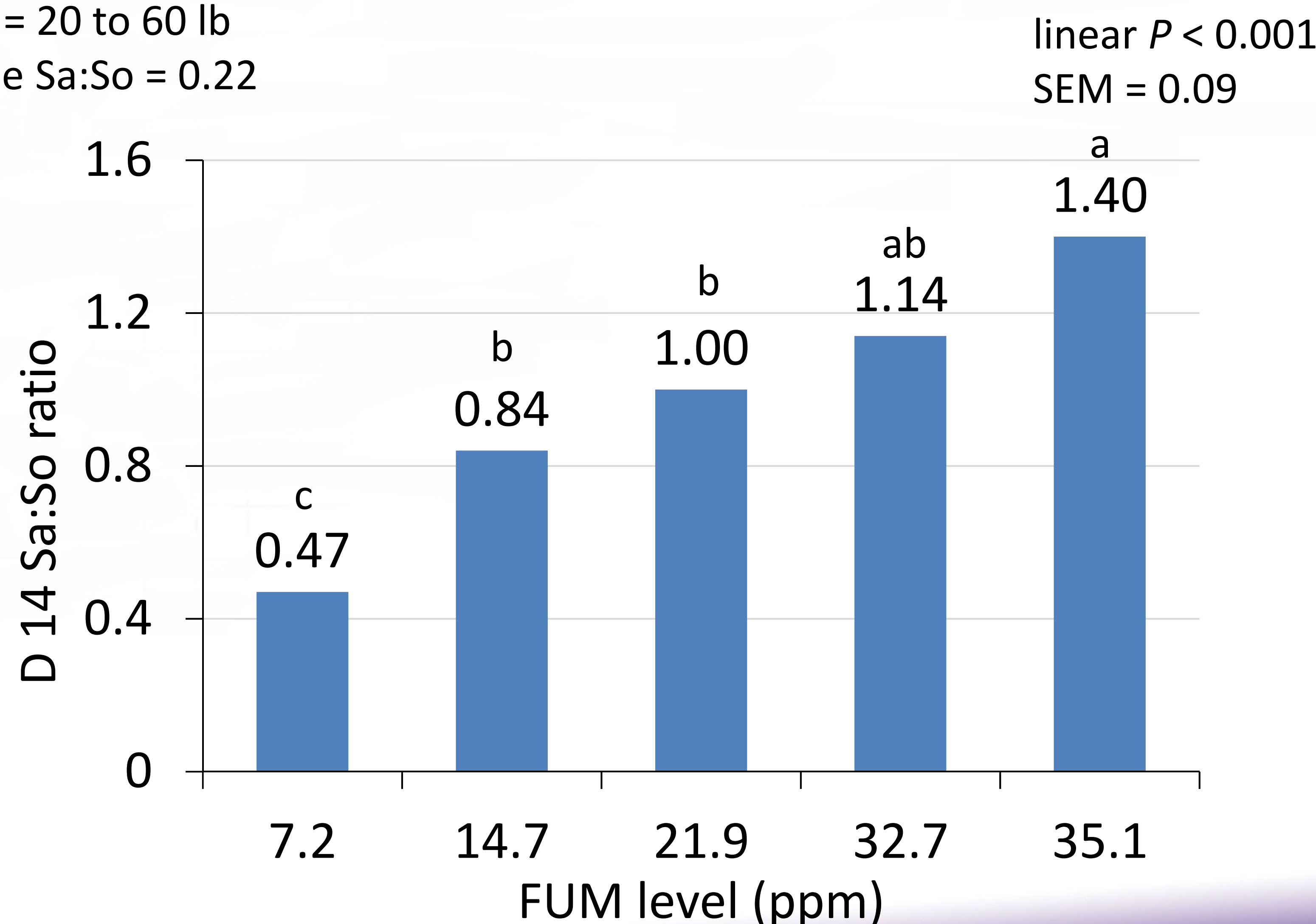
BW range = 20 to 60 lb



Rao et al., 2019

FUM level on d 14 Serum Sa:So ratio

BW range = 20 to 60 lb
d0 baseline Sa:So = 0.22



Rao et al., 2019

Efficacy of commercial products on performance of nursery pigs fed high fumonisin diets

- 3 products were selected (Kemin, NutriQuest and Biomin)
  - Kallsil Dry (Kemin) – 6 lb/ton
  - Feed Aid (NutriQuest) – 6 lb/ton
  - Biofix Select (Biomin) - 3.3 lb/ton

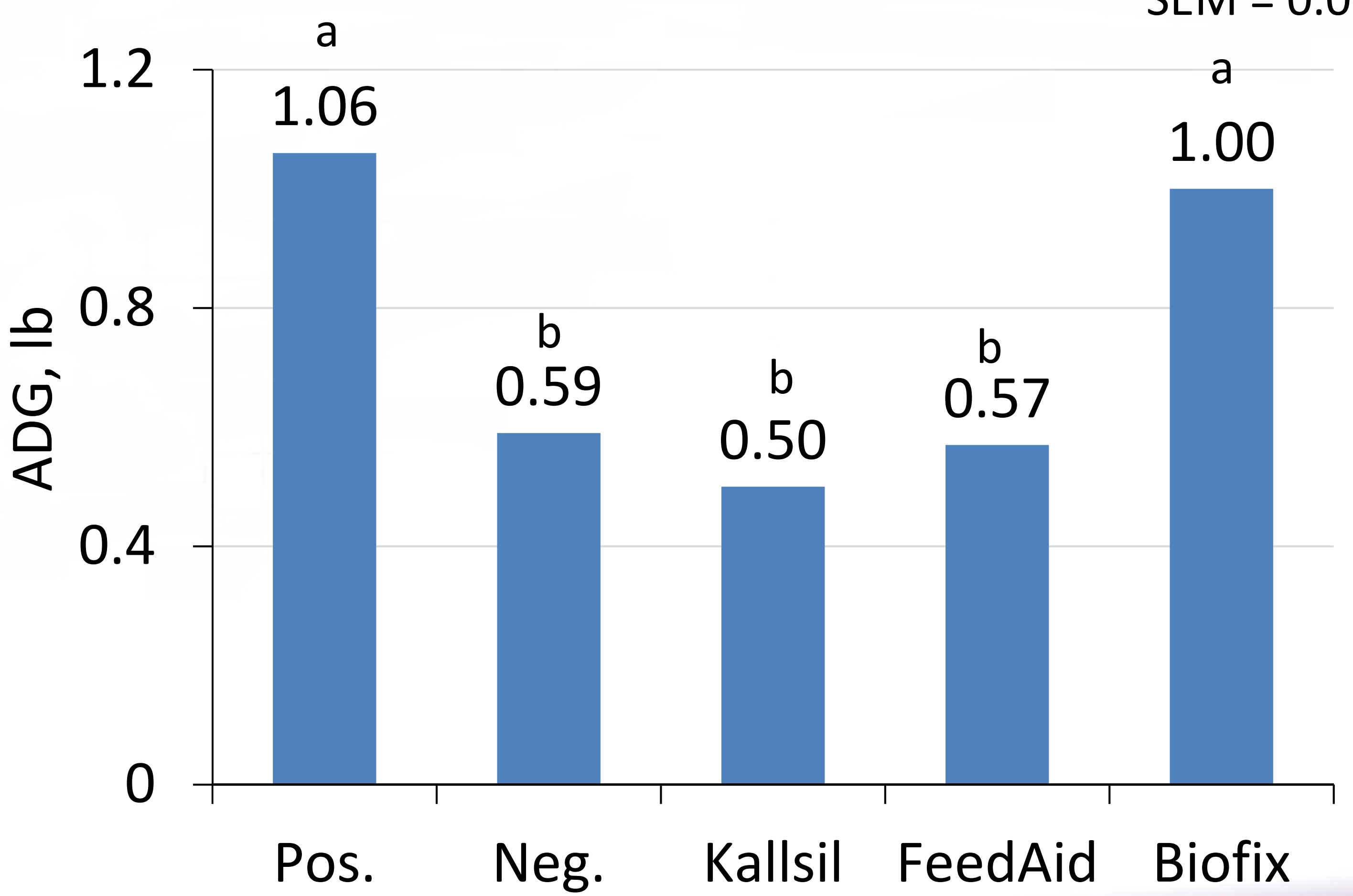
- 2 Experiments
  - Experiment 1 – Fumonisin at 60 ppm
  - Experiment 2 - Fumonisin at 30 ppm

Rao et al., 2019

Exp. 1 – d 0 to 14 ADG

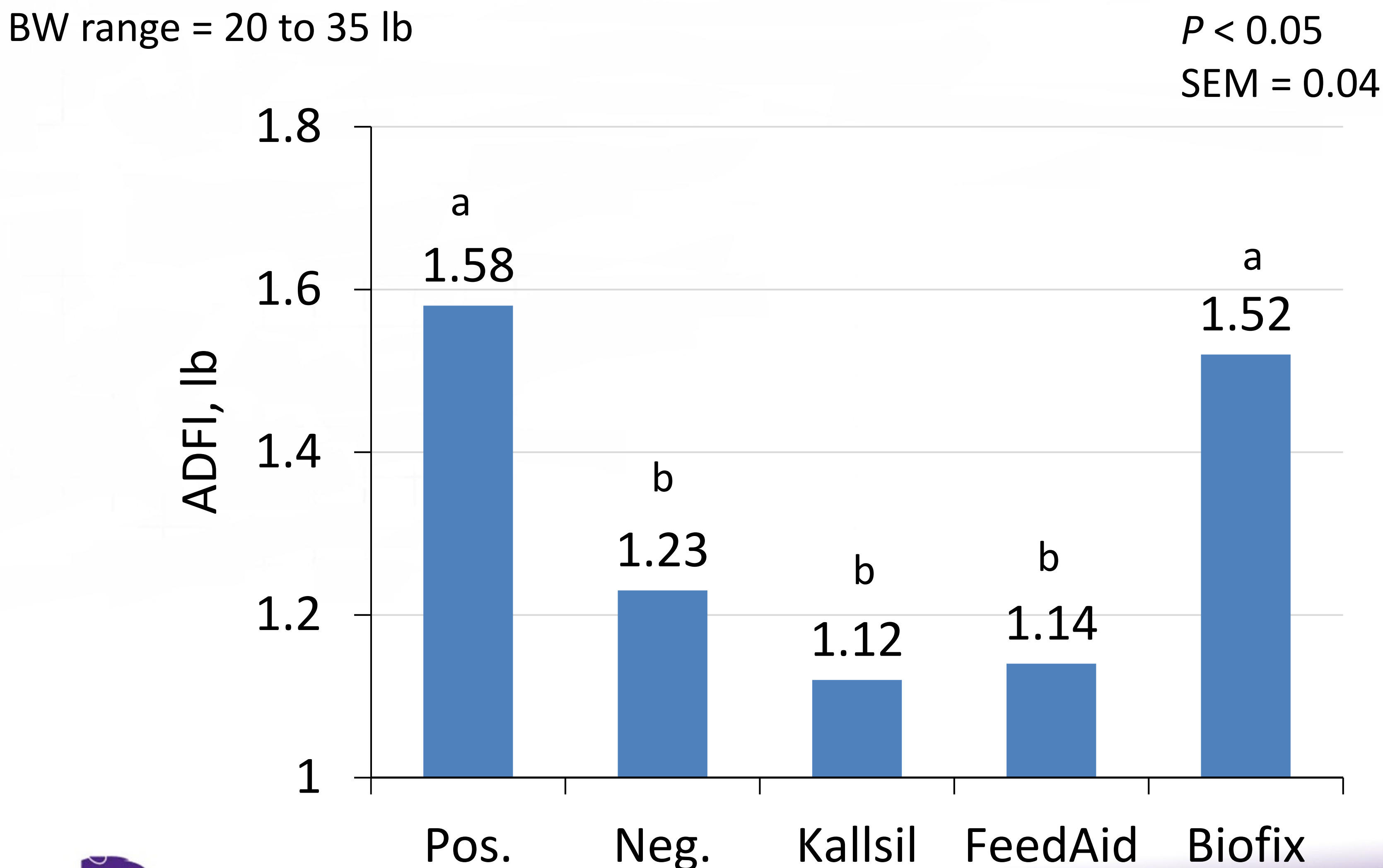
BW range = 20 to 35 lb

P < 0.05
SEM = 0.03



Rao et al., 2019

Exp. 1 – d 0 to 14 ADFI



Rao et al., 2019

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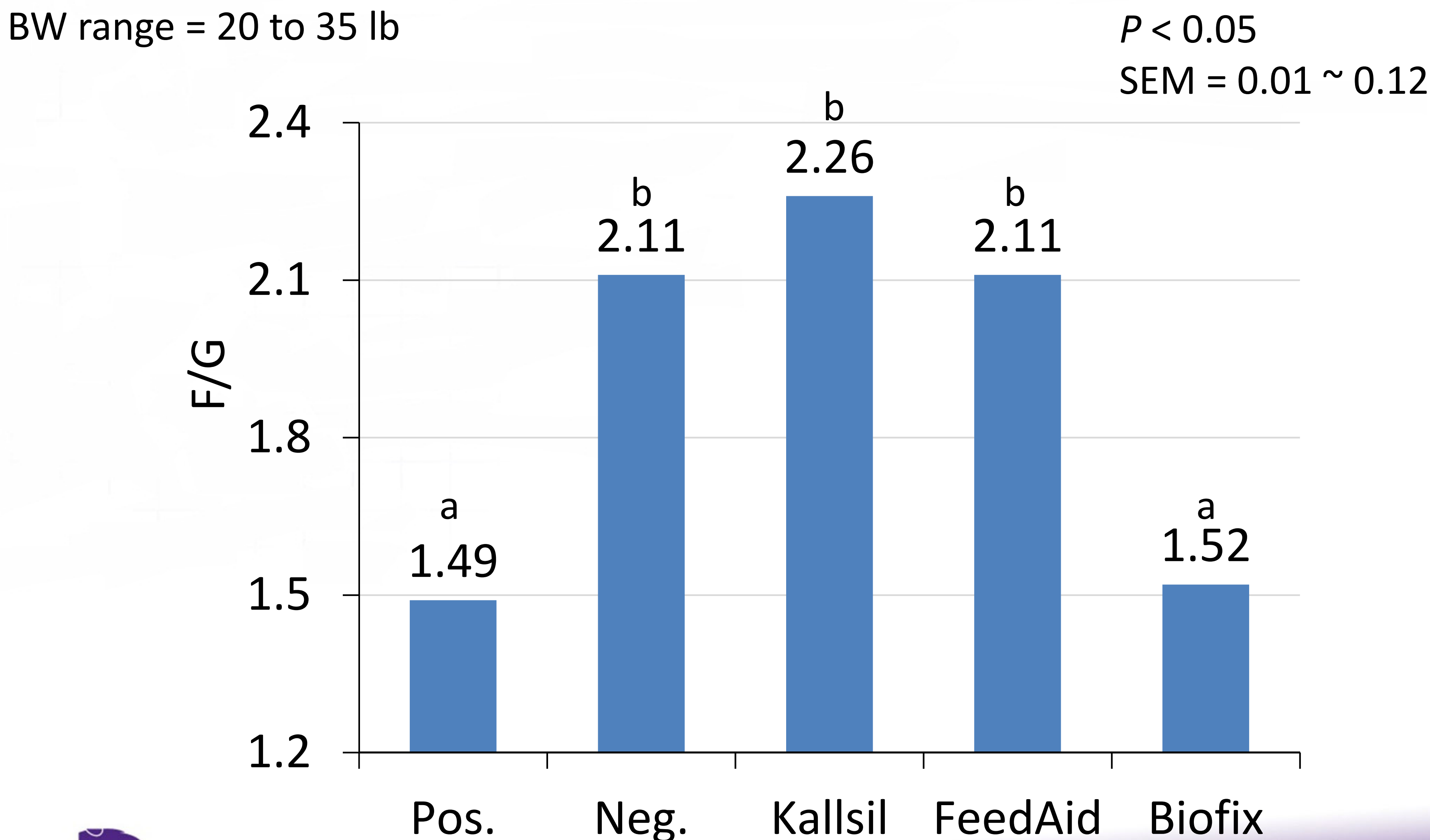
Exp. 1 – d 0 to 14 F/G



Rao et al., 2019

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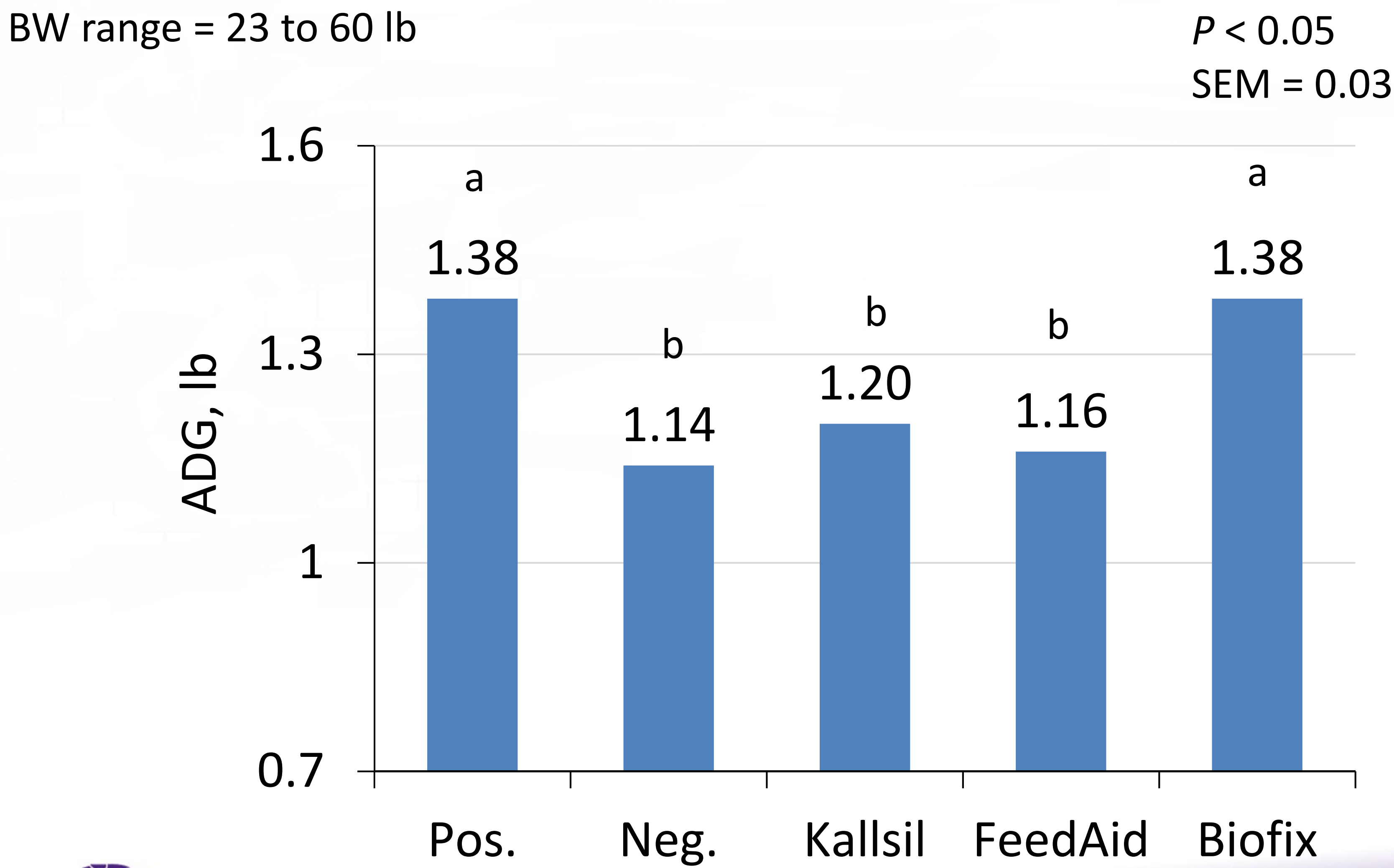
Exp. 2 – d 0 to 28 ADG

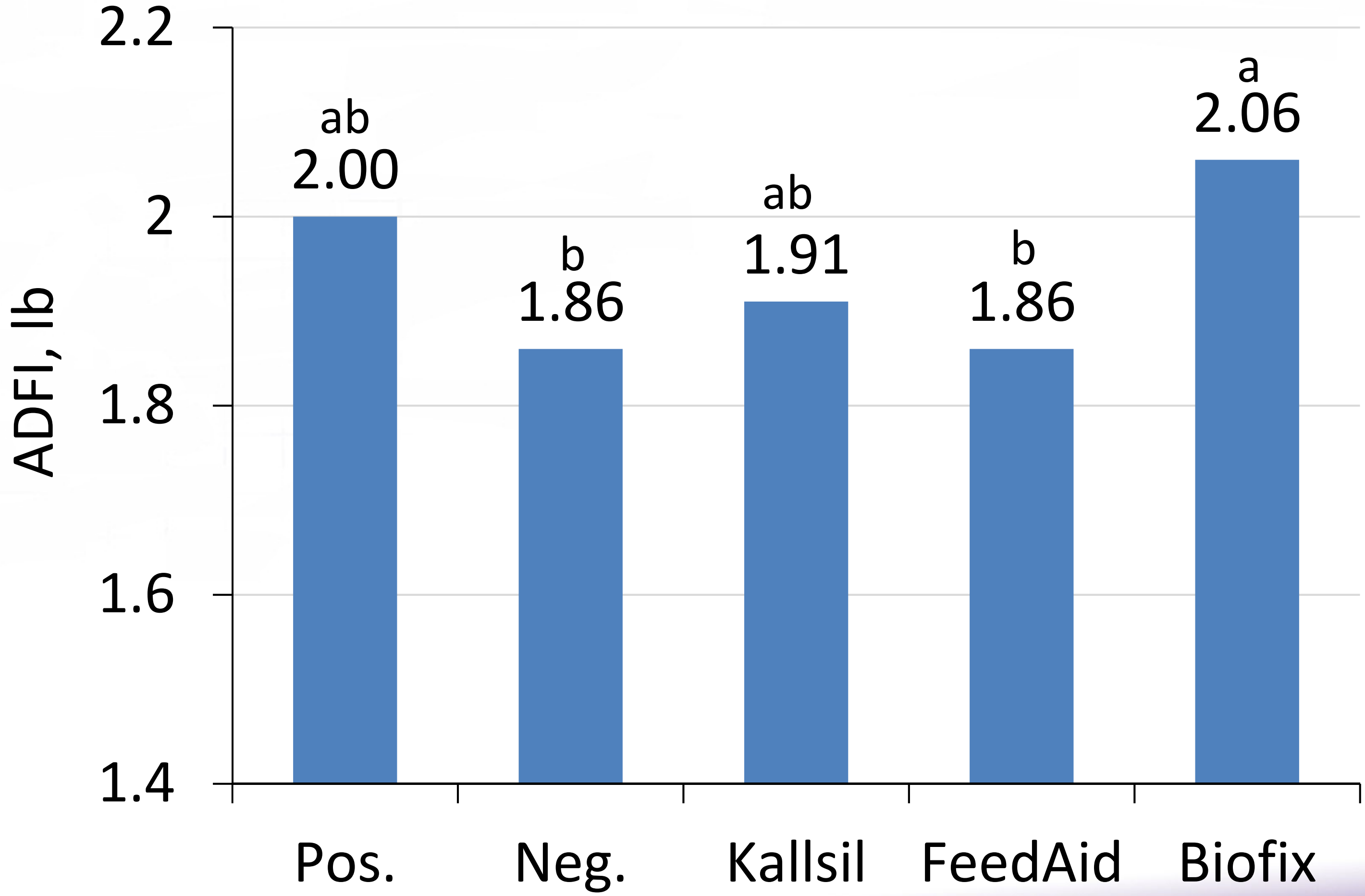


Rao et al., 2019

Exp. 2 – d 0 to 28 ADFI

BW range = 23 to 60 lb

P < 0.05
SEM = 0.05



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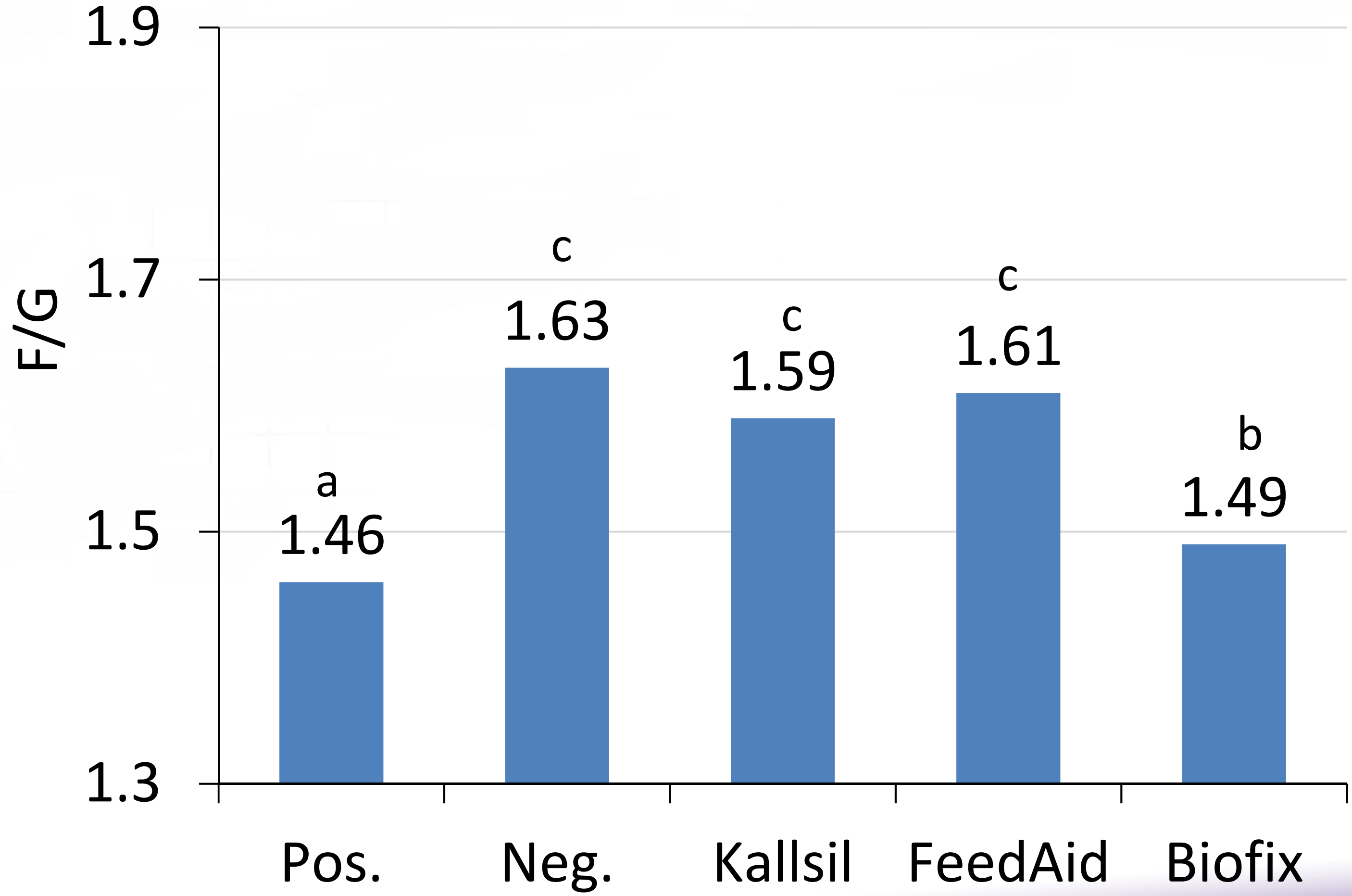
Rao et al., 2019

Knowledge for Life

Exp. 2 – d 0 to 28 F/G

BW range = 23 to 60 lb

P < 0.05
SEM = 0.02



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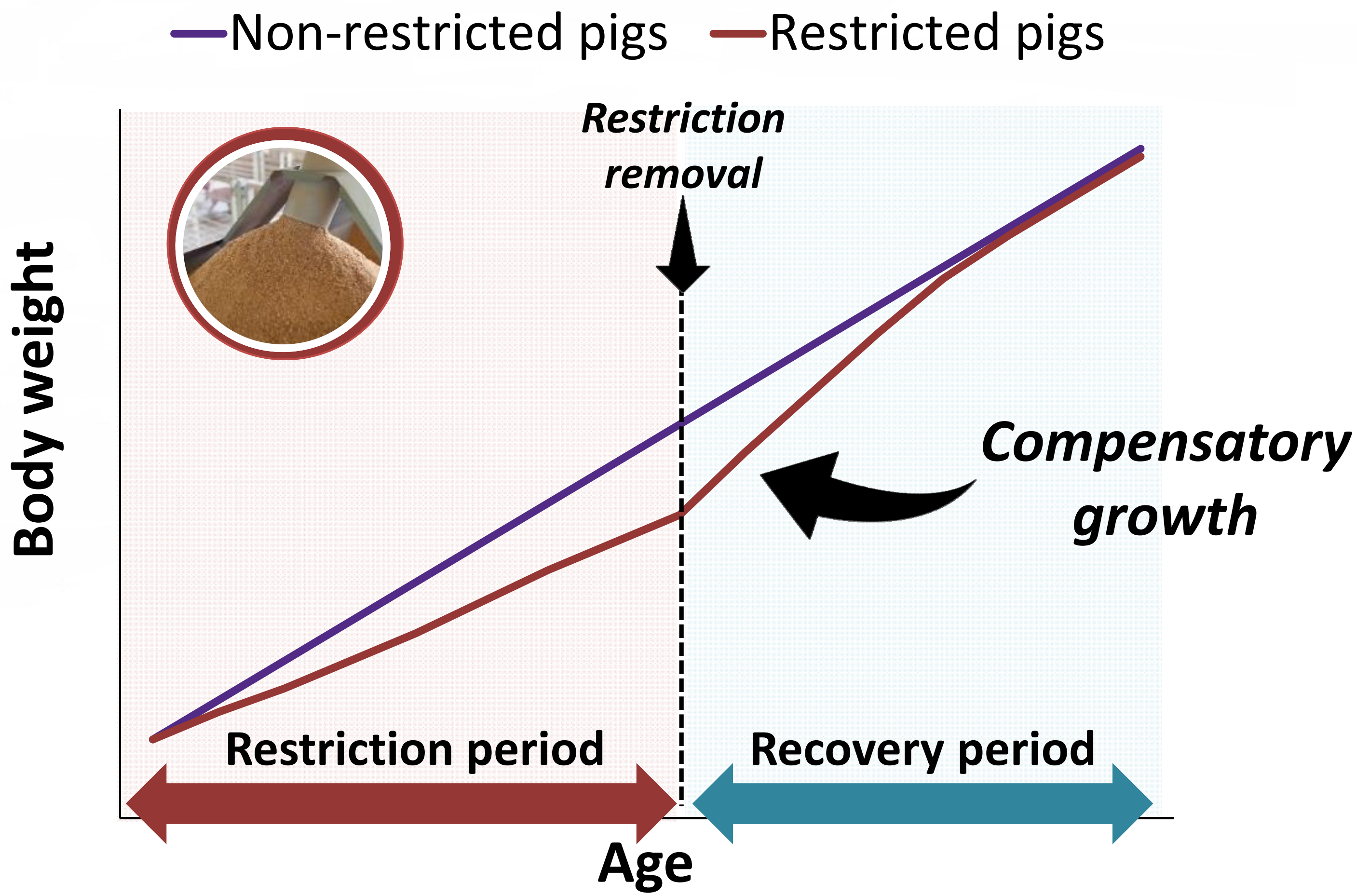
Rao et al., 2019

Knowledge for Life

Fumonisin summary

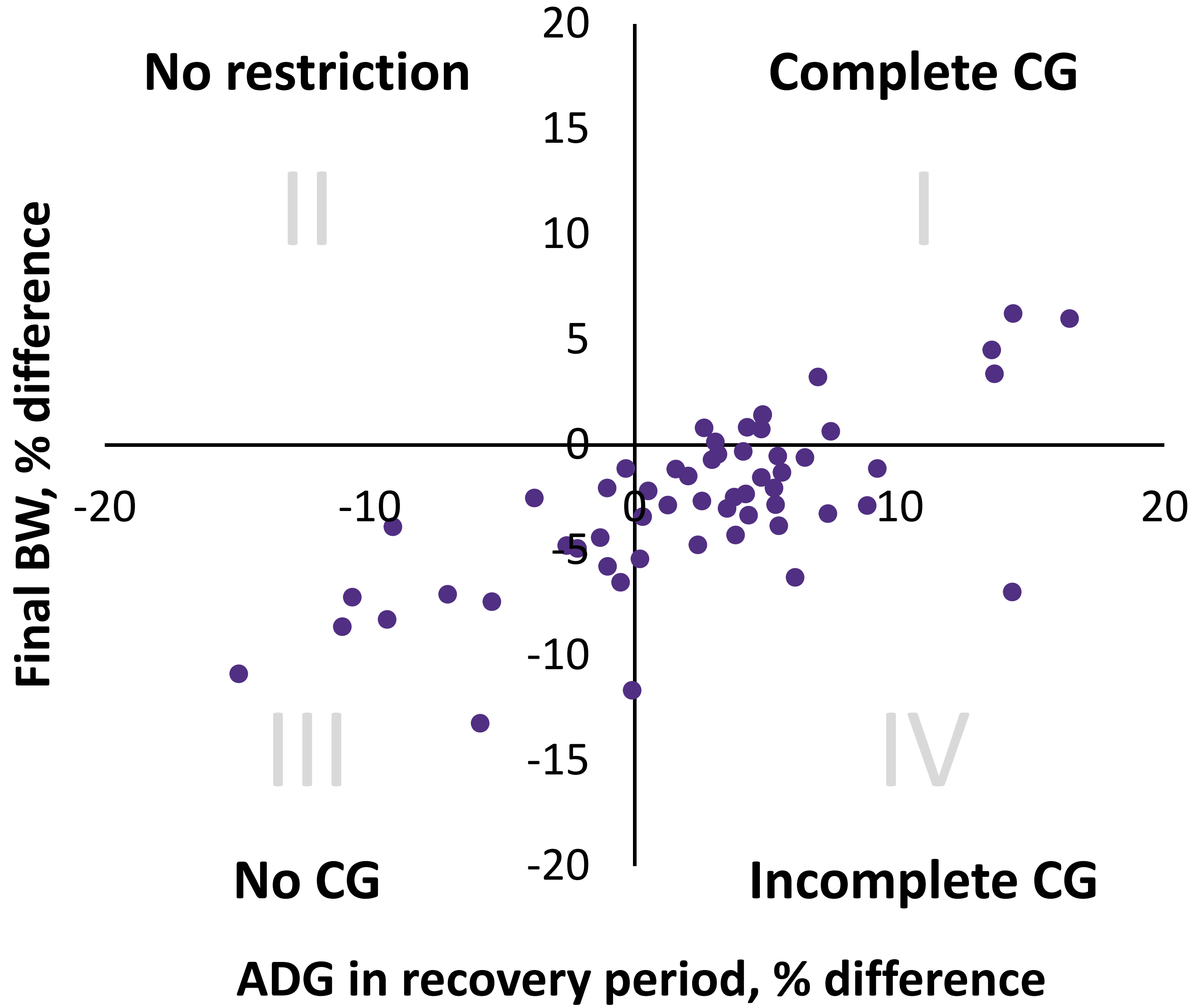
- Fumonisin
  - Dose:
    - < 20 ppm - No signs
    - 50 to 100 ppm – Low feed intake, low growth, immunosuppression
    - > 100 ppm – severe lung lesions, labored breathing, cyanosis, death
  - Biofix Select returned growth performance to same level as control.
  - Other feed additives tested did not provide benefit at fumonisin levels in the diets.

Compensatory Growth



Adapted from Ishida et al., 2015

Compensatory Growth Occurrence



Menegat et al., 2019

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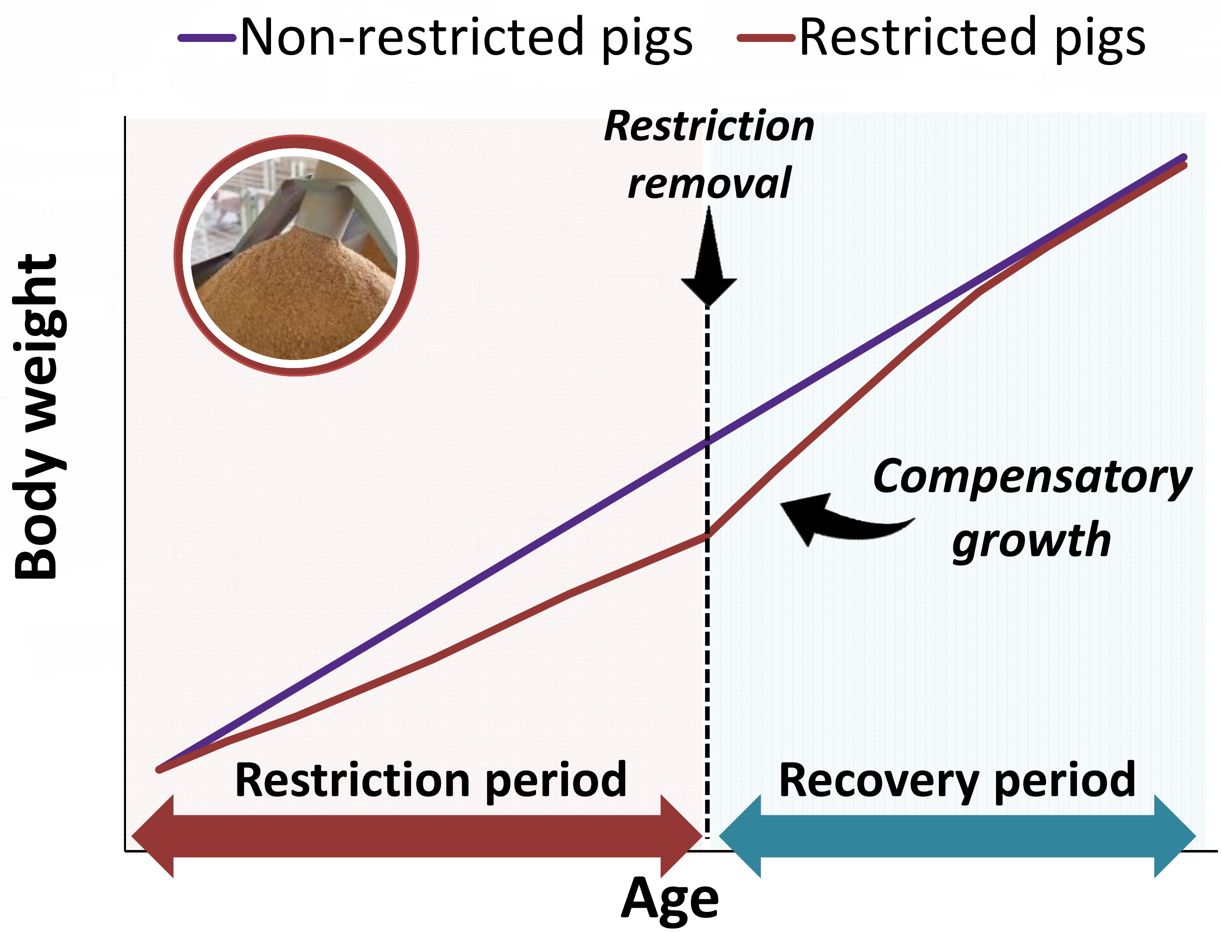
Compensatory gain conclusions

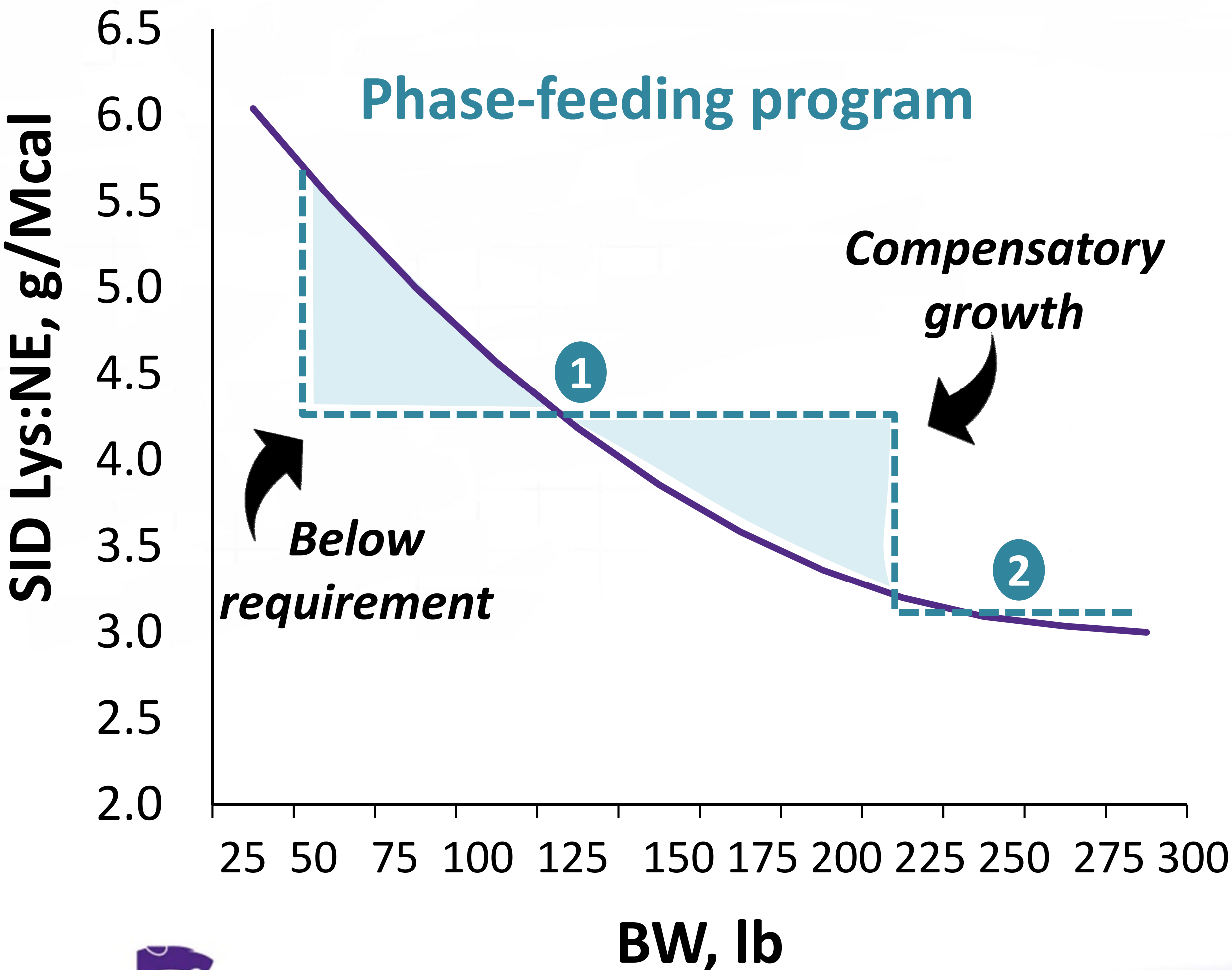


Important factors:

- Degree of lysine restriction
- Duration of restriction and recovery
- Lysine level in recovery

Menegat et al., 2019

Compensatory gain conclusions



- Simplification of phase-feeding strategies induces compensatory growth

Menegat et al., 2019

Branch chain amino acid prediction equations from Cemin et al., 2019

- Can the change in performance of pigs fed high leucine diets be predicted based on amino acid ratios?
- Meta analysis of 44 trials; 210 observations with wide range of Leu:Lys (82 to 715%), Ile:Lys (46 to 103%); Val:Lys (38 to 133%), and Trp:Lys (16 to 27%)

ADG, g = – 985.94 + 15.245 × average BW (kg) – 0.8885 x (average BW)^2

+ 1.063 × Leu:Lys

+ 20.2659 × Ile:Lys – 0.1479 × Ile:Lys × Ile:Lys

+ 9.2243 × (Ile+Val):Leu – 0.03321 × (Ile+Val):Leu × (Ile+Val):Leu

– 0.4413 × Ile:Trp

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CJ

Cemin et al., 2019

Knowledge for Life

Validate prediction equations

- 1,260 pigs (initially 74.0 lb BW) in 106-d experiment
  - 20 pigs per pen and 10 replicate pens/treatment
- Diets were corn-soybean meal with 30% DDGS in phases 1 to 3 and 20% in phase 4:
  1. Low level of Lys-HCl (SBM)
  2. High Lys-HCl and moderate Ile, Val, Trp (NC),
  3. Moderate Lys-HCl and higher Ile, Val, Trp (PC),
  4. PC with increased L-Val,
  5. PC with increased L-Ile
  6. PC with increased L-Trp

Kerkaert et al., 2020

Phase 3 diet composition (as-fed basis)

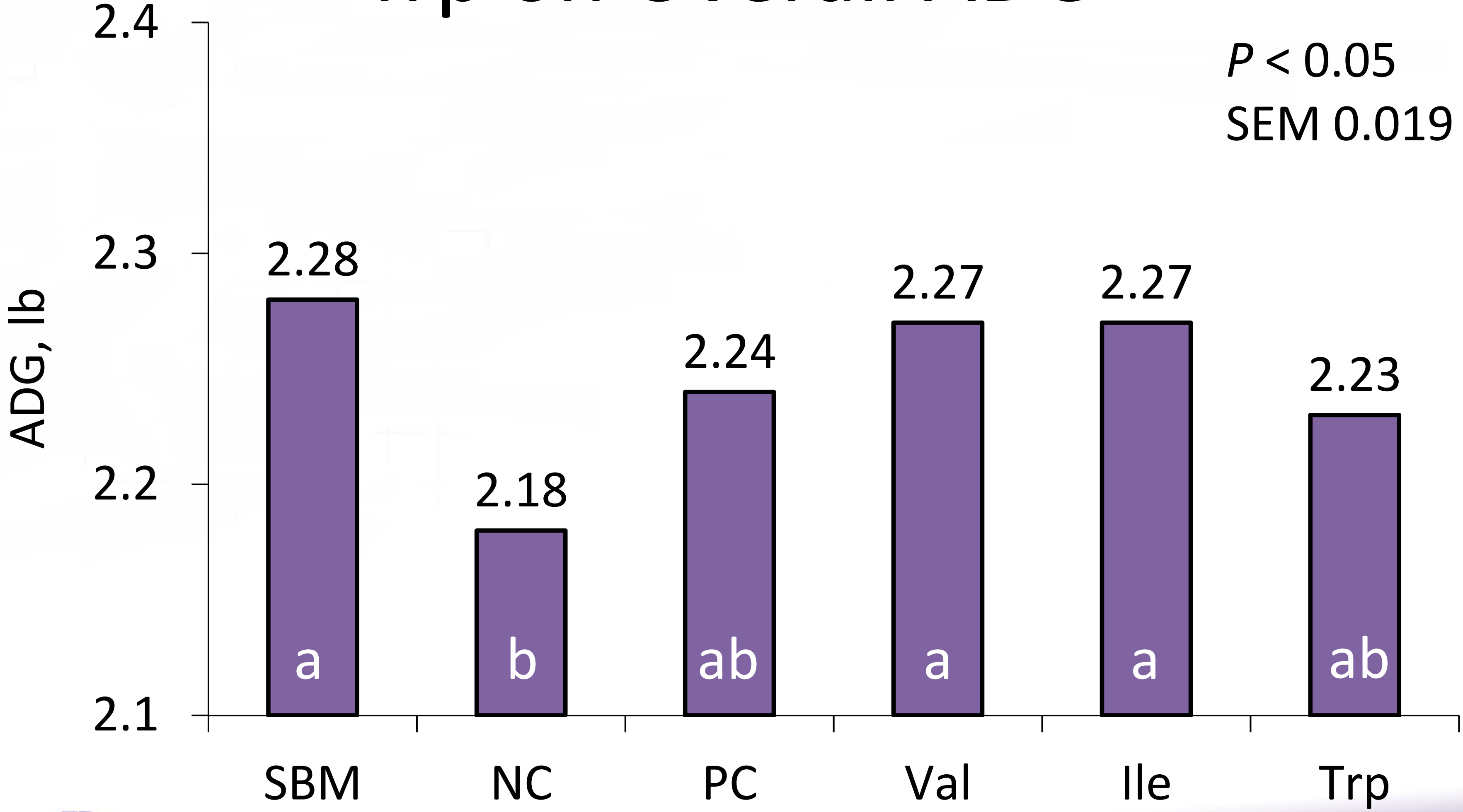
Item	SBM	NC	PC	Val	Ile	Trp
Ingredients, %						
Corn	51.34	62.55	60.58	60.46	60.45	60.55
Soybean meal (46.5% CP)	15.07	3.58	5.55	5.56	5.56	5.55
DDGS, > 6 and < 9% Oil	30.00	30.00	30.00	30.00	30.00	30.00
Choice white grease	1.50	1.10	1.20	1.25	1.25	1.20
Calcium carbonate	1.16	1.13	1.13	1.13	1.13	1.13
Calcium phosphate	0.15	0.33	0.30	0.30	0.30	0.30
Salt	0.50	0.50	0.50	0.50	0.50	0.50
L-Lysine-HCl	0.15	0.50	0.44	0.44	0.44	0.44
DL-Methionine	-	0.03	0.03	0.03	0.03	0.03
L-Threonine	-	0.11	0.10	0.10	0.10	0.10
L-Tryptophan	-	0.04	0.05	0.05	0.05	0.07
L-Valine	-	0.02	-	0.06	-	-
L-Isoleucine	-	-	-	-	0.08	-
VTM	0.10	0.10	0.10	0.10	0.10	0.10
Phytase	0.03	0.03	0.03	0.03	0.03	0.03

Phase 3 Amino Acid Ratios

	SBM	NC	PC	PC + Val	PC + Ile	PC+ Trp
CP, %	17.9	13.9	14.6	14.6	14.6	14.6
SID Lys	0.76	0.76	0.76	0.76	0.76	0.76
SID Ile:Lys	78	53	58	58	67	58
SID Leu:Lys	187	150	157	157	157	157
SID Val:Lys	90	68	70	78	70	70
SID Trp:Lys	19.3	17.0	19.0	19.0	19.0	22.2
Predictions						
ADG, lb	2.23	2.12	2.19	2.23	2.23	2.23

Kerkaert et al., 2020

Effects of Supplemental Val, Ile, and Trp on Overall ADG



Kerkaert et al., 2020

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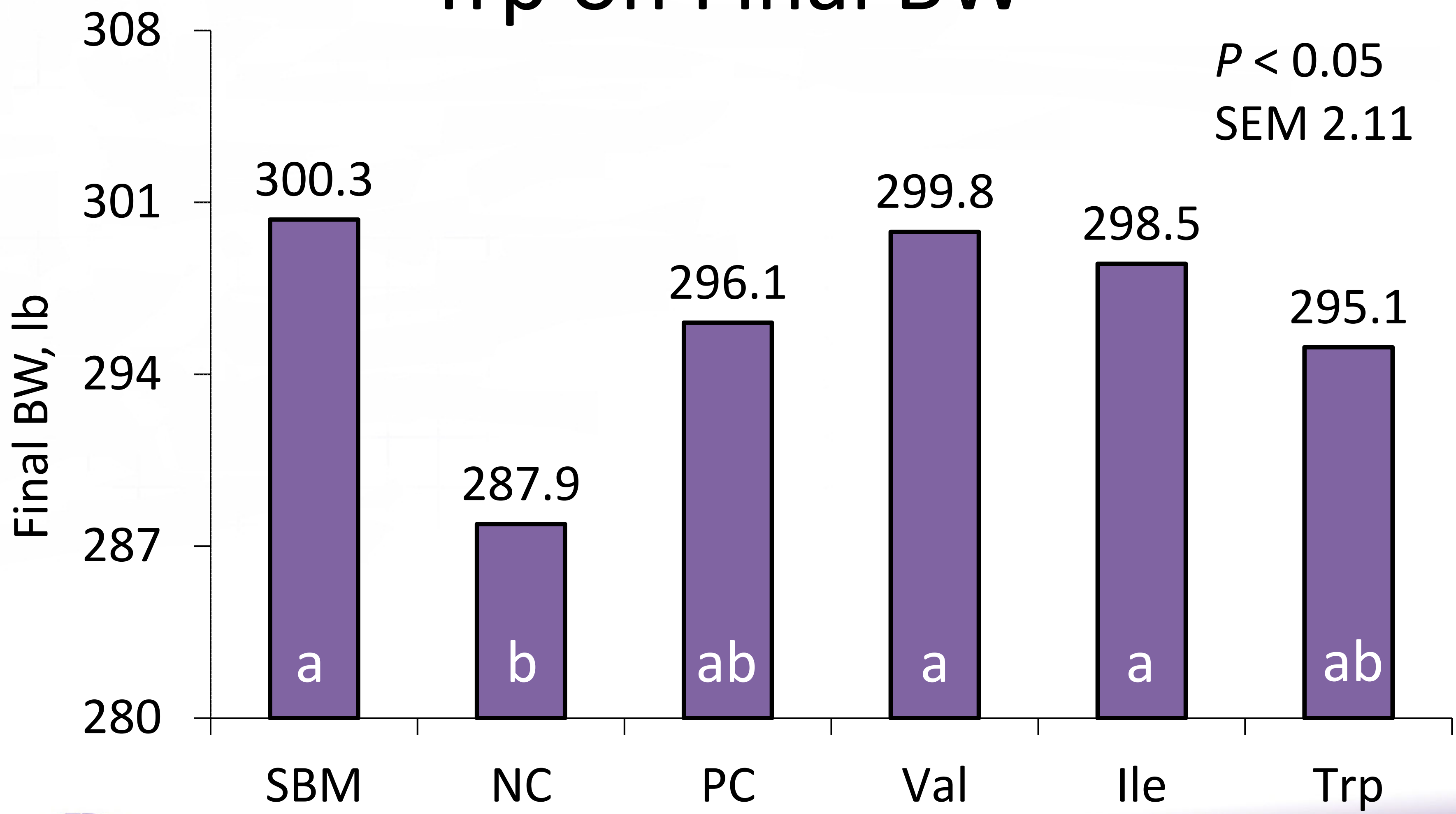
Knowledge for Life

Effects of supplemental Val, Ile, and Trp on Final BW



Kerkaert et al., 2020

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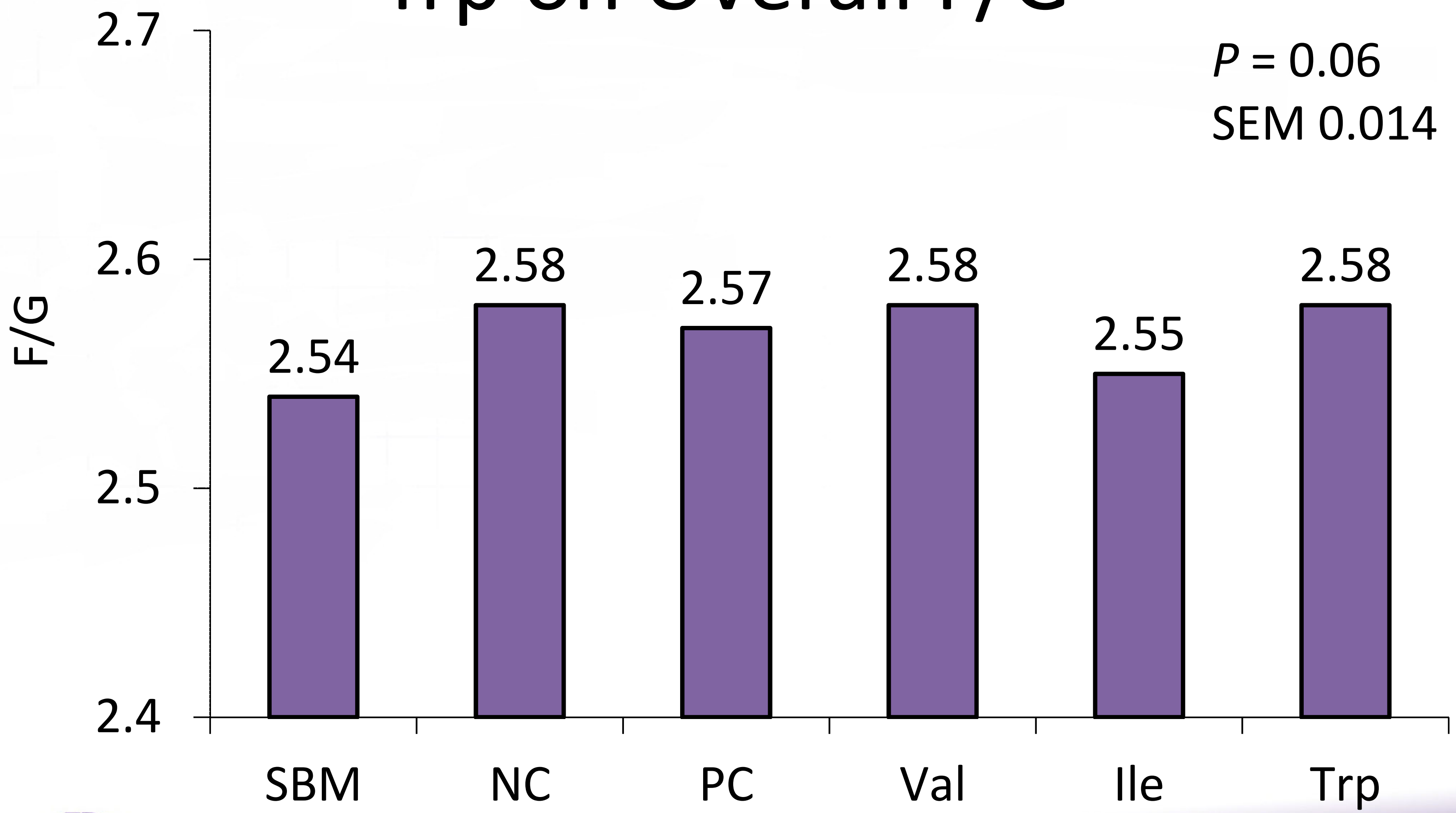
Effects of Supplemental Val, Ile, and Trp on Overall F/G



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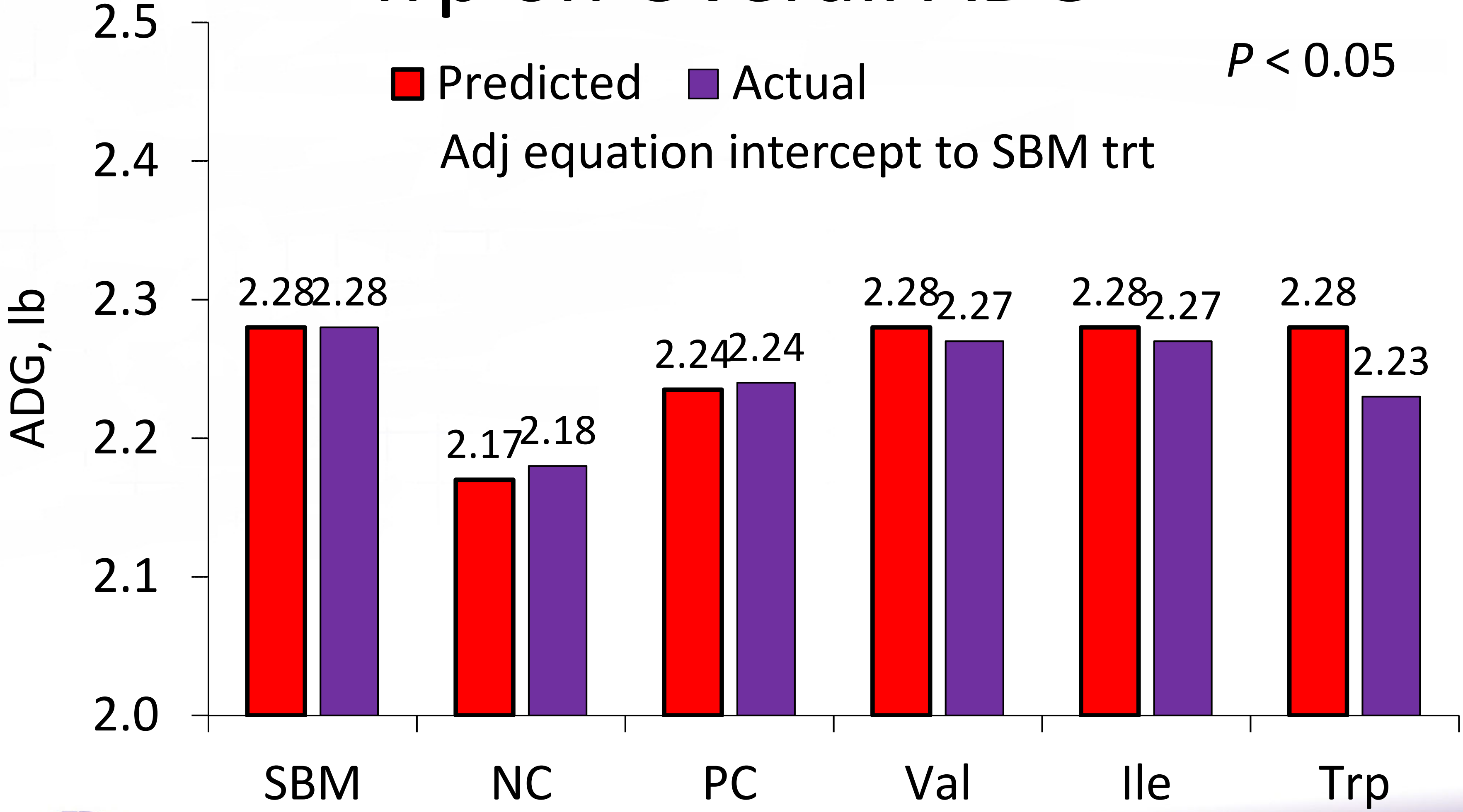
Kerkaert et al., 2020

Knowledge for Life

Effects of Supplemental Val, Ile, and Trp on Overall ADG



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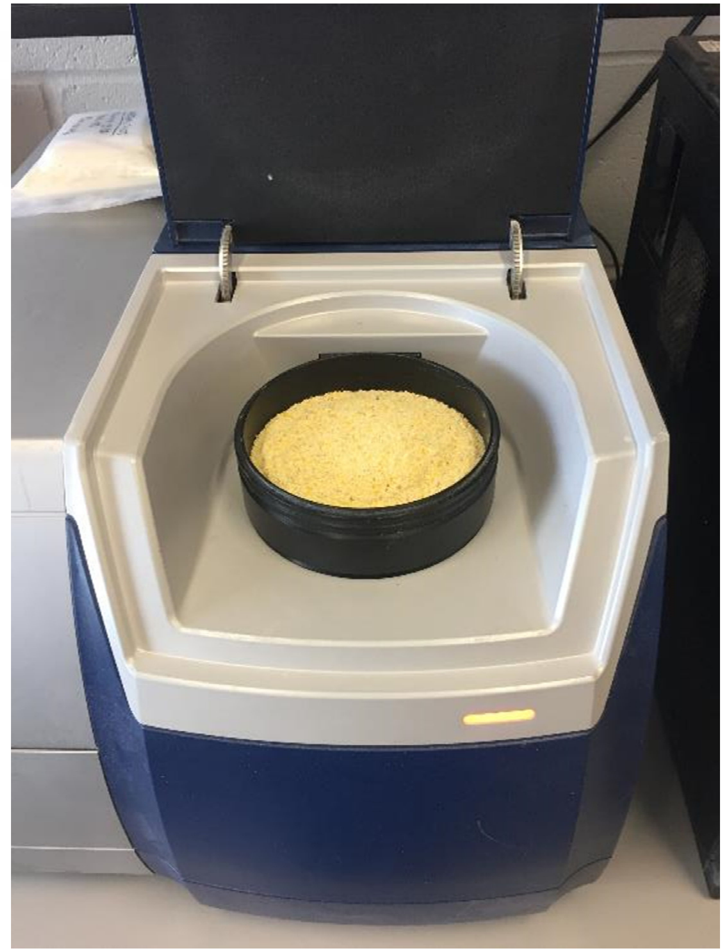
Kerkaert et al., 2020

Knowledge for Life

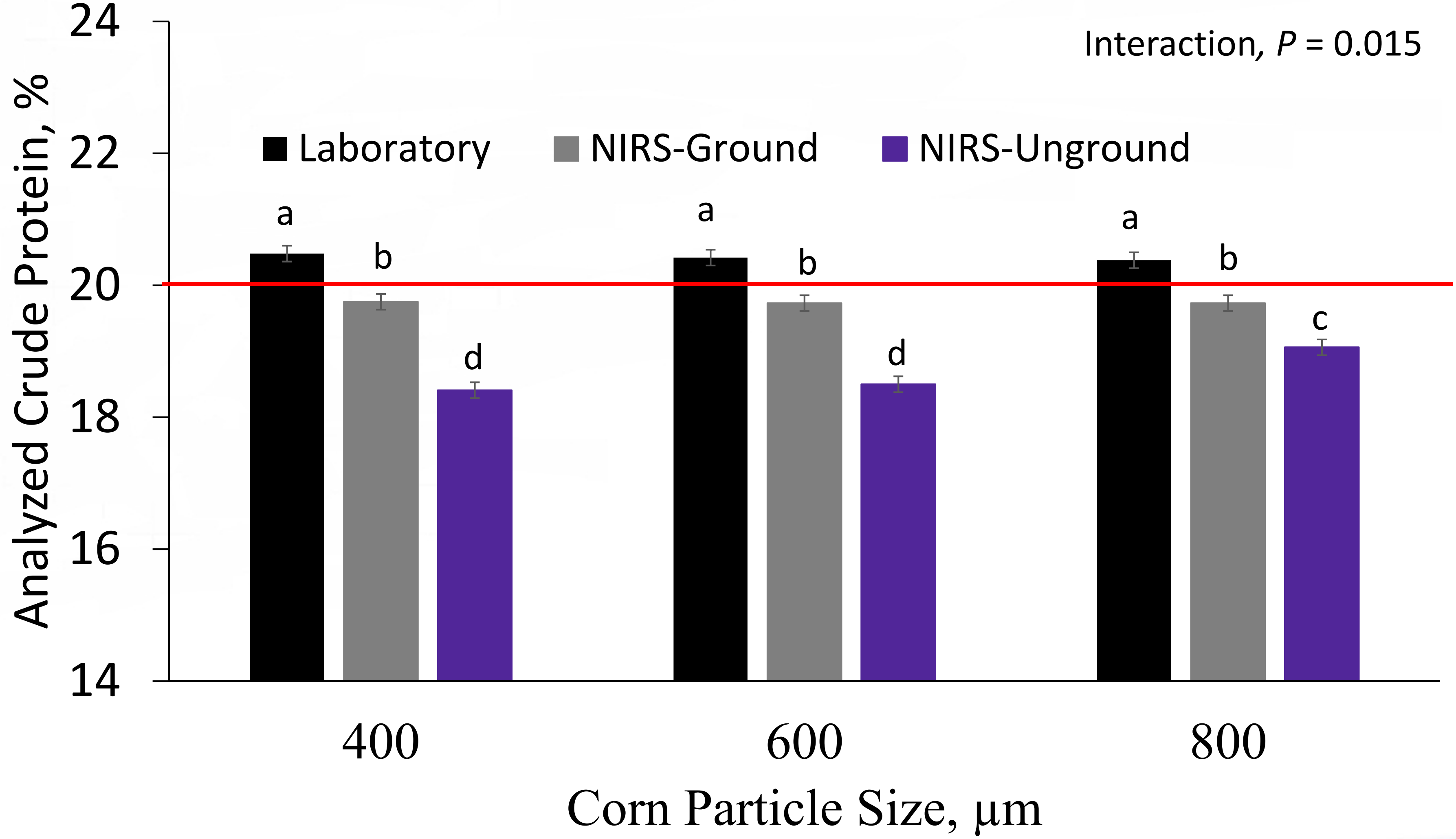
Overview of Feed Science Research

- Update on QA Procedures
  - NIR
  - PDI
- Phytase Stability

Sample Preparation for NIR Analysis



Particle Size



Frempong & Evans, 2018;

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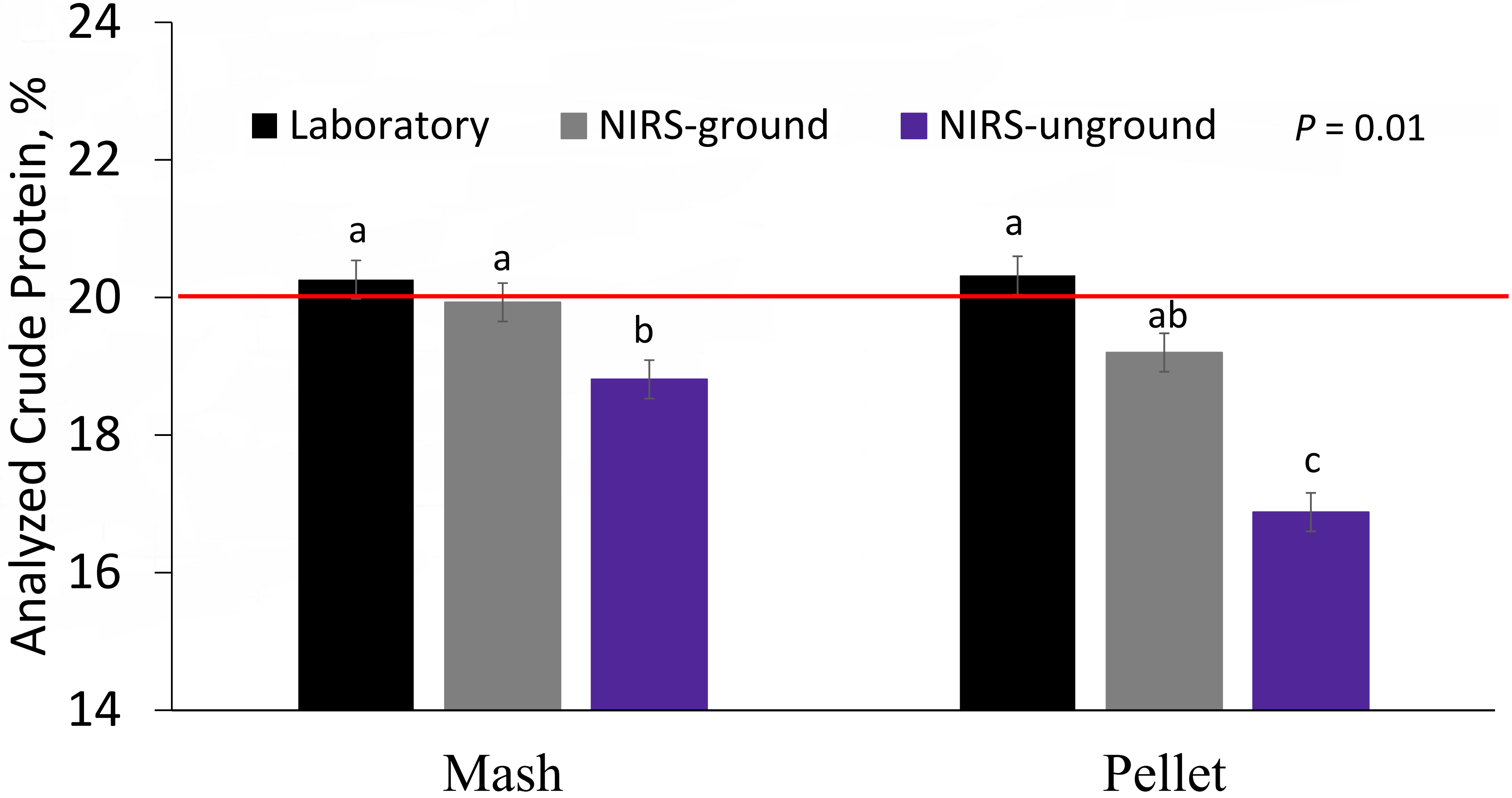
Pellet Samples



Frempong & Evans, 2018

Future Opportunities for QA

- Traditional analytical methods
  - Expensive, skill intensive
    - Urease, TI, KOH
    - Crude protein
    - Available lysine

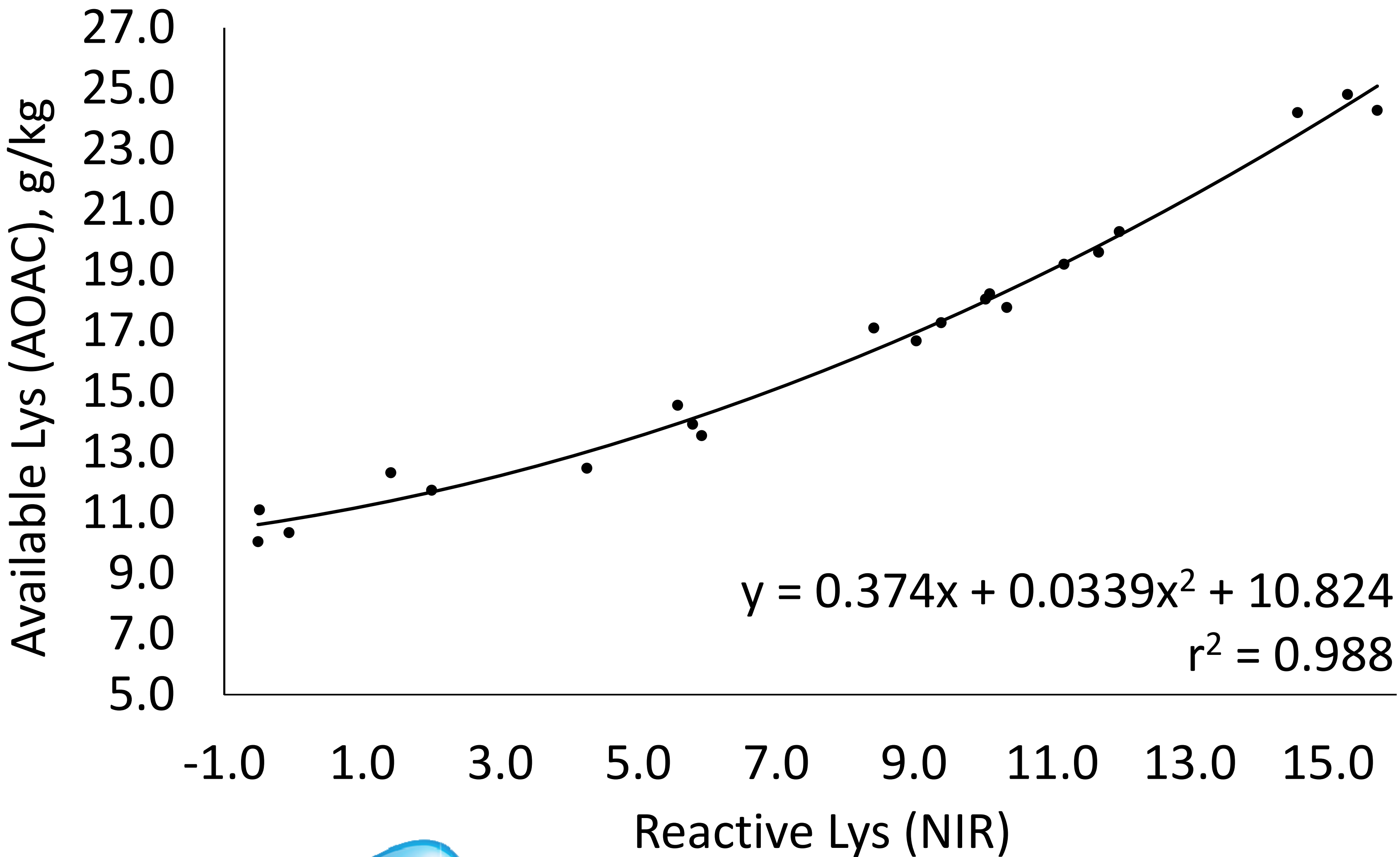
Leco N Analyzer

- Near Inferred Reflectance Spectroscopy
  - Rapid, cost effective
  - Crude protein
  - Amino acids
    - Lysine
  - Reactive Lysine
  - Urease

Foss DS2500

Evans, 2019

Available/Reactive Lys



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ABVista

Dunmire et al., 2019

Knowledge for Life

Potential Opportunity for DDGS

1. Lys:CP ratio
2. Reactive Lys:CP ratio
3. Reactive Lys: Lys ratio

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Holmen NHP100
Pellet Durability Index

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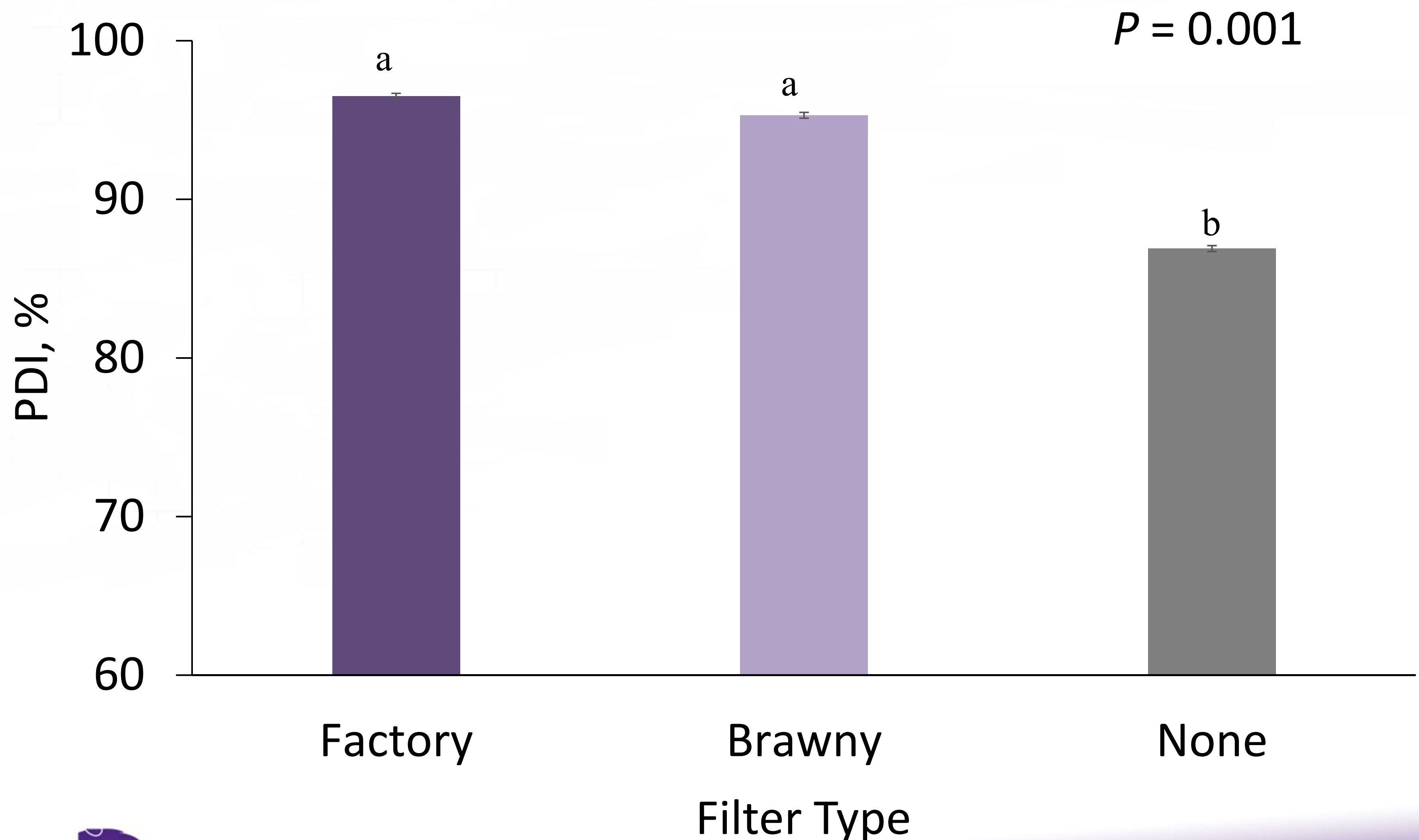
Pellet Durability Index



Evans et al., 2019

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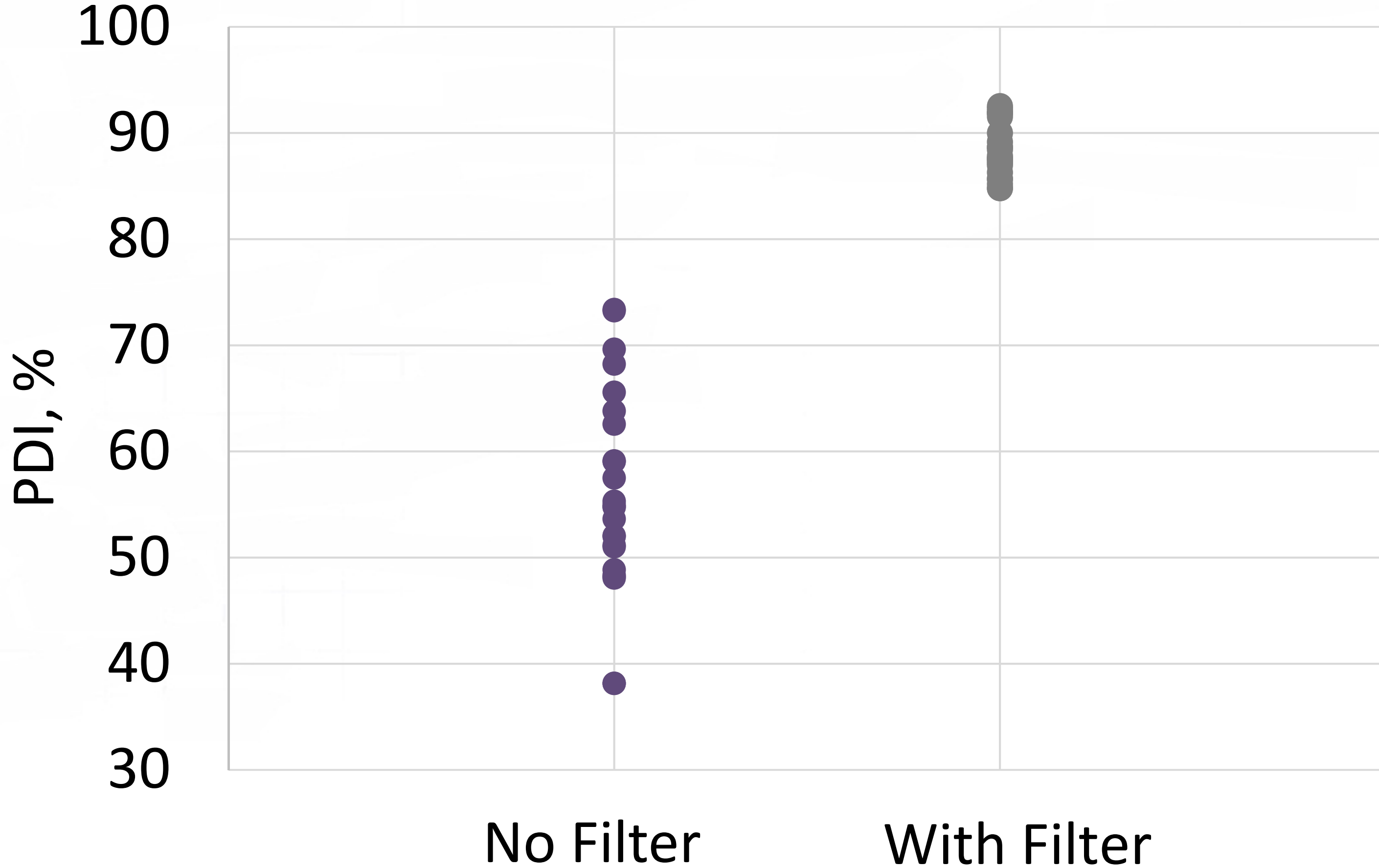
Filter vs No Filter



Average: 56% **Average: 89%**

Std: 9.2% **Std: 2.5%**

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Nichols et al., 2019

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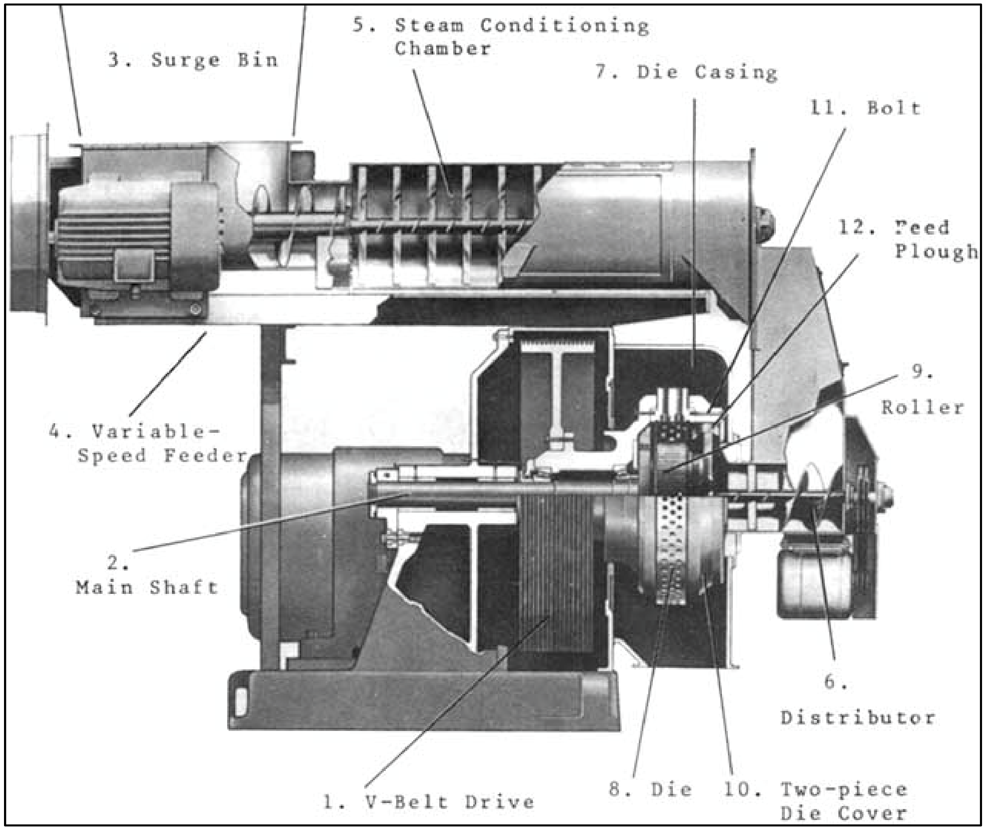
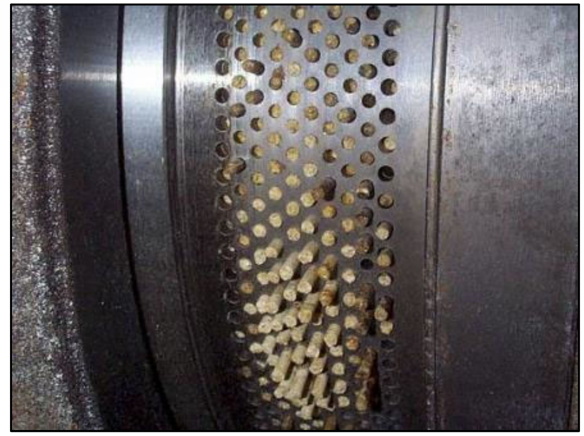
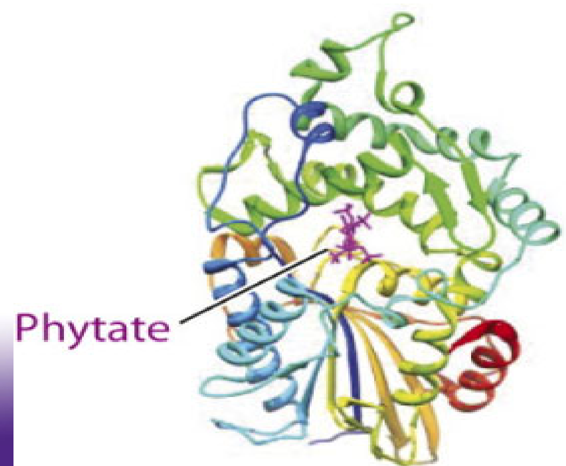
Phytase Stability During Pelleting







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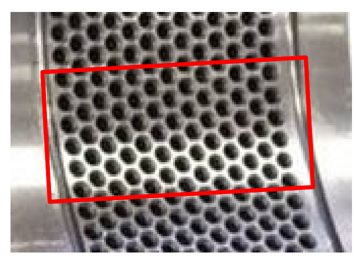
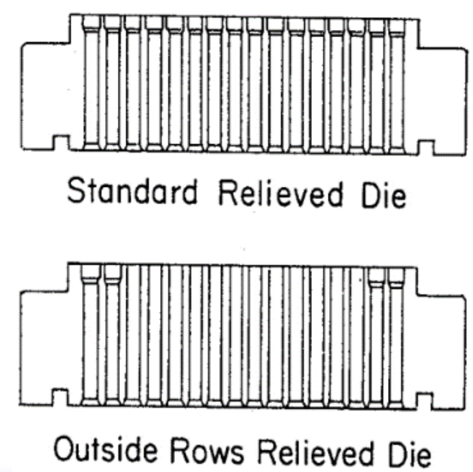
Die Retention Time (DRT) Calculation

$$DRT = \frac{Amount\ of\ material\ in\ the\ effective\ length\ of\ the\ die\ (AMD)^{1}}{Mass\ flow\ rate}$$

$$^{1}AMD = \text{internal die surface area (in}^2\text{)} \times \text{ number of holes per in}^2 \times \text{effective volume per hole (in}^3\text{)} \times \text{ material density } (lb/in^3)$$





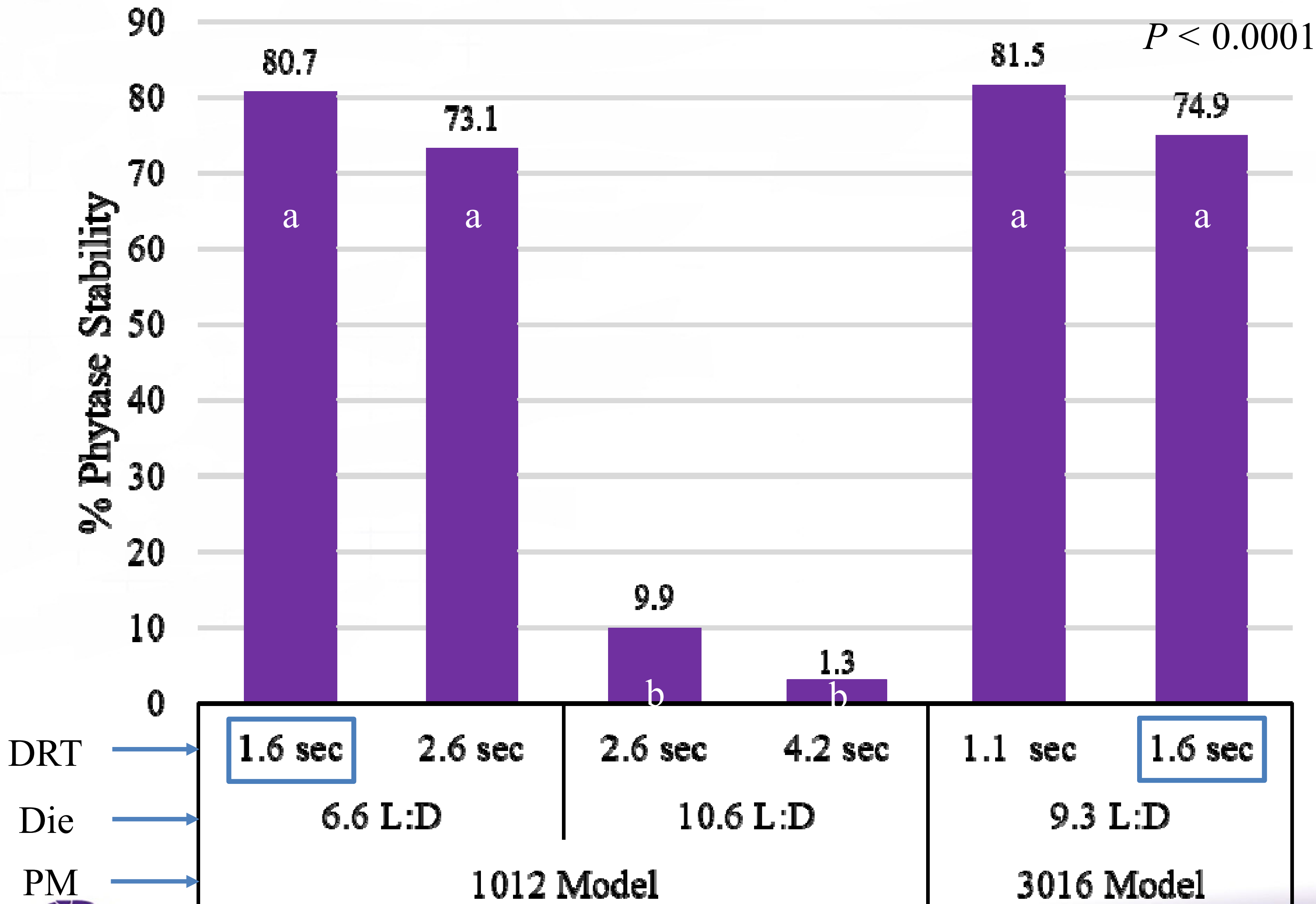
Saensukjaroenphon et al., 2019

Die Retention Time Calculation

Pellet mill model		1012-2				3016-4	
Internal die work area, $inch^2$		85				226	
Die hole diameter, inch		3/16		3/16		3/16	
Effective length, inch		1 ¼		2		1 ¾	
Pellet die length:diameter		6.6		10.6		9.3	
Holes per Die		1187		1187		3316	
Production rate, ton/hr	Actual	1.00	0.63	0.90	0.61	5.85	3.73
	Planned	(1.00)	(0.63)	(1.00)	(0.63)	(6.00)	(3.84)
Die retention time, sec.	Actual	1.6	2.6	2.9	4.3	1.1	1.7
	Planned	(1.6)	(2.6)	(2.6)	(4.2)	(1.1)	(1.6)

Saensukjaroenphon et al., 2019

Phytase Stability for Cooled Pellet Samples



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Saensukjaroenphon et al., 2019

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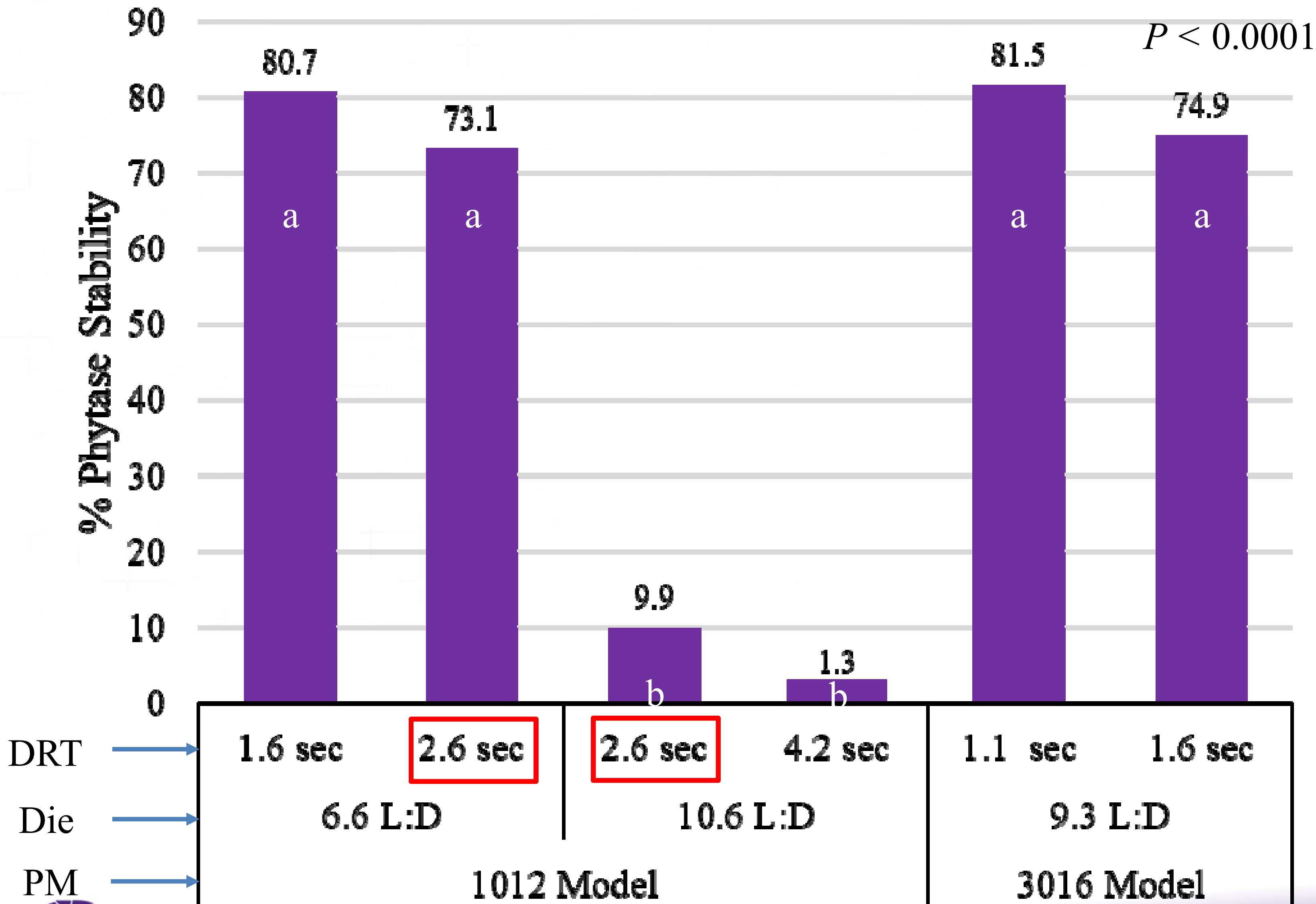
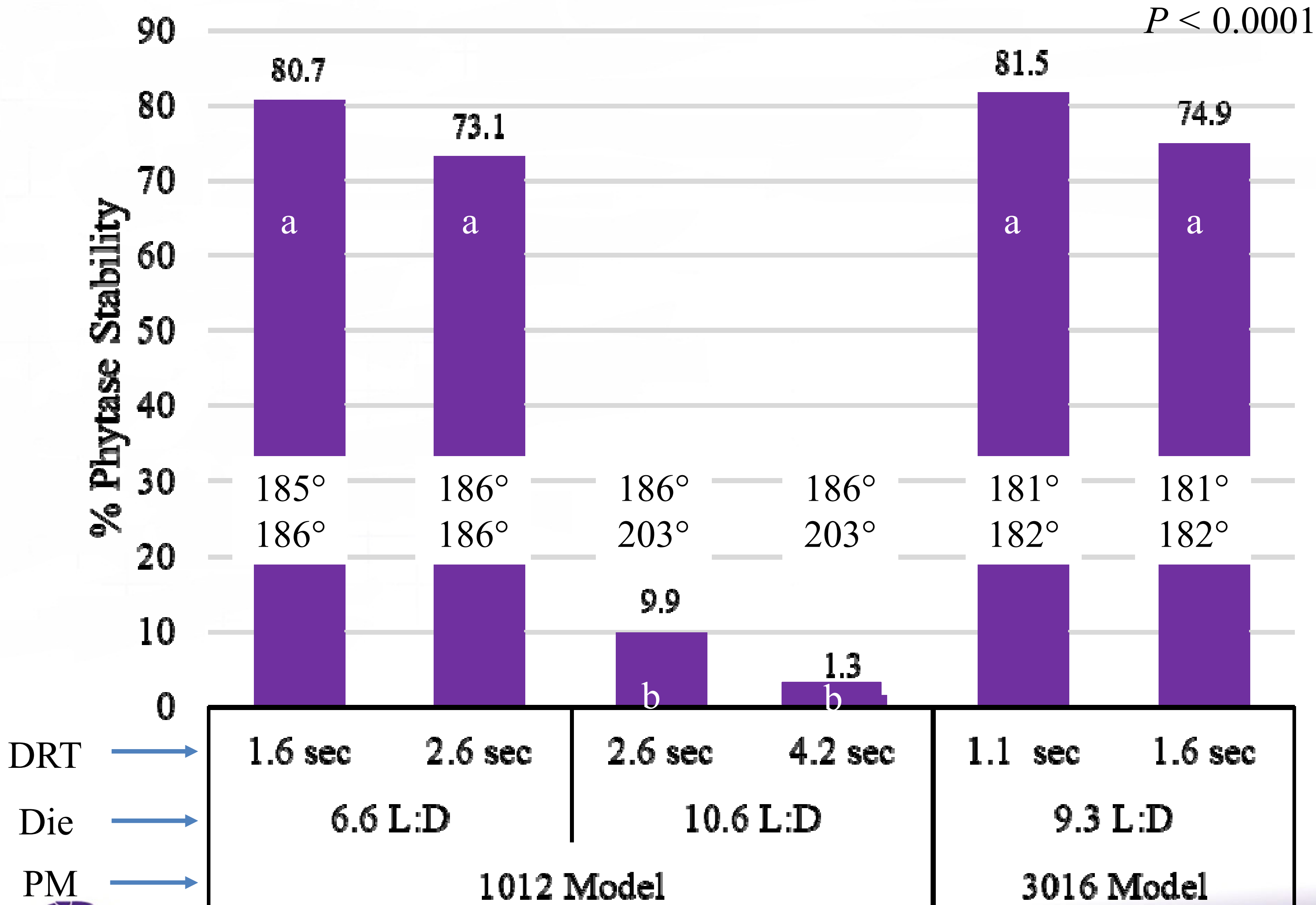
Phytase Stability for Cooled Pellet Samples



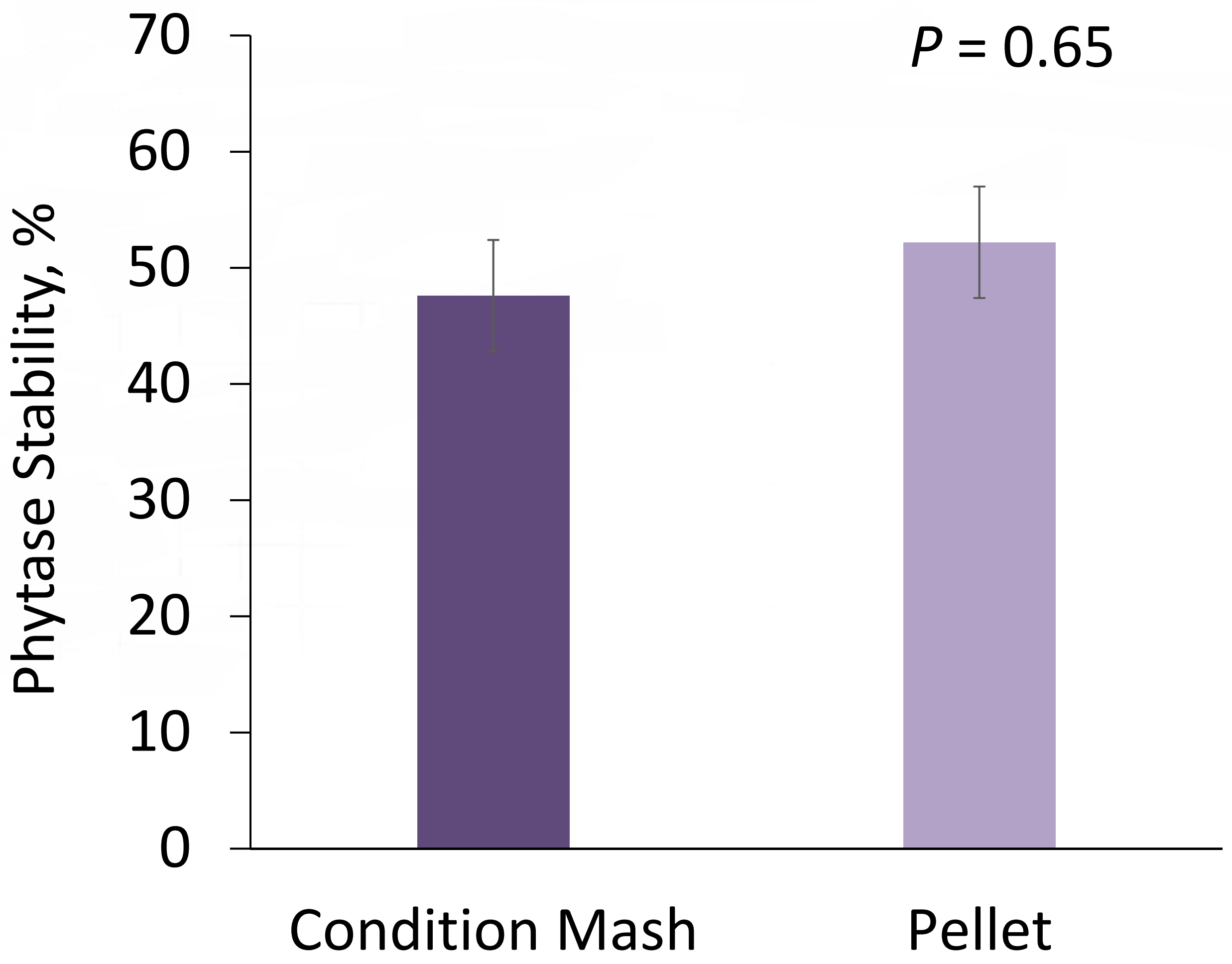
Saensukjaroenphon et al., 2019

Results of Phytase for Cooled Pellet Samples

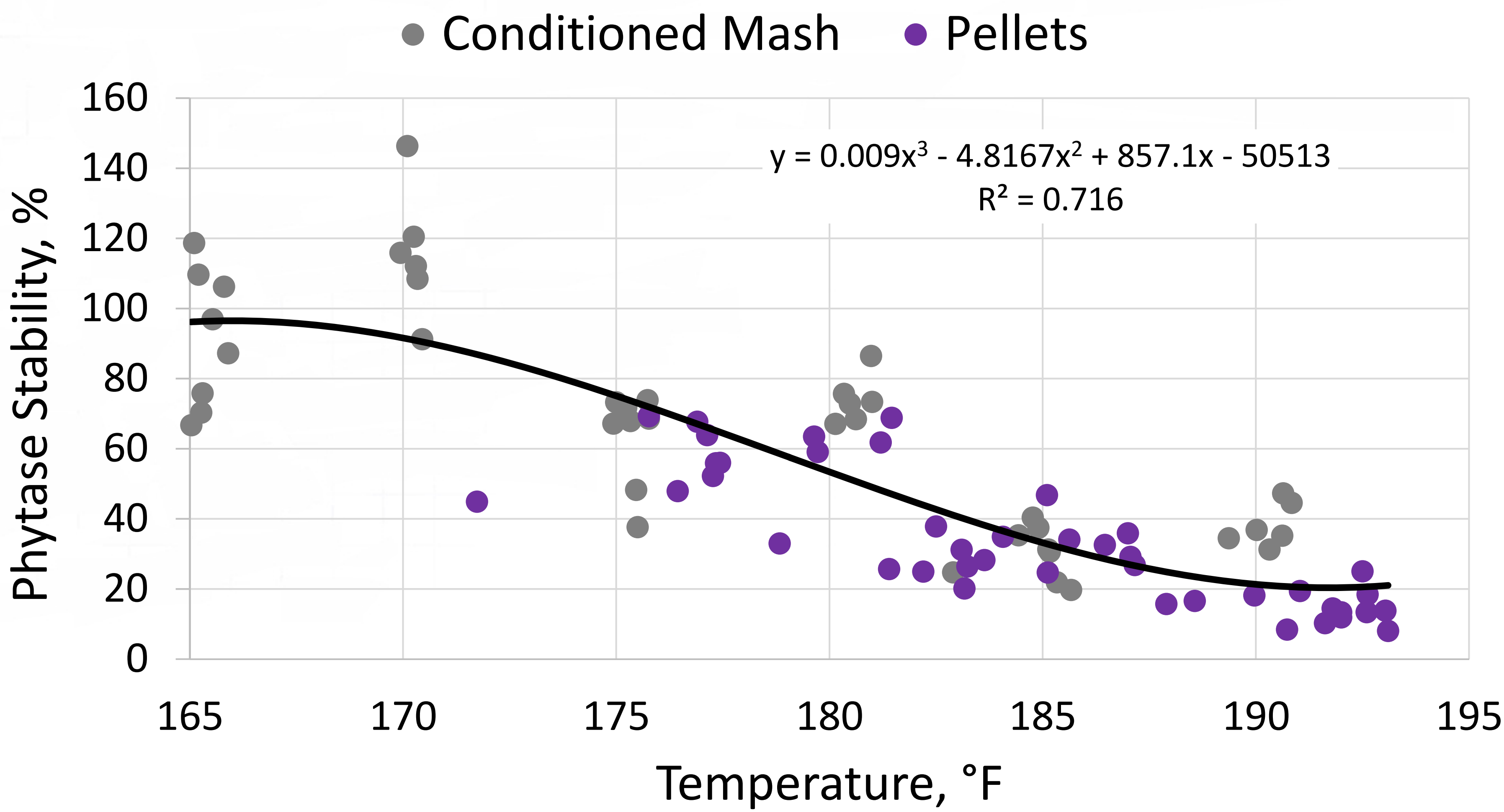


Saensukjaroenphon et al., 2019

Phytase Stability, %



Temperature on Phytase Stability



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Truelock et al., 2019

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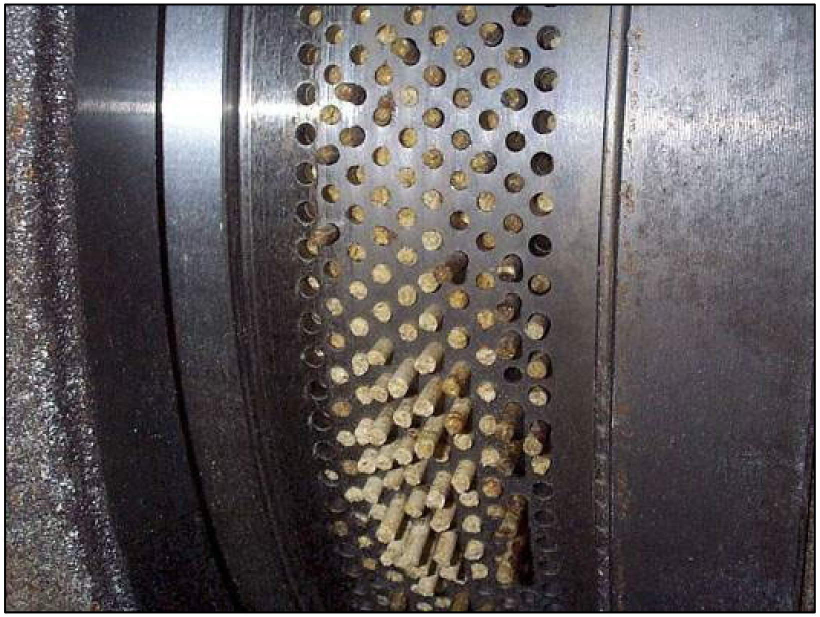
How to Measure Hot Pellet Temperature?

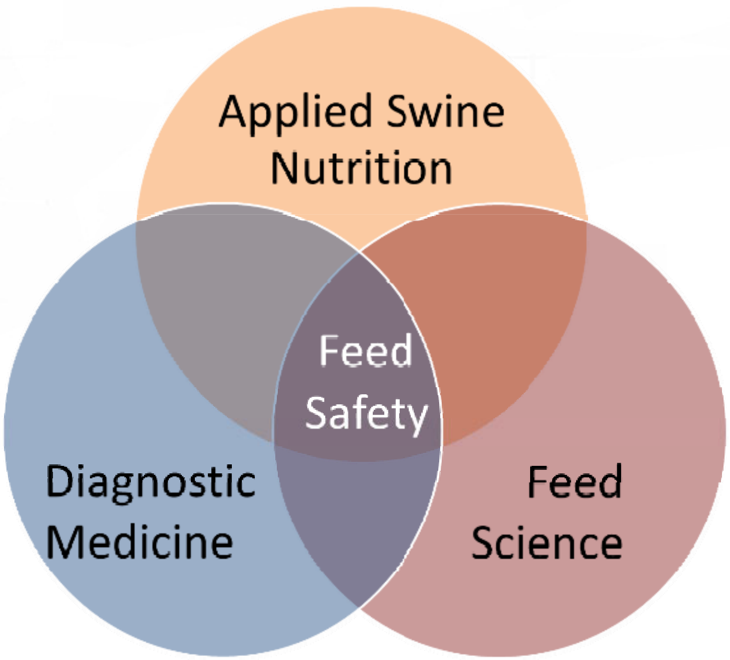


Take Home Message

1. Make sure to grind samples before using the NIR
2. Use a filter when measuring PDI with the Holmen
3. Hot pellet temperature is currently the best indicator for phytase stability.

Accumulated experience in PED control as a strategy in ASF control

Methods to keep viruses out of the feed supply chain



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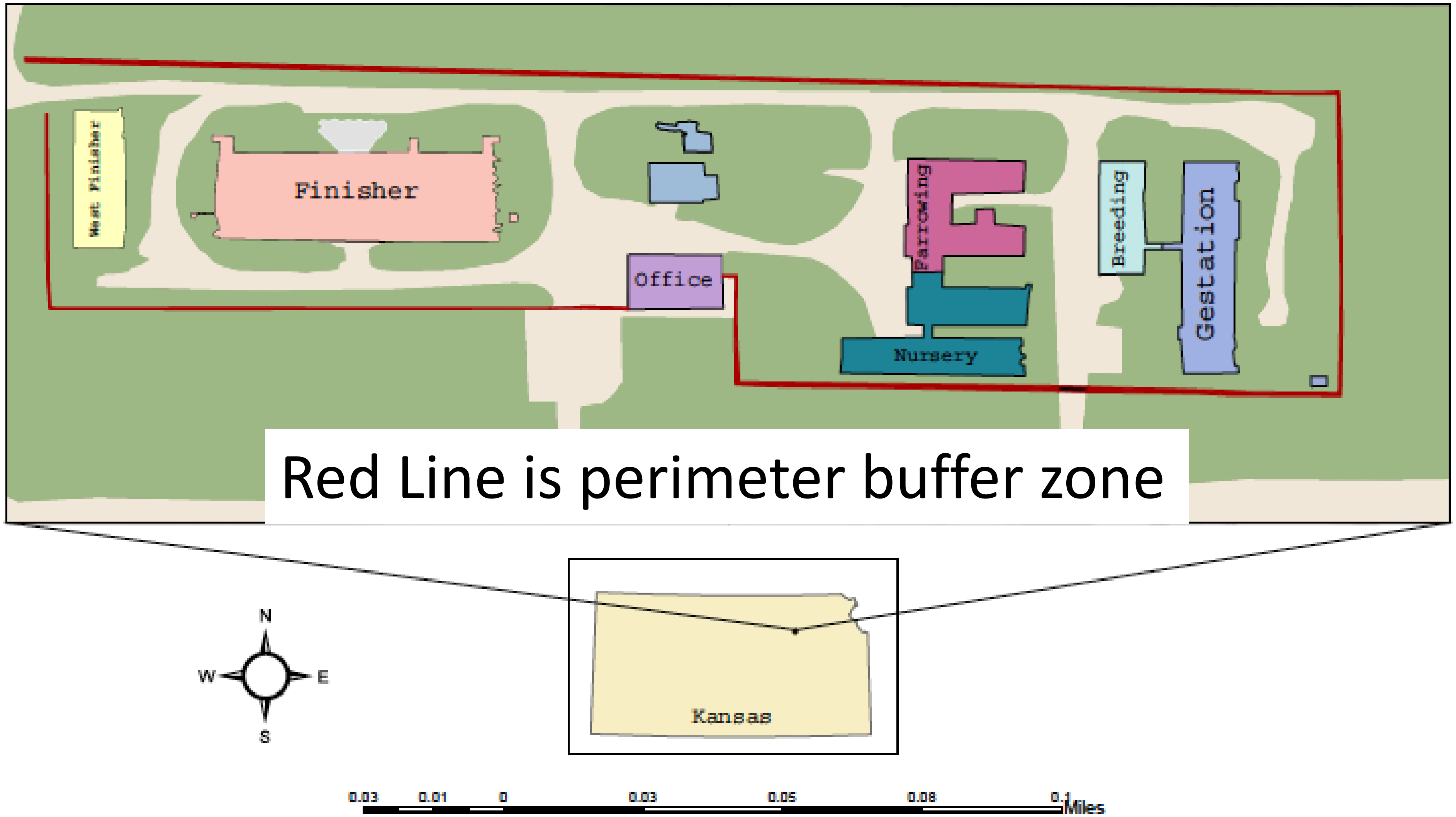
K-State Swine Farm PEDV Infection

- Friday March 8, 2019 newly weaned pigs noted with scours (batch farrow, every 5 weeks)
- Over the weekend sows in gestation began having profuse diarrhea
- Monday AM March 11, 2019 Feces submitted for diagnostic testing
- Afternoon results back positive for PEDV

KSU Swine Unit



Perimeter Buffer Zone

- Pigs, semen, people and supply movement are controlled crossing the perimeter
  - Examples:
    - All gilts quarantined in isolation off site for 8 weeks and tested for PRRS before entry into the farm.
    - Semen delivery is to a cooler that is in the office not directly to the breeding barn.
    - Market pigs are shuttled on a farm trailer to a truck outside the zone.
    - All supplies crossing the perimeter are ensured to have come from pig free zones

K-State Herd Health

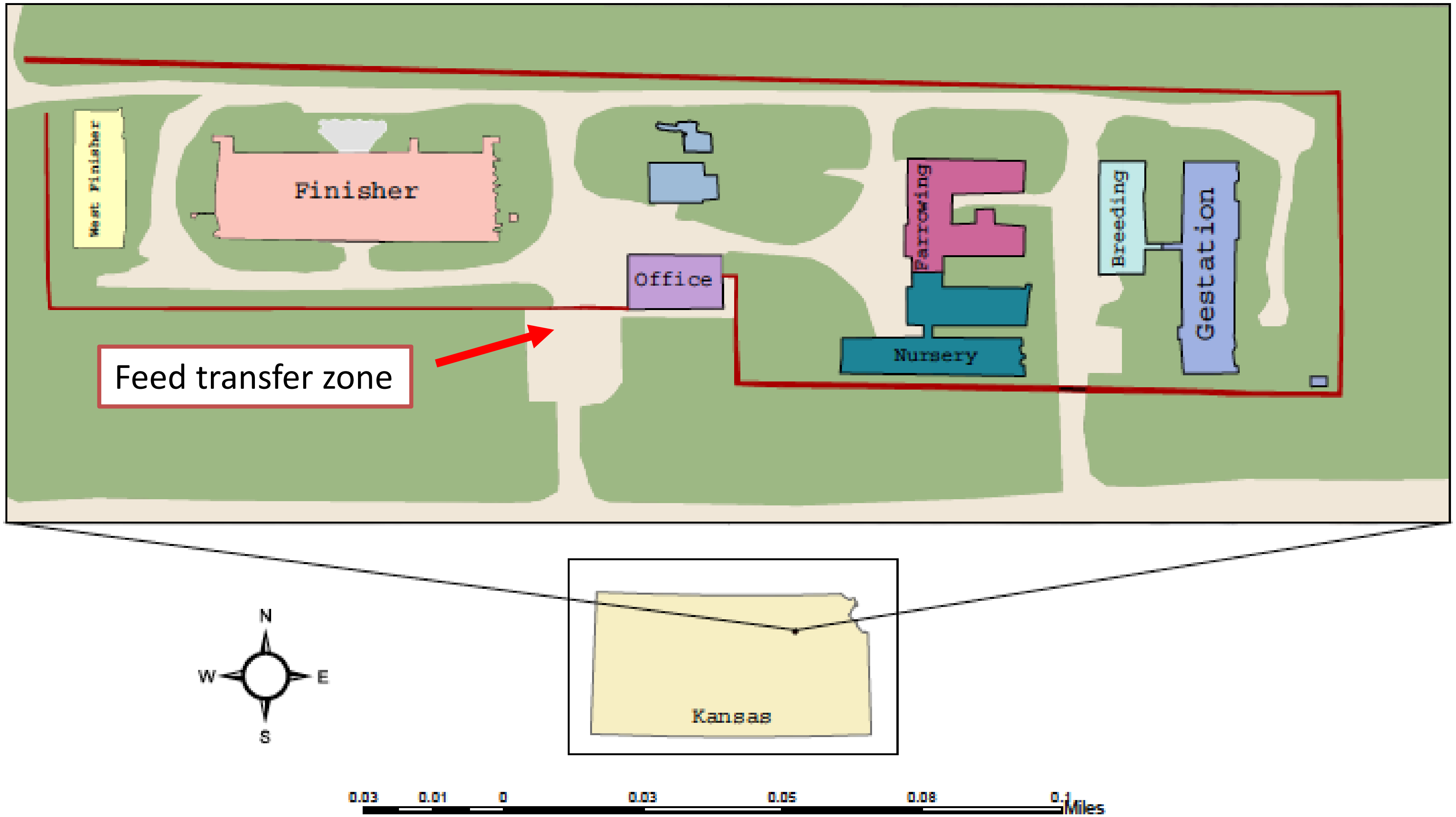
- Eliminated PRRSV in 2000
- No clinical SIV
- No prior corona virus infection
- Virtually no adverse health event in almost 20 years

After PEDV Diagnosis Implemented Changes to Biosecurity:

- Clean coveralls going into each room
- Limited all outside entrance to the farm
- Segregated employees:
  - Finisher
  - Farrowing/Nursery
  - Breeding Gestation
- Feed transfer protocol

Note: Feed bins are inside the perimeter buffer.

KSU Swine Unit



Feed mill would have been contaminated without implementing the feed transfer protocol

March 30, 2019 Testing	PED PCR ct
Farm Feed Truck Cab	**32.38**
Farm Feed Truck Tire FR	**35.91**
Farm Feed Truck Tire FL	Neg
Farm Feed Truck Tire RR	**33.76**
Farm Feed Truck Tire RL	Neg

Location	PED PCR ct
Feed Truck	Neg
Feed Truck floor Mats	Neg
Feed Truck Tires	Neg

Note: Lower PCR ct = More Virus

Knowledge for Life

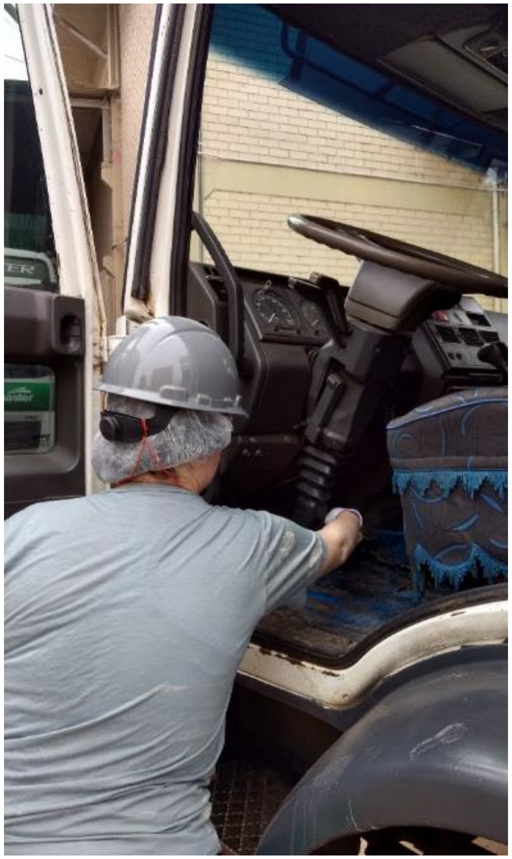
March 30, 2019 Testing

Concern: High levels of PEDV contamination in all areas of the <u>farm including entrance transition zones</u>.

	Location	Result
1	Before Entrance bench	34.8
2	After Entrance bench	35.2
3	Before Employee shower	33.3
4	Before inside transition	31.1
5	After inside transition	30.2
6	Floor North Transition	33.2
7	Floor West Transition	33.4
8	Office Floor	30.2
	Transition into/out Farm	

	Location	Result
9	Farrowing Hallway	29.3
10	Farrowing Transition	35.1
25	Nursery Hallway	28.67
11	Nursery Transition	30.18
12	Nursery Transition	26.69
23	Entrance to nursery	27.87
24	Entrance to nursery	28.59
13	Finsher Tranition	32.35
14	Entrance to finisher	27.37
15	Entrance to finisher	24.58
16	Entrance to finisher	25.03
17	Entrance to finisher	26.83
34	Floor Mat	Neg
35	Forklift tires	Neg
36	Load out	Neg
	Farm Working Areas	
	Feed Mill	

Environmental Testing Procedure
Use moistened gauze to swab surfaces



After PEDV Diagnosis Implemented Changes to Biosecurity:

- Clean coveralls going into each room
- Limited all outside entrance to the farm
- Segregated employees:
  - Finisher
  - Farrowing/Nursery
  - Breeding Gestation
- Feed transfer protocol

Not successful! (Segregated employees)

Successful! (Feed transfer protocol)

April 3, 2019 Testing

Location	Result	Location	Result
Steve's Car	Neg	Feed Truck Cab	**37.06**
Worker Car	**37.42**		
Worker Car	Neg		
Worker Car	Neg		
Worker Car	Neg		
Student Car	**36.4**		
Student apt	**34.46**		
Floor before bench	Neg		
Floor after bench	Neg		
Floor and door into shower	**36.75**		
Floor before inside bench	**33.82**		
Floor after inside bench	**32.09**		
Office Floor	**34.05**	Feed Ttruck floor Mats	Neg
West Door Transition	Neg	Feed Truck Tires	Neg
North Door Transition	**35.81**	Dust collection	Neg
Office desk	**33.64**	Control Room	Neg
Men's Bathroom	**33.09**	Corn cleaner Dust	Neg
Outside Perimeter Buffer		Farm Working Areas	
Transition into/out Farm		Feed Mill	

Improvement: However concerning that vehicles and student apartment are contaminated since these are outside the perimeter buffer containment zone. Also, office areas are still contaminated.

Multiple disinfections per day in office area and transition zones.

Boots stay in the inside of each barn

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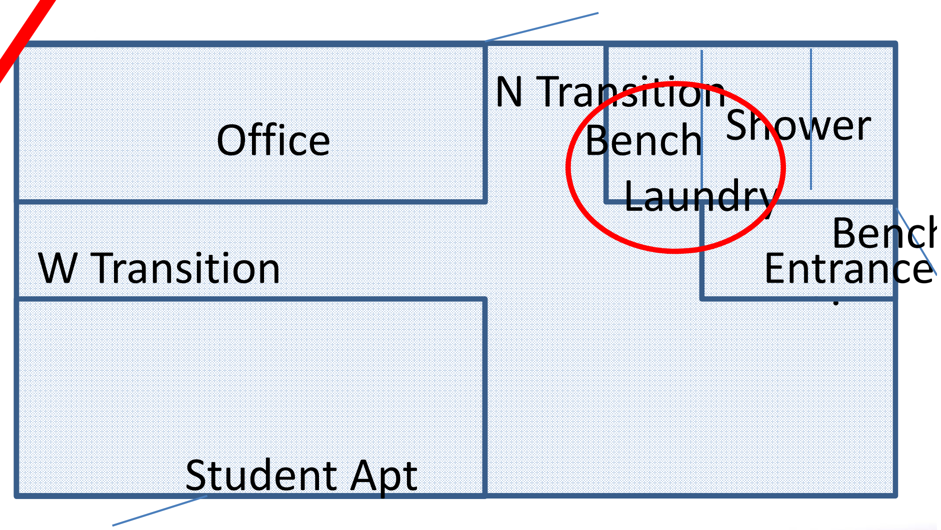
April 16, 2019 Testing

	Location	Result
1	Worker Cars	Neg
2	Worker Cars	Neg
3	Worker Cars	Neg
4	Worker Cars	Neg
5	Worker Cars	Neg
6	Worker Cars	Neg
7	Student Apt	Neg
8	Before entrance bench	37.5
9	After the entrance bench	Neg
44	Just inside men's shower	Neg
10	Mens shower Change area	Neg
11	Before Womens Shower	Neg
12	After Womens Shower	Neg
13	Before Employee shower	Neg
14	After Employee Shower	Neg
15	Washer Dryer Floor	31.2
16	Before inside transition	32.83
17	After inside transition	Neg
18	Office Floor	Neg
19	Office Floor	Suspect
20	Office W Transition	Neg
21	Office N Transition	Neg
	Vehicles	
	Transition into/out Farm	

Concerning: Low level contamination before entrance bench which is outside perimeter zone. Heavy contamination in the shower laundry transition area.



April 30, 2019 Testing

Prior to the outbreak these pallets would have been sent back to the feed mill.

Location	Result
Old nursery transition zone	31.6
R1 Old nursery pens:	31.2
R2 Old nursery pens:	28.1
New nursery transition zone	34.9
Gestation transition zone	37.0
Finishing transition zone	35.1
Farrowing transition zone	Neg
Farrowing floor	32.6
Farrowing Office	31.2
Feed room pallets	29.3
Farrowing pallets	34.3
Farm Working Areas	
Feed Mill	

May 13, 2019 Testing

Location	Result
Worker Car	**37.1**
Worker Car	Neg
Worker Car	Neg
Student Apt	Neg

Challenge: Worker compliance decreases over time. Need to continually review protocols.

Footprint on bench indicates lack of compliance!

May 13, 2019 Testing

	Location	Result
	Laundry area after shower	35.15
	Floor before the inside bench	33.18
	Floor after the inside bench	33.79
	Washer/dryer past Transition	Neg
	Hallway floor	Neg
	Office floor	Neg
	North transition zone	Neg
	West transition zone	Neg
	Office	37.36

Challenge: Laundry and transition zones still have contamination.

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Research and Extension

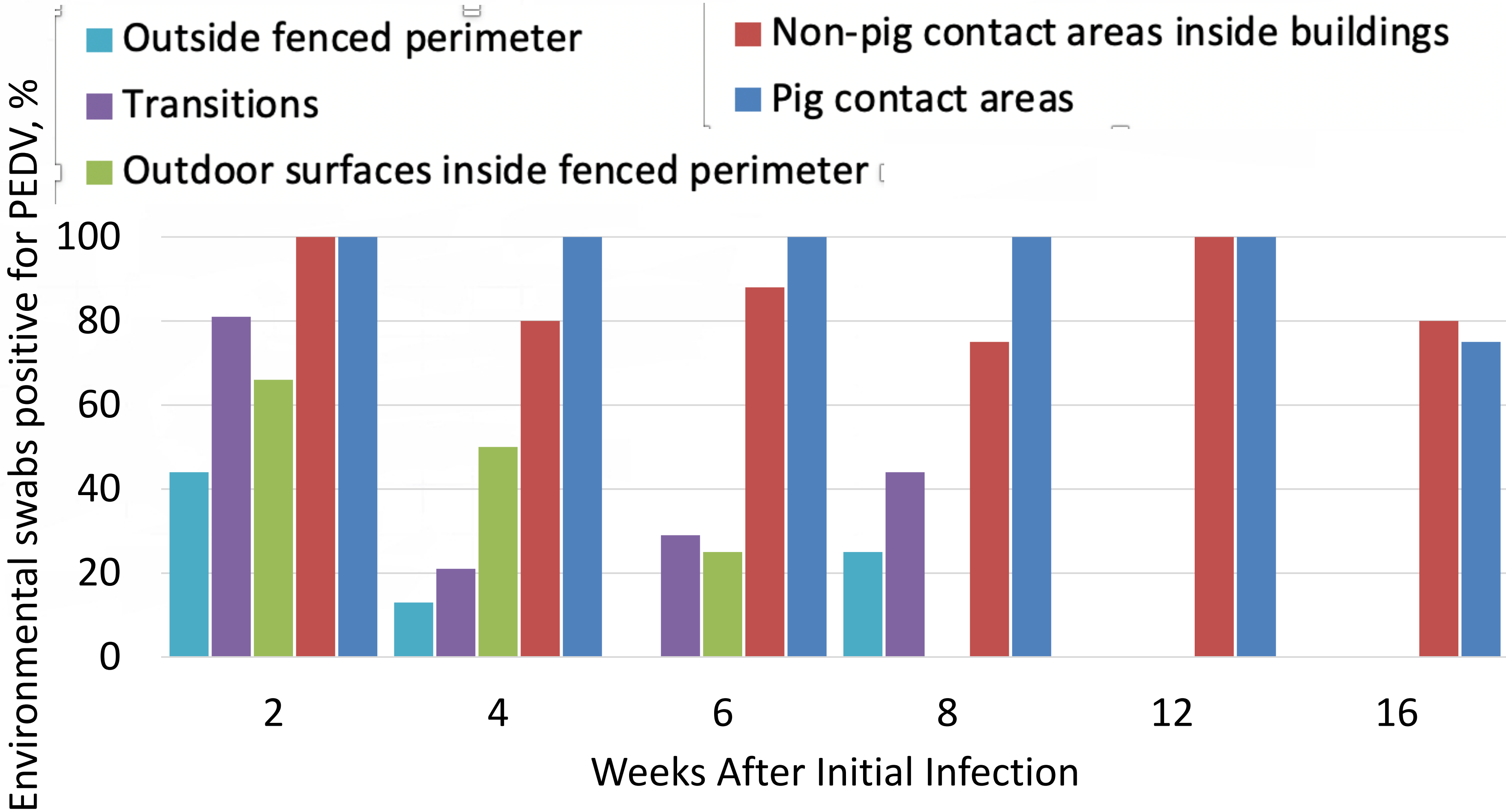
June 12, 2019 Testing

Location	Result
Worker Car	Neg
Just before the entrance bench	Neg
Just after the entrance bench	Neg
Washer/dryer by showers	Neg
Floor before the inside bench	Neg
Floor after the inside bench	Neg
Washer/dryer past Transition	Neg
Office Floor	Neg
Vehicles	
Transition into/out Farm	

First time all transition zone areas are negative while still having areas of contamination in the growing pig population

K·STATE
Research and Extension

Percentage of environmental samples testing positive for PEDV via qRT-PCR after initial infection



No positives ever detected at feed mill or nearby nursery

K·STATE Research and Extension

Knowledge for Life

Monitoring the PEDV in the **environment** was critical to educate employees

K-STATE
Research and Extension

Knowledge for Life

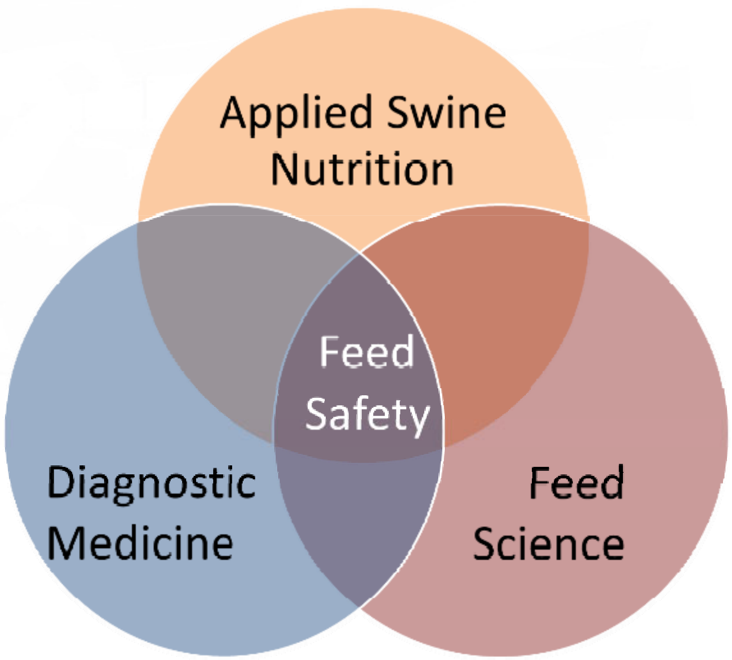
Does environmental monitoring apply for ASFV?

No	Location	Result
1	Cabin before disinfection	**Pos**
2	Wheels before disinfection	Neg
3	Cabin after disinfection	Neg
4	Wheels after disinfection	Neg
5	Cabin before disinfection	**Pos**
6	Wheels before disinfection	Neg
7	Cabin after disinfection	Neg
8	Wheels after disinfection	Neg
9	Cabin before disinfection	Neg
10	Wheels before disinfection	Neg
11	Cabin after disinfection	**Pos**
12	Wheels after disinfection	Neg

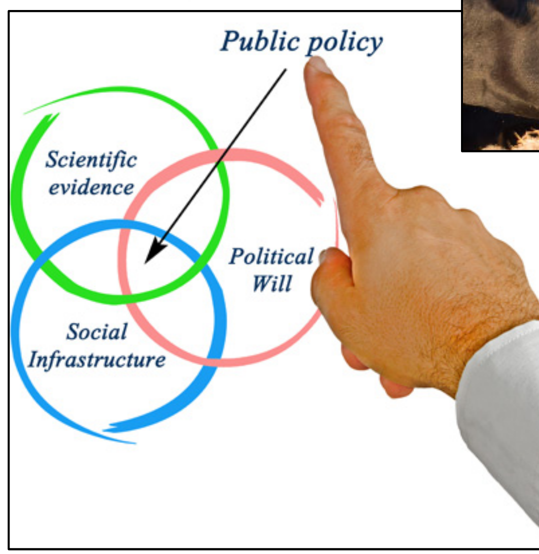
No	Location	Result
13	Cabin before disinfection	**Pos**
14	Wheels left before disinfection	Neg
15	Wheels right	Neg
16	Cabin after disinfection	Neg
17	Wheels left after	Neg
18	Wheels right after	Neg

66 other samples from within the feed mill and ingredients all **Neg**.

Kansas State University Feed Safety Team



Helping Kansas Pork Producers via Feed Safety Science and Policy



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Research and Extension

Knowledge for Life

K-State Feed Safety Outreach with Industry and Policy in 2019

- ASF Bio-Security Task Force
  - *What types of feed mill biosecurity can be applied to prevent feed-based transmission and contamination of feed mills?*

STANDARD NUTRITION COMPANY

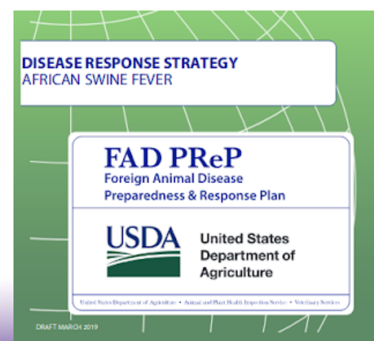
DFS ANIMAL NUTRITION "Your Value Adding Partner"

PIPESTONE SYSTEM

- Foreign animal disease response planning activities
  - *In the midst of an outbreak, how can non-infected animals within a control zone be delivered feed safely?*

VS National Training and Exercise Program

African Swine Fever SFEAR Exercise
September 23 – 26, 2019


DISEASE RESPONSE STRATEGY
AFRICAN SWINE FEVER
FAD PReP
Foreign Animal Disease Preparedness & Response Plan
USDA United States Department of Agriculture
DRAFT MARCH 2019

Kansas Secure Pork Supply Plan

The Kansas Secure Pork Supply Plan (KS SPS Plan) is a tool for the Kansas Swine Industry to be implemented for guidance when moving animals from uninfected farms during a foot-and-mouth disease (FMD), Classic Swine Fever (CSF), or African Swine Fever (ASF) outbreak in North America. The movement of animals with guidance from this document will help to support the economic viability of the Kansas swine industry during an outbreak.

The goals of the KS SPS Plan are to:

- Support the economic viability of the Kansas swine industry during and after an FMD, CSF or ASF outbreak
- Provide for efficient and effective response to minimize disease spread
- Support a continuous supply of pork to consumers
- Provide guidance to reduce disease spread throughout livestock sectors once stop movement orders are lifted

KS SPS Plan Document

- Draft Kansas Secure Pork Supply Summary Plan

Contact - Emily Voris
KDA, Animal Health Planner,
Emily.Voris@ks.gov 785-210-7741.

K-State Feed Safety Outreach with Industry and Policy in 2019

- Feed Risk Task Force
  - Determined voluntary importation restrictions are a better option for minimizing risk vs. current regulatory channels
  - Current questions:
    - *What activities are possible for minimizing the risk of feed-based ASFV entry and transmission?*
    - *In the absence of a NAHLN-validated assay, what would a 'non-negative' mean in a feed or ingredient?*
    - *What would be an appropriate confirmatory test?*

K-State Feed Safety Collaboration with Industry and Policy in 2019

- Scientific advising to FDA, USDA, Dept. Homeland Security
  - Current questions:
    - *If ASFV is identified in the U.S., should there be a porcine-to-porcine feeding ban put in place, similar to BSE (at least temporarily)?*
      - *Can this affect the pet food industry?*
    - *Are there feed additives available that have been scientifically demonstrated to mitigate ASFV?*
      - *How can their regulatory approval be streamlined?*

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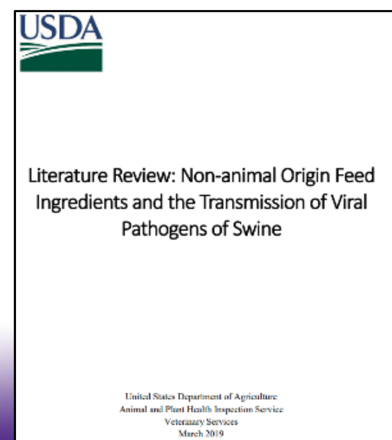
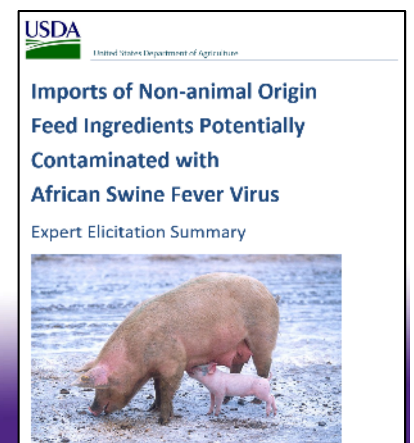
Research and Extension

Homeland Security
Critical Infrastructure Partnership Advisory Council


USDA

Literature Review: Non-animal Origin Feed Ingredients and the Transmission of Viral Pathogens of Swine

United States Department of Agriculture
Animal and Plant Health Inspection Service
Veterinary Services
March 2019

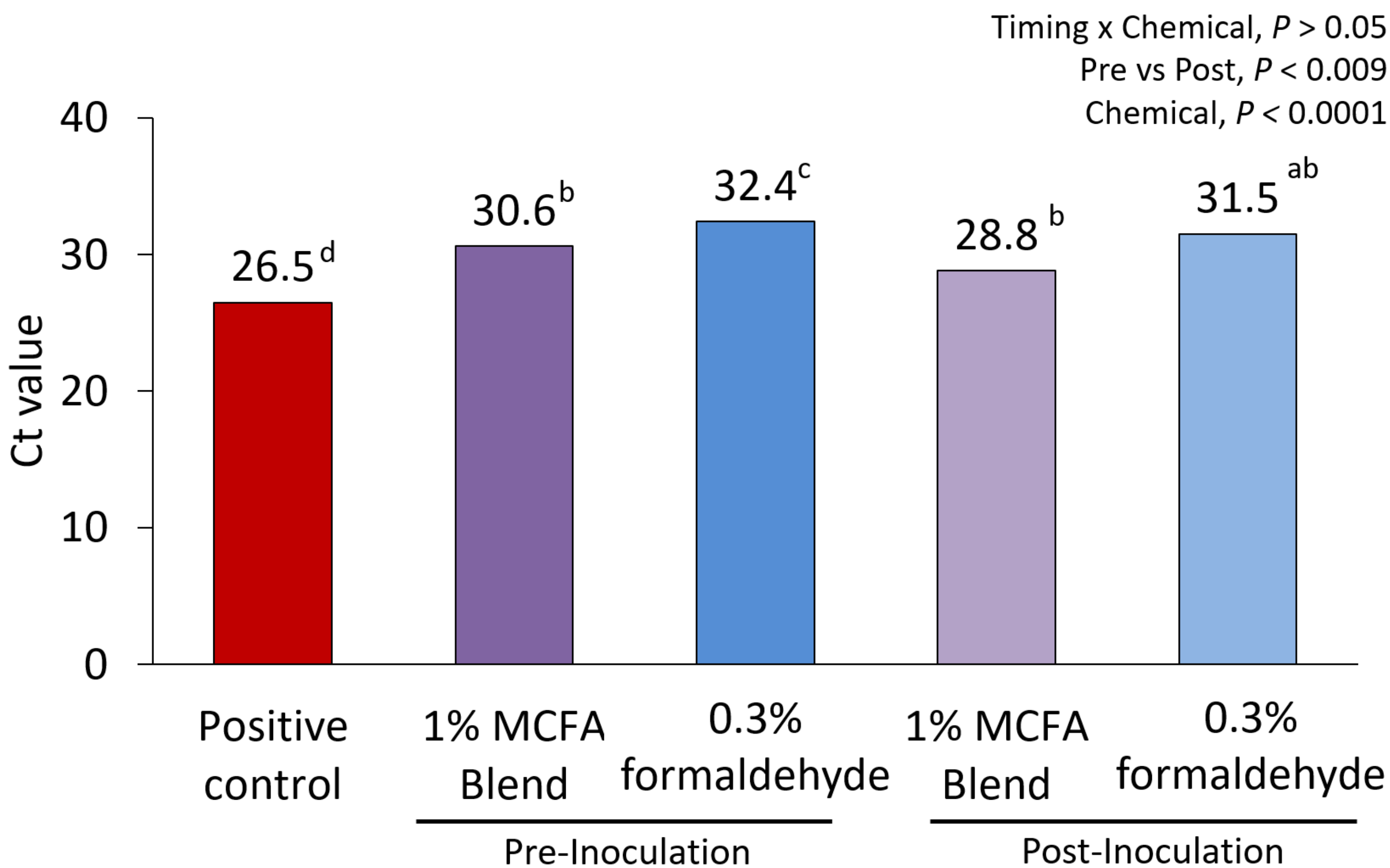

USDA
United States Department of Agriculture

Imports of Non-animal Origin Feed Ingredients Potentially Contaminated with African Swine Fever Virus

Expert Elicitation Summary

Effect of medium chain fatty acids on porcine epidemic diarrhea virus in swine feed

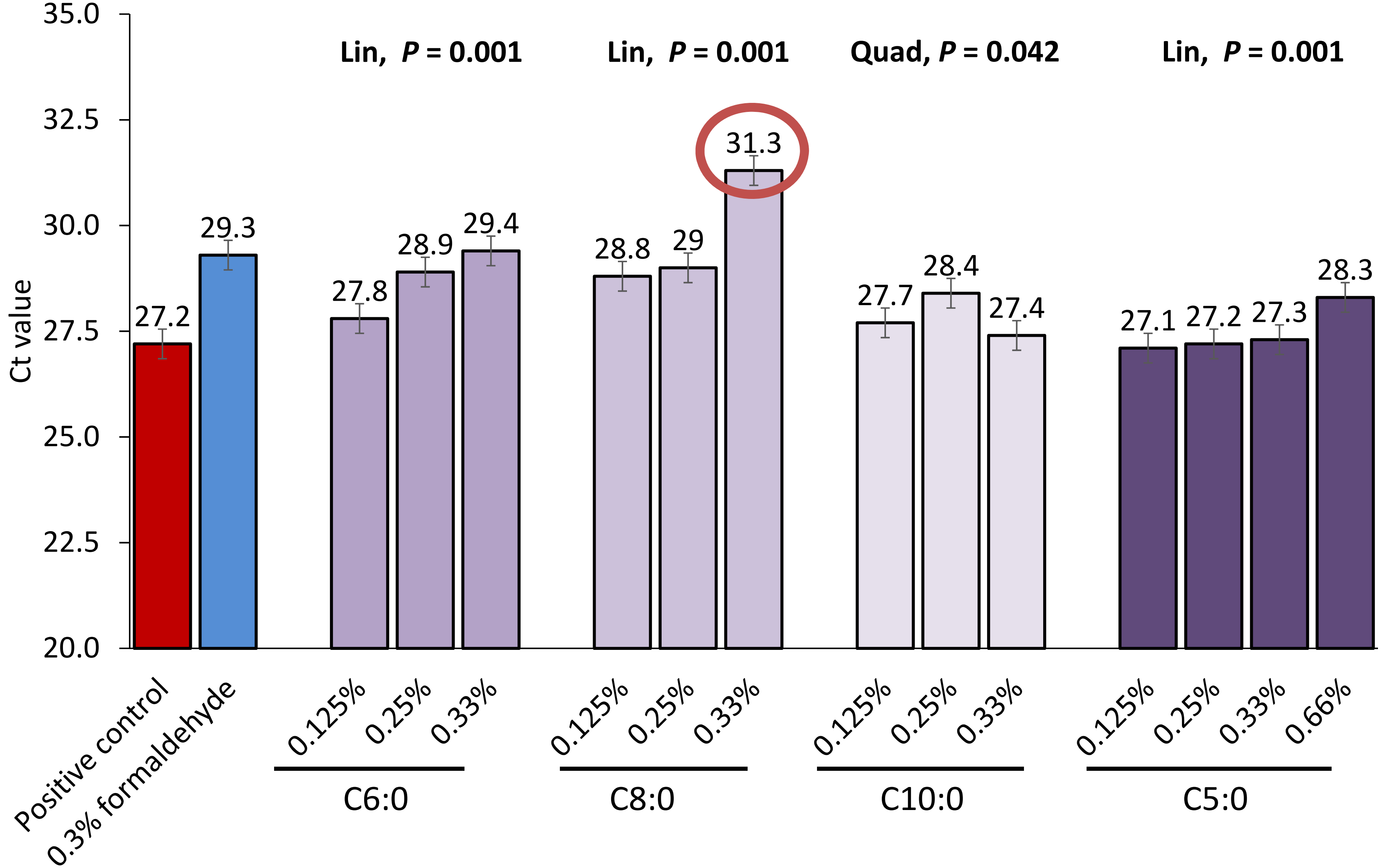
Exp. 1: Effect of timing and chemical mitigant on PEDV detection



SEM =0.46
MCFA blend = 1:1:1 C6:C8:C10

Lerner et al., 2019

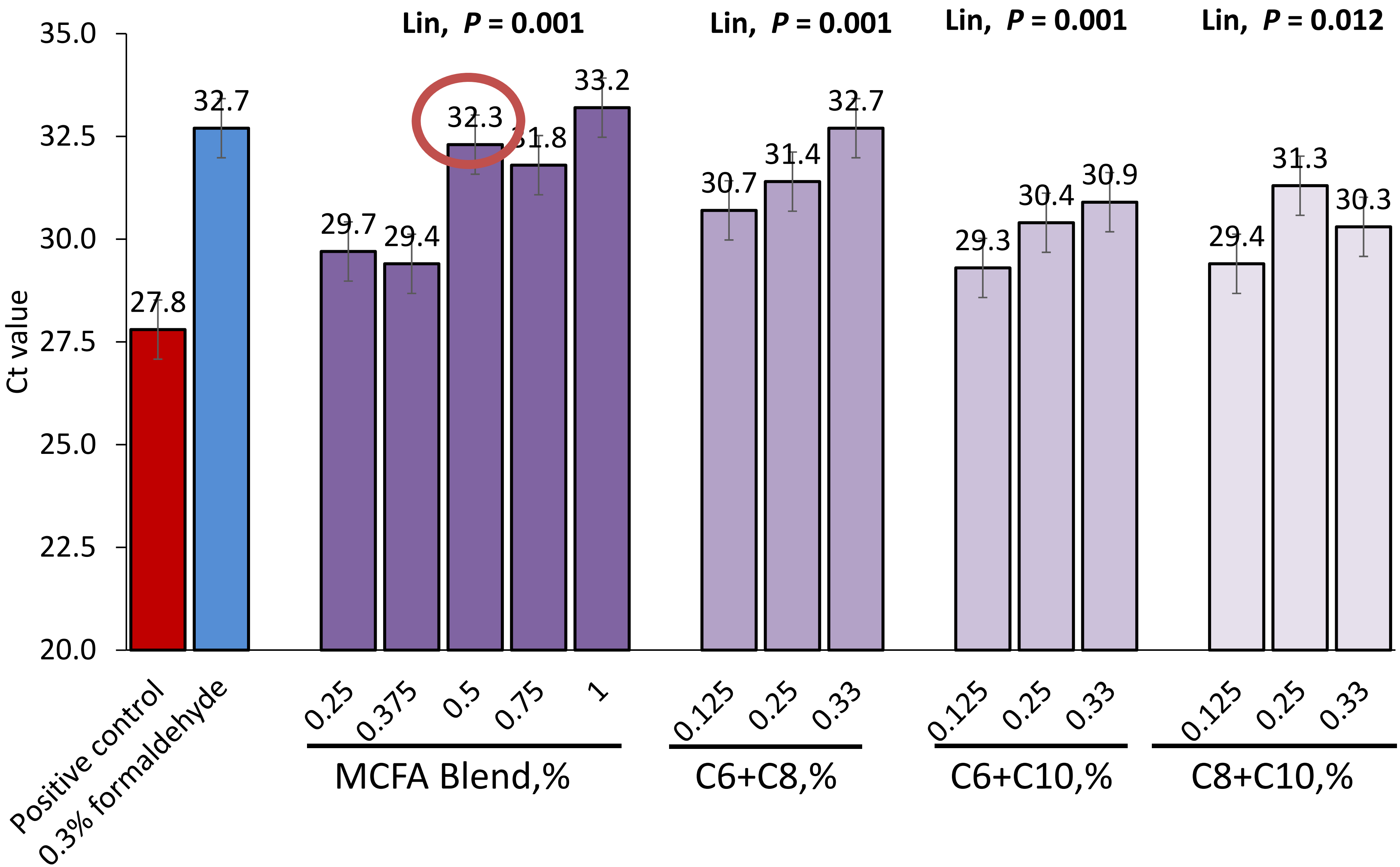
Exp. 2: Effect of varying levels of MCFA on PEDV detectability



All treatments applied pre-inoculation

Lerner et al., 2019

Exp. 3: Effect of varying levels and combinations of MCFA on PEDV detectability



All treatments applied pre-inoculation.

Lerner et al., 2019

Exp. 4: Evaluation of select chemical treatments in bioassay

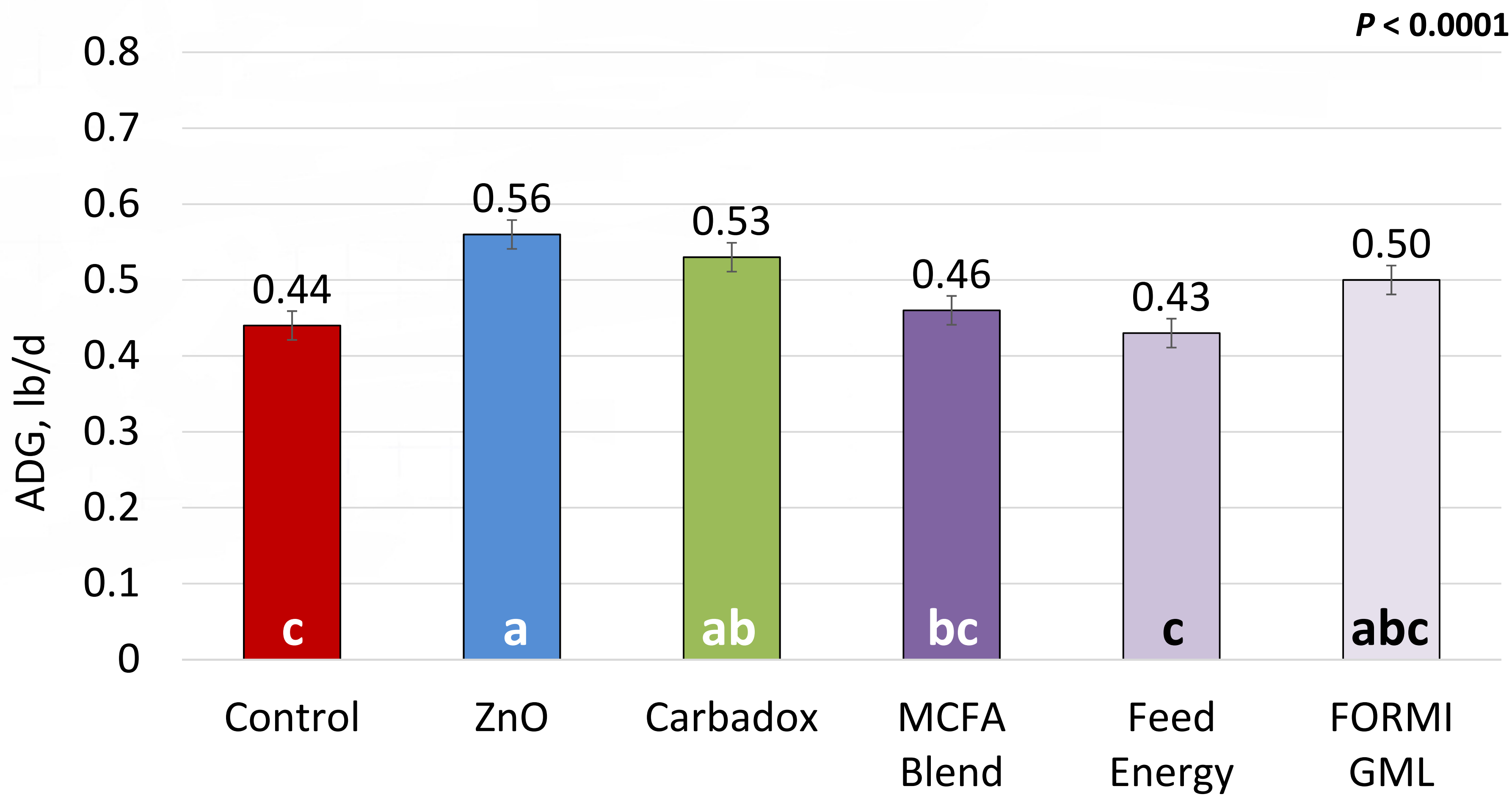
Item	Feed Ct	Fecal swabs, dpi[1]					Cecal content, 7 dpi
		-2	0	3	5	7	
Negative control	> 36	---[2]	---	---	---	---	> 36
Positive control	28.0[b]	---	---	+--	++-	+--	25.4
0.3% formaldehyde	29.2[b]	---	---	---	---	---	> 36
0.5% MCFA Blend	32.2[a]	---	---	---	---	---	> 36
0.3% C8	32.9[a]	---	---	---	---	---	> 36

[1] A (+) indicates evidence of PEDV infectivity and (-) indicates no evidence of infectivity with one symbol per pig

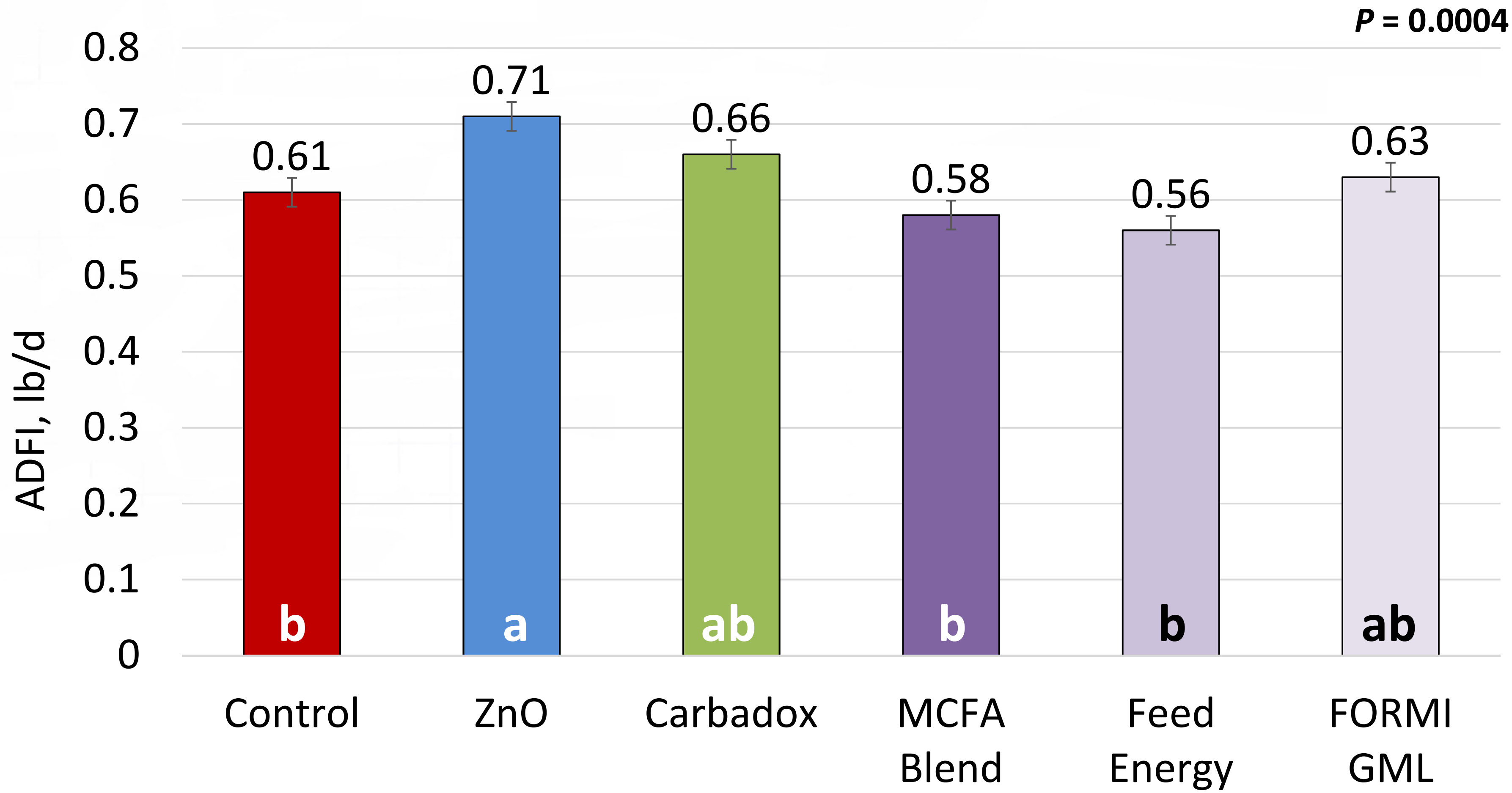
[ab] Means with differing superscripts differ, $P < 0.05$

Effects of varying lipid sources as alternatives to ZnO or Carbadox in Nursery Pigs

Effects of varying lipid sources as alternatives to ZnO or carbadox in Nursery Pigs (d 0 to 19)



Effects of varying lipid sources as alternatives to ZnO or carbadox in Nursery Pigs (d 0 to 19)



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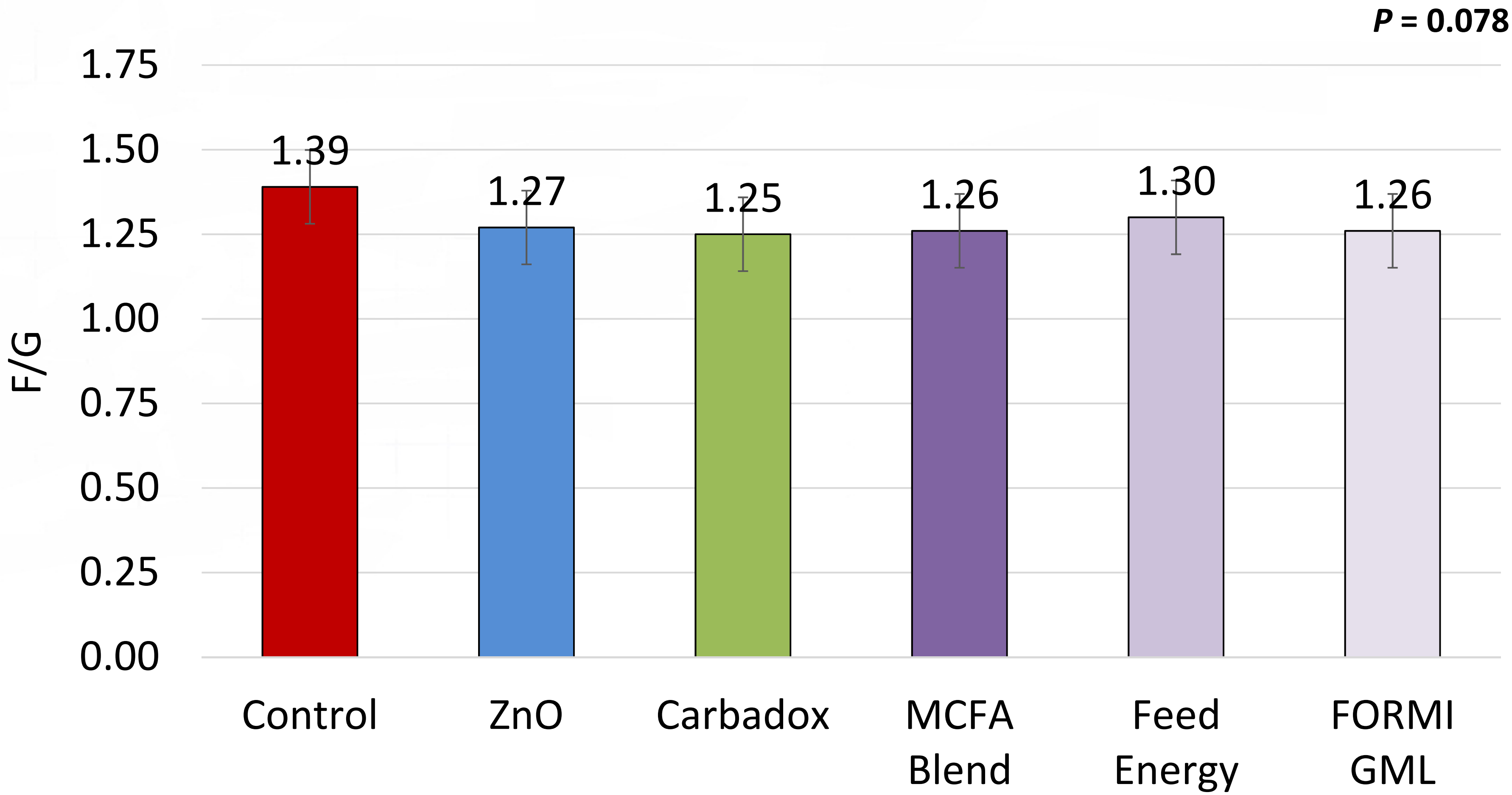
Dahmer et al., 2019

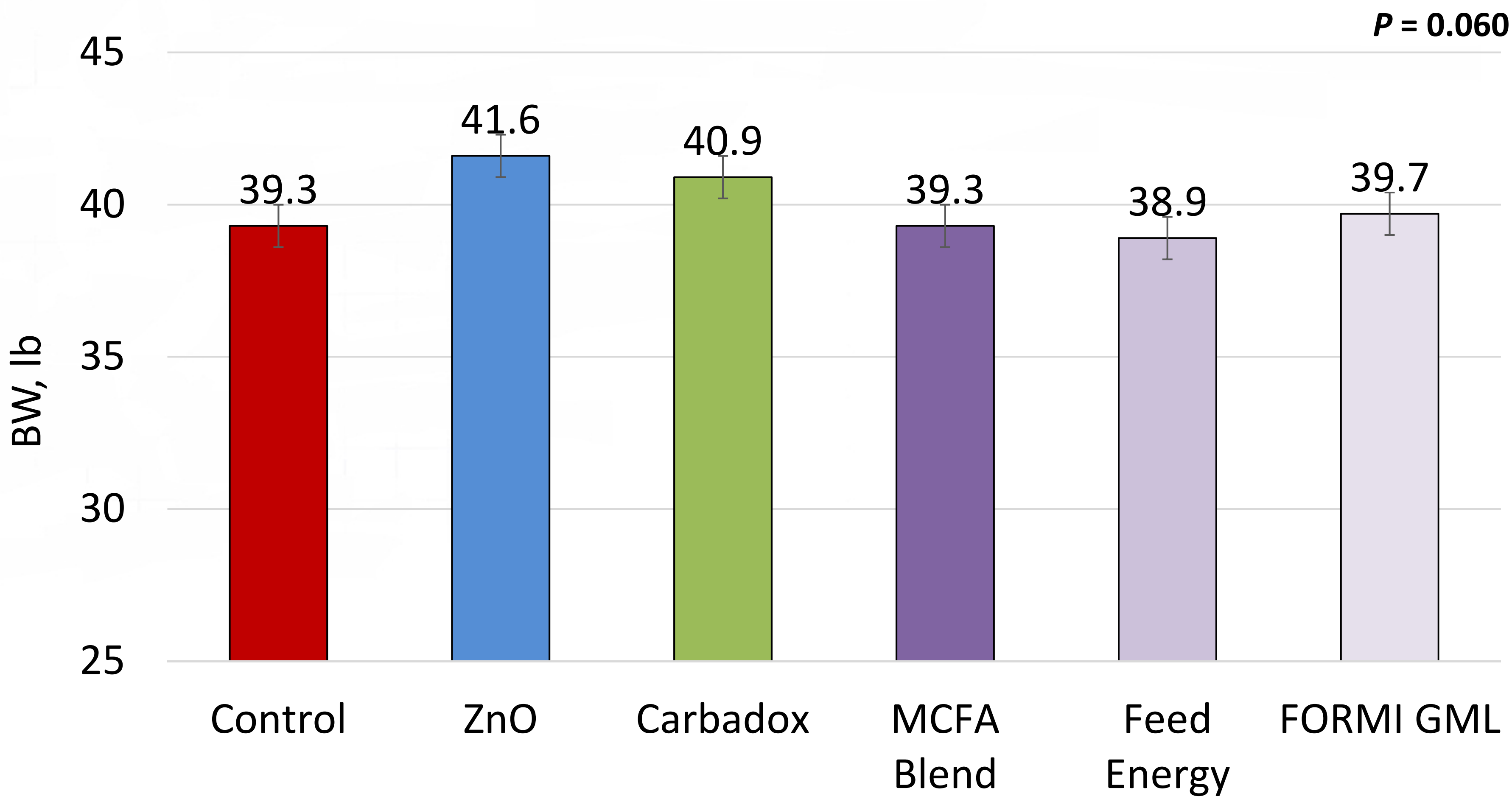
Knowledge for Life

Effects of varying lipid sources as alternatives to ZnO or carbadox in Nursery Pigs (d 0 to 19)



Dahmer et al., 2019

Effects of varying lipid sources as alternatives to ZnO or carbadox in Nursery Pigs (d 35)



Dahmer et al., 2019

K·STATE Research and Extension

Knowledge for Life

Journal of Animal Science, 2019, 4691–4697
doi:10.1093/jas/skz319
Advance Access publication October 16, 2019
Received: 23 July 2019 and Accepted: 8 October 2019
Special Topics

AMERICAN SOCIETY OF ANIMAL SCIENCE

SPECIAL TOPICS

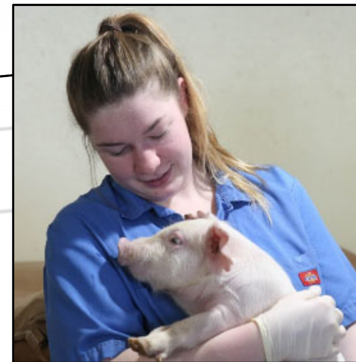
Implementing a course-based undergraduate research experience to grow the quantity and quality of undergraduate research in an animal science curriculum[1]

Cassandra K. Jones*,[2] and Annie B. Lerner*

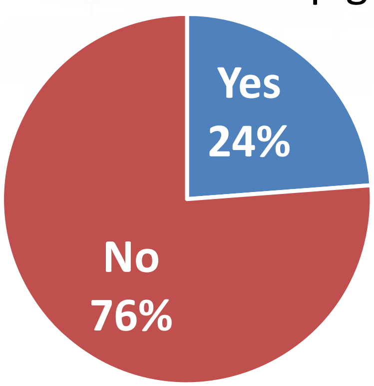
*Kansas State University, Department of Animal Sciences & Industry, Manhattan, KS 66506

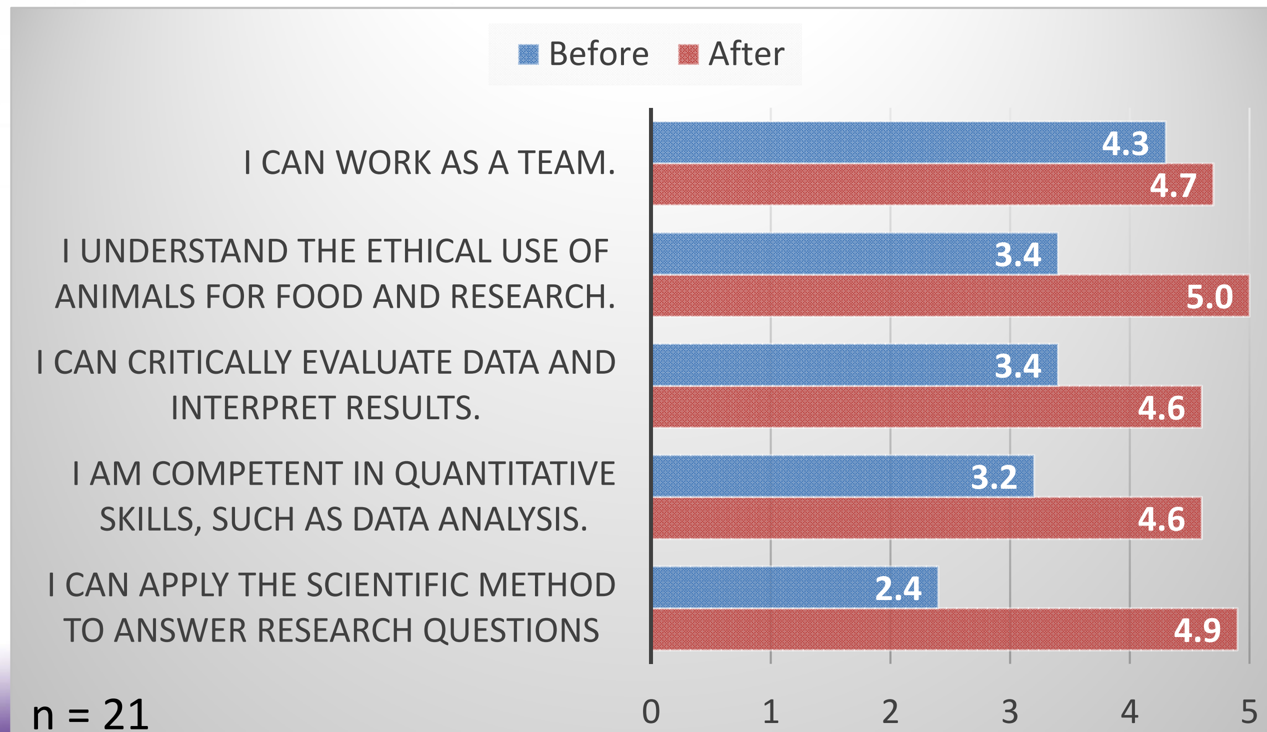
[1]The authors thank the Dr. Mark and Kim Young Undergraduate Research Fund in Animal Sciences & Industry for financial support.

[2]Corresponding author: jonesc@ksu.edu



Before taking this class, I had touched a pig.





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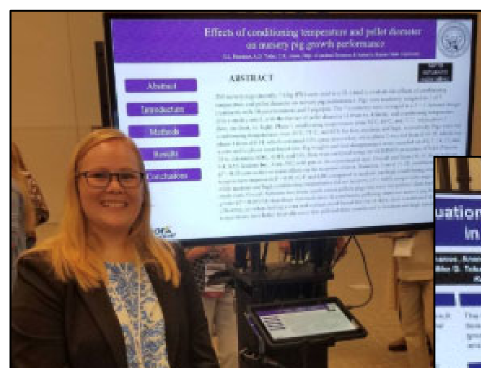
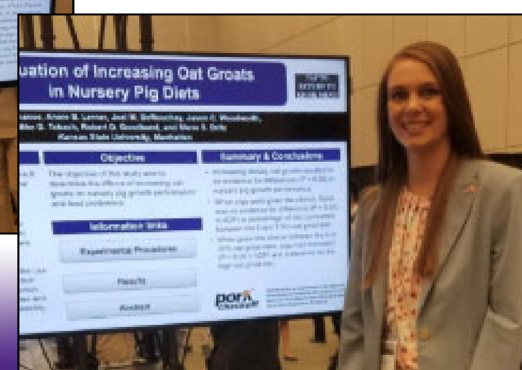
K-State Swine Undergraduate Activities

- Provide 150 students with unique on-farm experiences annually
- Swine Club: 72 members
  - President: Olivia Harrison
  - Vice Presidents: Owen Michael, Brooks Nichols, Adrian Austin
  - Secretary: Lane Egger
  - Social Chair: Reece Leonard
- 2019 National ASAS: Top 5 Undergraduate Competition Abstracts
  - Olivia Harrison
  - Jenna Chance
- Dozens of internships, jobs





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K-State Swine Undergraduate Activities

2018/2019 Entry-level Salary Information for Recent Graduates in Agriculture and Related Disciplines

Animal and Dairy Sciences

Job Title	Average Salary	Low Salary	High Salary	#
AI Technician/Breeding	$33,883	12,000	45,800	14
Animal Health Industry	44,786	18,000	80,000	14
Companion Animal	25,188	11,400	50,000	18
Education/Extension	35,780	13,000	50,000	10
Equine Industry	25,077	12,000	37,000	12
Farming Operation	36,080	18,000	55,000	32
Feed/Nutrition	45,482	27,000	65,000	14
Food Industry	51,298	34,000	65,000	44
Herdsman	40,149	20,800	60,000	28
Poultry Industry	49,431	40,000	68,500	21
Research Technician	35,104	20,000	50,000	40
Sales Representative	46,111	25,000	65,000	39
Swine Industry	40,602	35,000	54,000	27
Vet Technician	26,443	14,000	50,000	47
Zookeeper/Wildlife Rehab	24,786	20,000	31,000	7
Other	36,464	12,500	64,000	59
Major Total	$38,241	11,400	80,000	426
Further Education				359

31st Annual
Kansas State University
2020 SWINE PROFITABILITY CONFERENCE

Tuesday, February 4, 2020
Stanley Stout Center, 2200 Denison Avenue

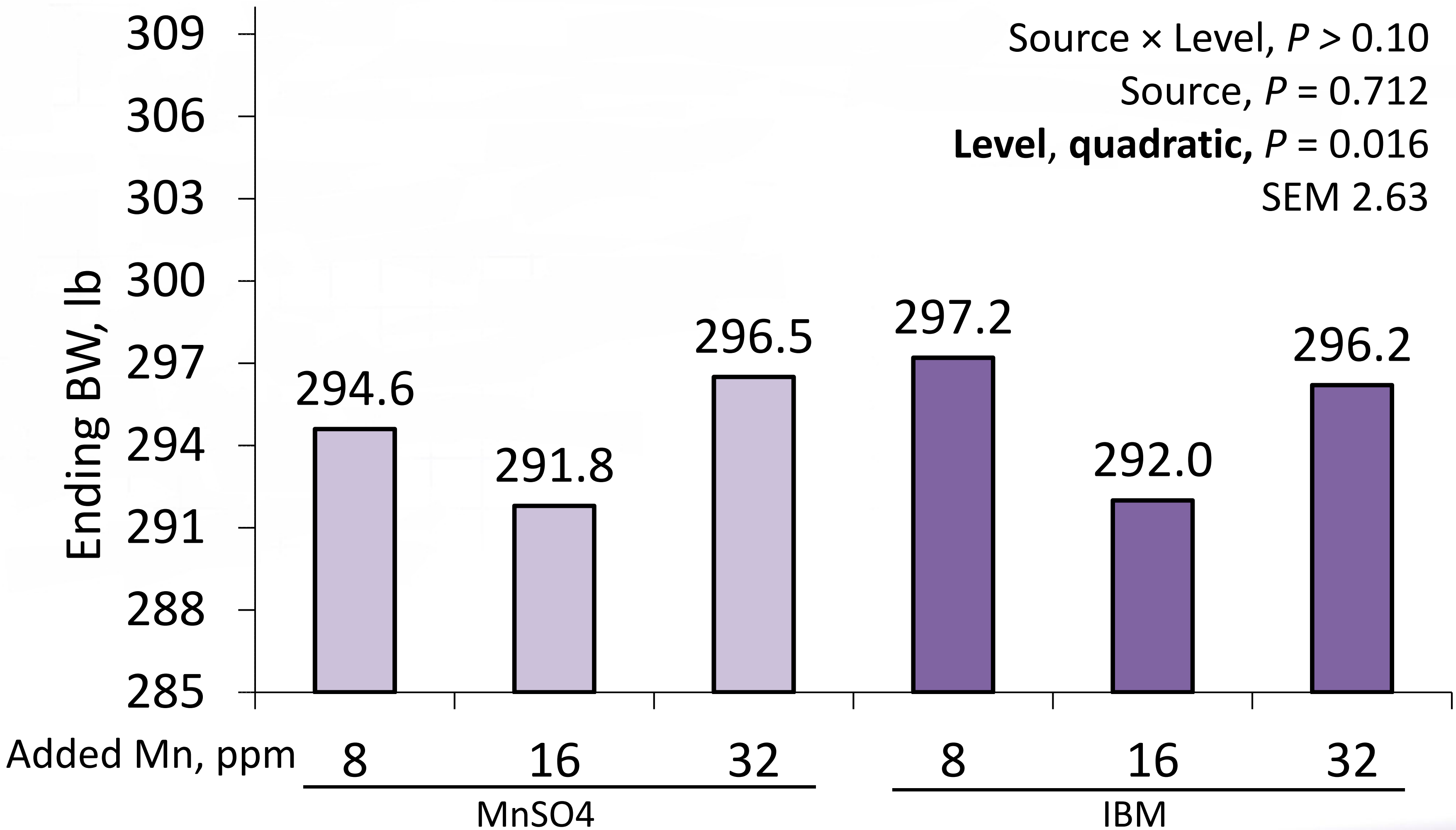
9:15 a.m.	Coffee and Donuts
9:30 a.m.	Welcome
9:45 a.m.	Our Business Approach to Risk Management *Bob Taubert, Managing Partner, New Horizon Farms, Pipestone, MN*
10:30 a.m.	2020 World Meat Dynamics and US Pork Price Outlook *Joe Kerns, Kerns and Associates*
11:15 a.m.	Development of our Kansas swine business *Kaden and Emily Roush, R Family Farms*
12:00 noon	Lunch
1:15 p.m.	Field-based strategies to prevent, significantly control and/or eliminate swine infectious diseases *Dr. Daniel Linhares, DVM, MBA, PhD; Vet Diagnostic & Production Animal Medicine Iowa State University*
2:00 p.m.	Bio-security: Achievements, Gaps and Future Action *Dr. Steve Dritz, DVM, PhD; Diagnostic Medicine/Pathobiology; Kansas State University.*
3:00 p.m.	Adjourn

Mn Research Objective

Determine the effects of increasing levels of Mn 8, 16, and 32 ppm) and source of Mn ($MnSO_4$ or Intellibond M)on growth performance, carcass characteristics, and economics of growing-finishing pigs

- NRC (2012) requirement is 2 to 4 ppm

Mn source and level on ending BW

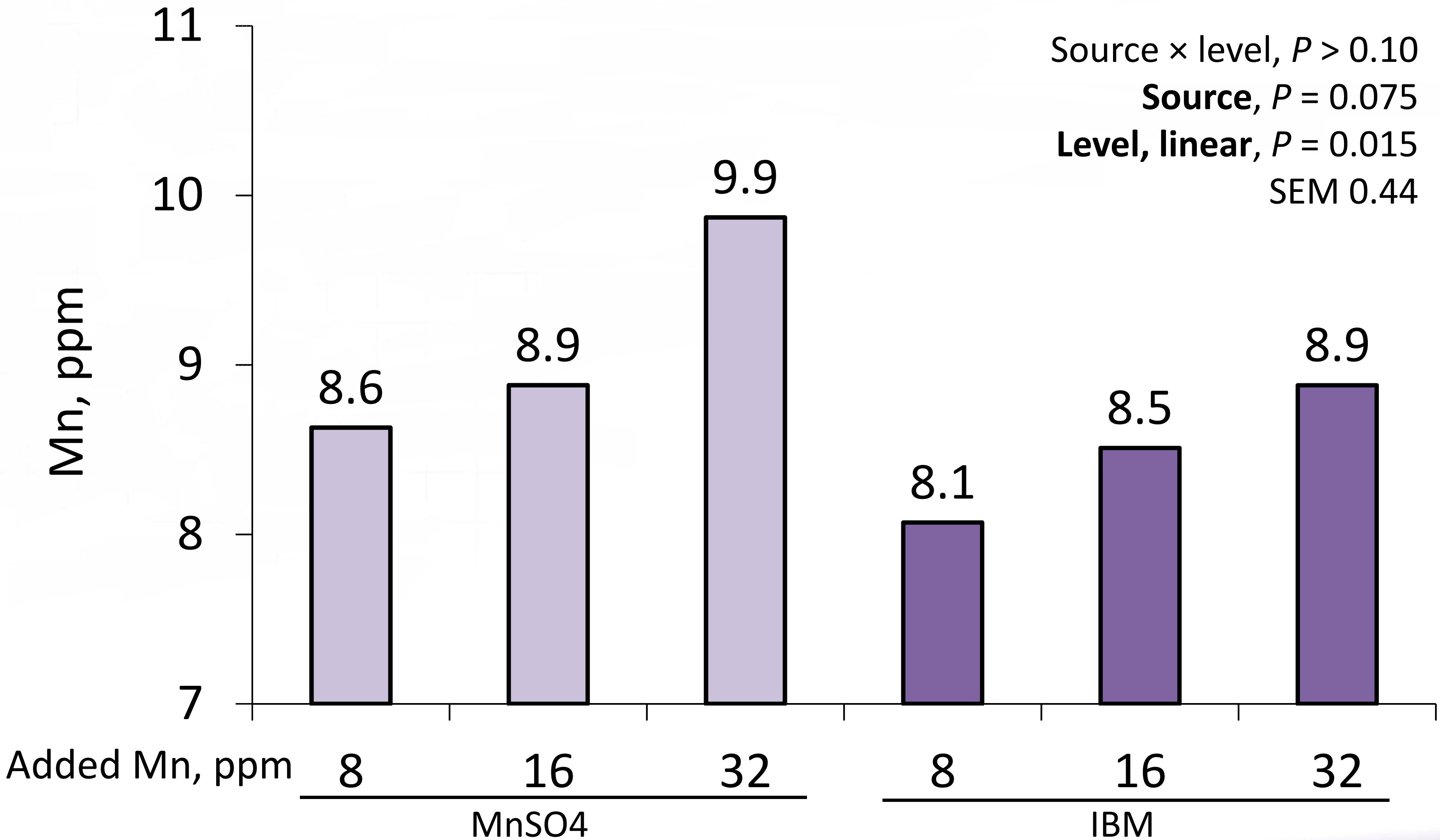


K·STATE Research and Extension

Kerkaert et al., 2019

Knowledge for Life

Mn source and level on Mn liver concentrations



Xylanase Research Objective

Determine the effects of xylanase (0, 2.3, 4.5, 9.1, 18.1, and 34.0 SXU/lb) on growth performance, mortality, carcass characteristics, and economics of growing-finishing pigs raised in a commercial environment

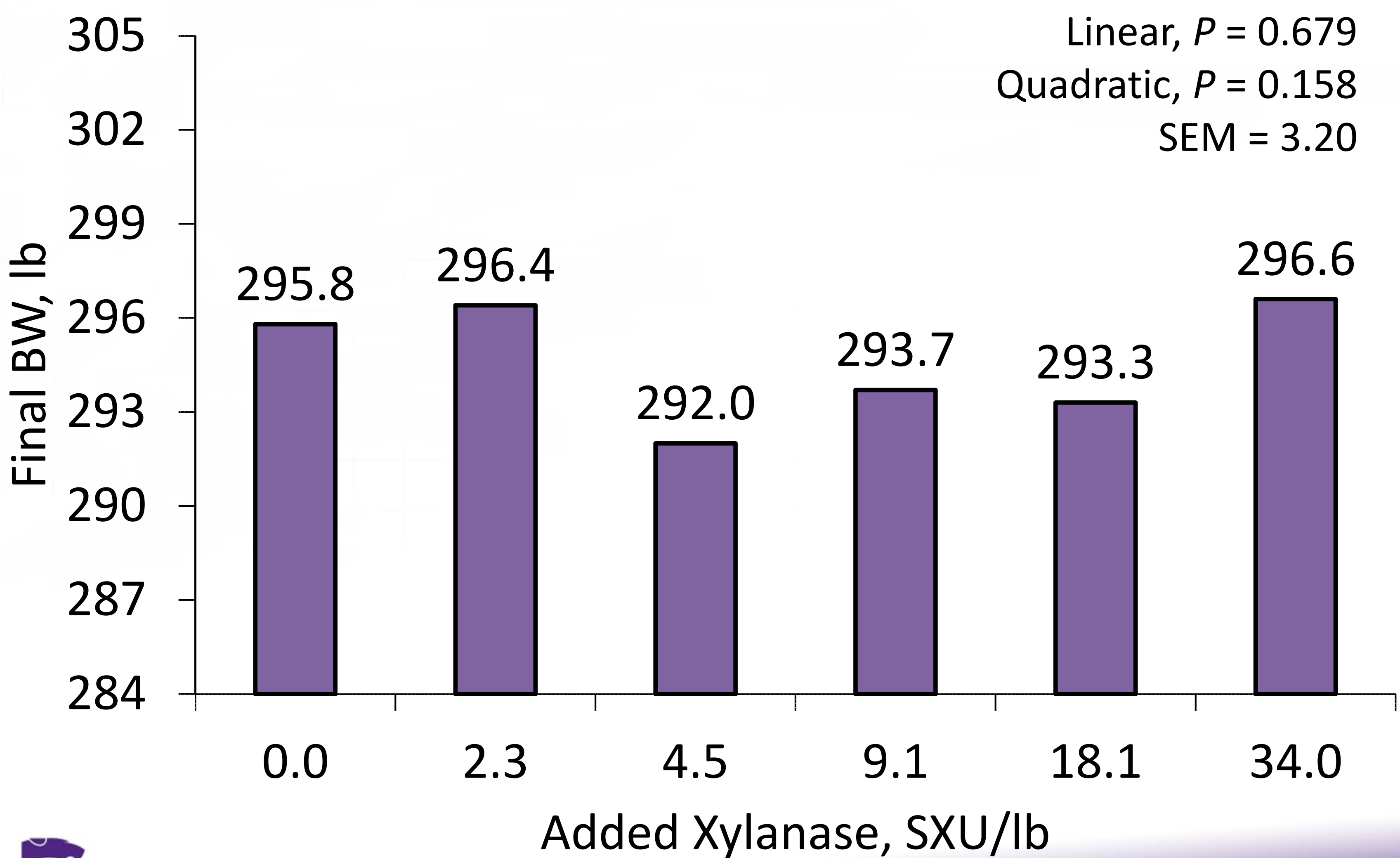
NEW HORIZON FARMS

Jefo Life, made easier

K·STATE Research and Extension

Knowledge for Life

Effect of added xylanase on Final BW

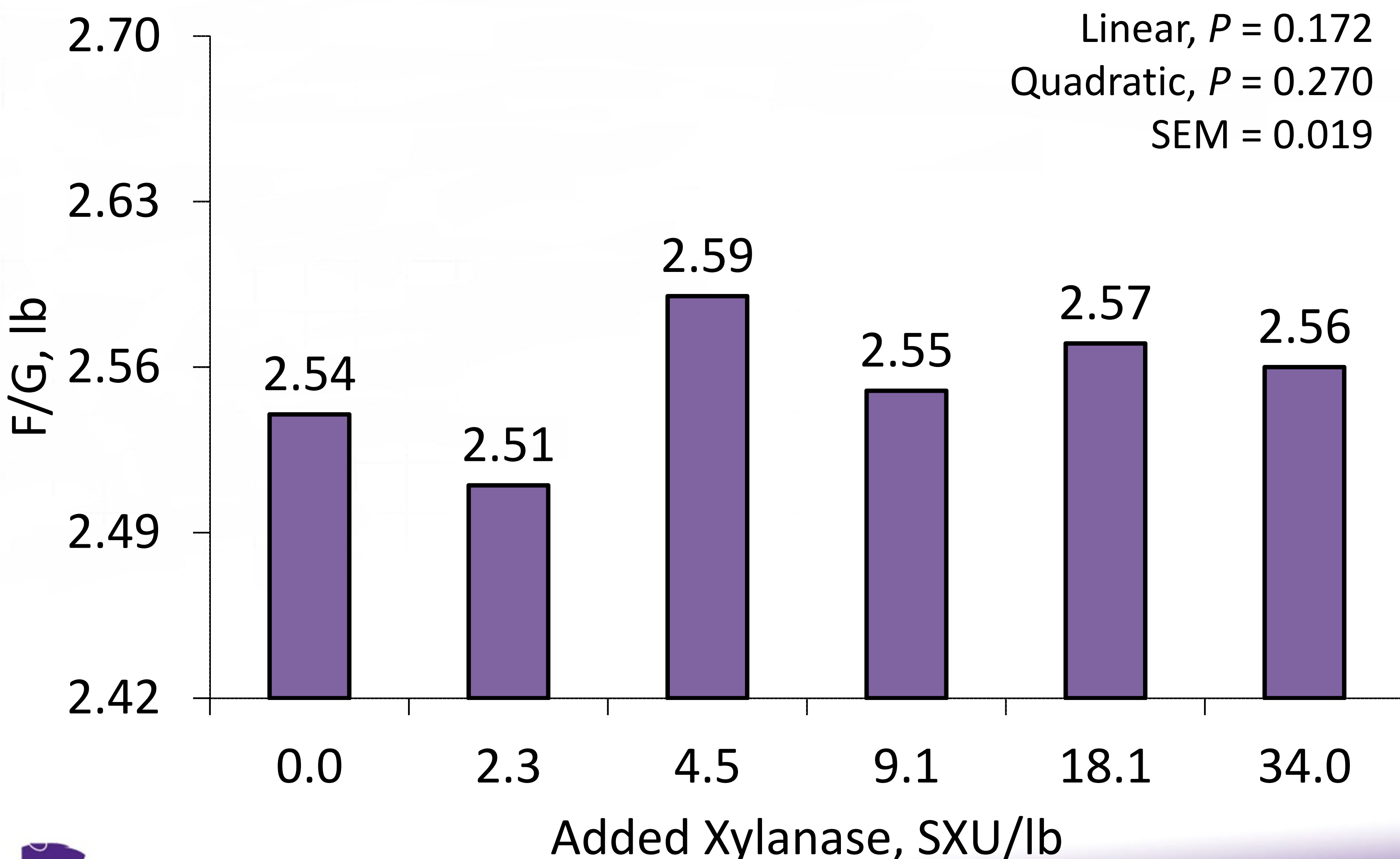


K·STATE Research and Extension

Kerkaert et al. 2019

Knowledge for Life

Effect of added xylanase on overall F/G



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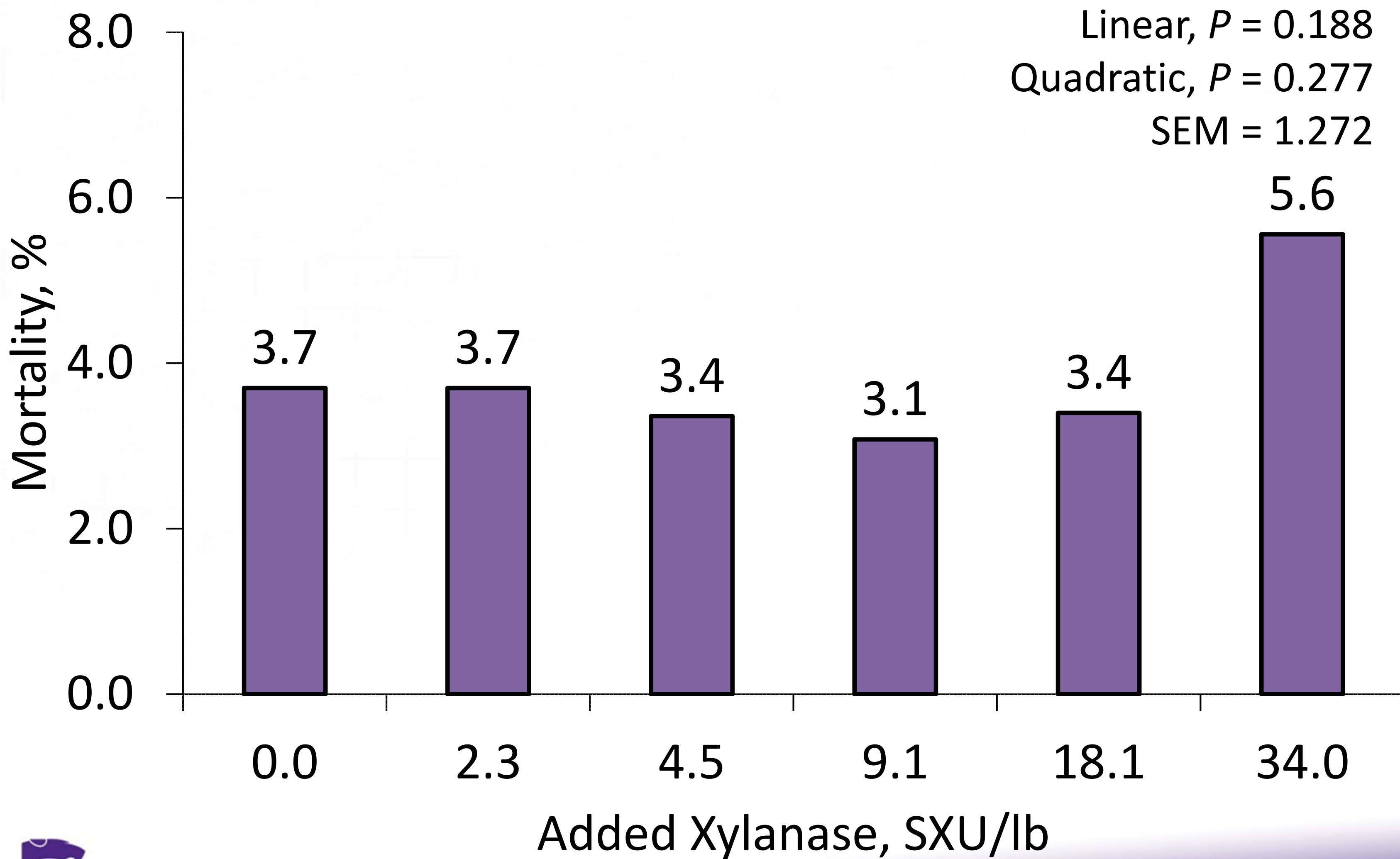
Kerkaert et al. 2019

Knowledge for Life

Effect of added xylanase on mortality



K·STATE Research and Extension

Kerkaert et al. 2019

Knowledge for Life

Phytase Level and Withdrawal Objective

Investigate the effects of feeding high phytase levels and the impact of phytase feeding duration on growth performance, carcass characteristics, and economics of growing-finishing pigs

Treatments

– Control: no added phytase
– Phytase in grower phase: 1,500 FYT d 0-57, then control
– Phytase throughout: 1,500 FYT d 0-market

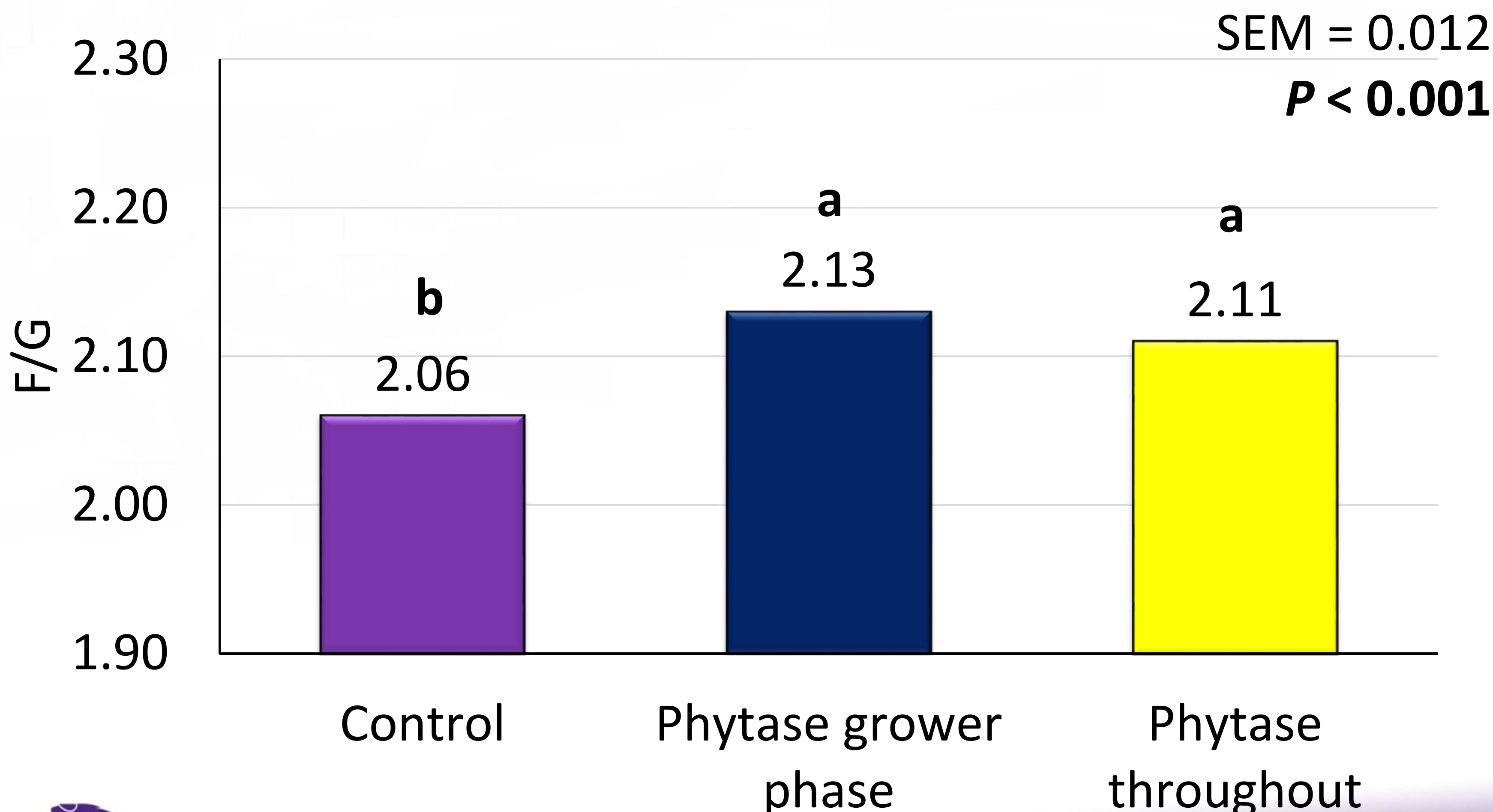
K·STATE Research and Extension
NEW HORIZON FARMS
DSM
Knowledge for Life

Materials and Methods

Assumed release values for 1,500 FYT/kg Ronozyme Hiphos	
Available P, %	0.166
STTD P, %	0.146
STTD Ca, %	0.102
ME, kcal/lb	24
NE, kcal/lb	19
SID Lysine, %	0.0217
SID Methionine, %	0.0003
SID Methinonine+cysteine, %	0.0089
SID Threonine, %	0.0224
SID Tryptophan, %	0.0056
SID Isoleucine, %	0.0122
SID Valine, %	0.0163

Feed efficiency, d 0 to 57

Phytase = 1,500FYT of HiPhos assuming full matrix release



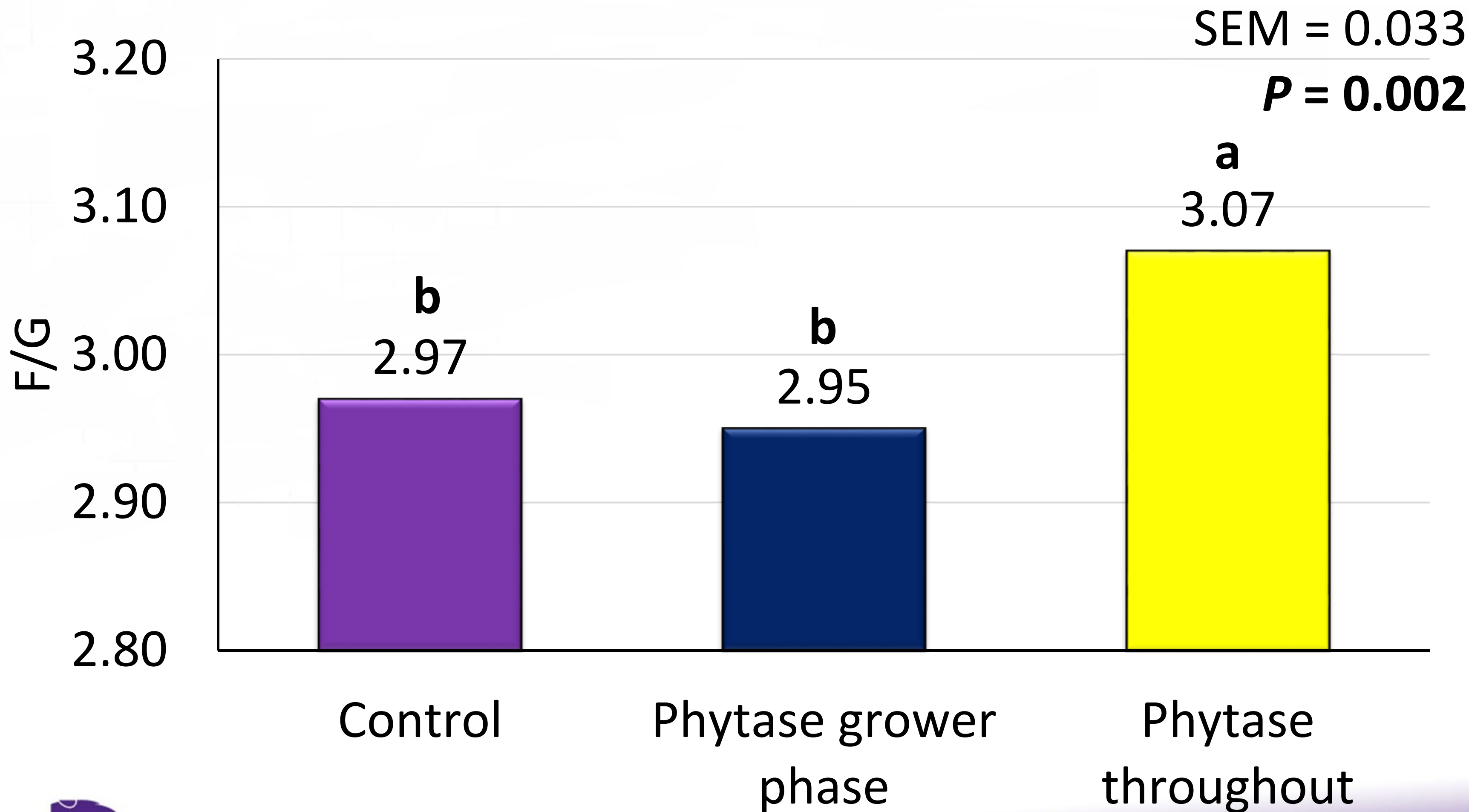
K·STATE Research and Extension

Vier et al., 2019

Knowledge for Life

Feed efficiency, d 57 to 126

Phytase = 1,500FYT of HiPhos assuming full matrix release



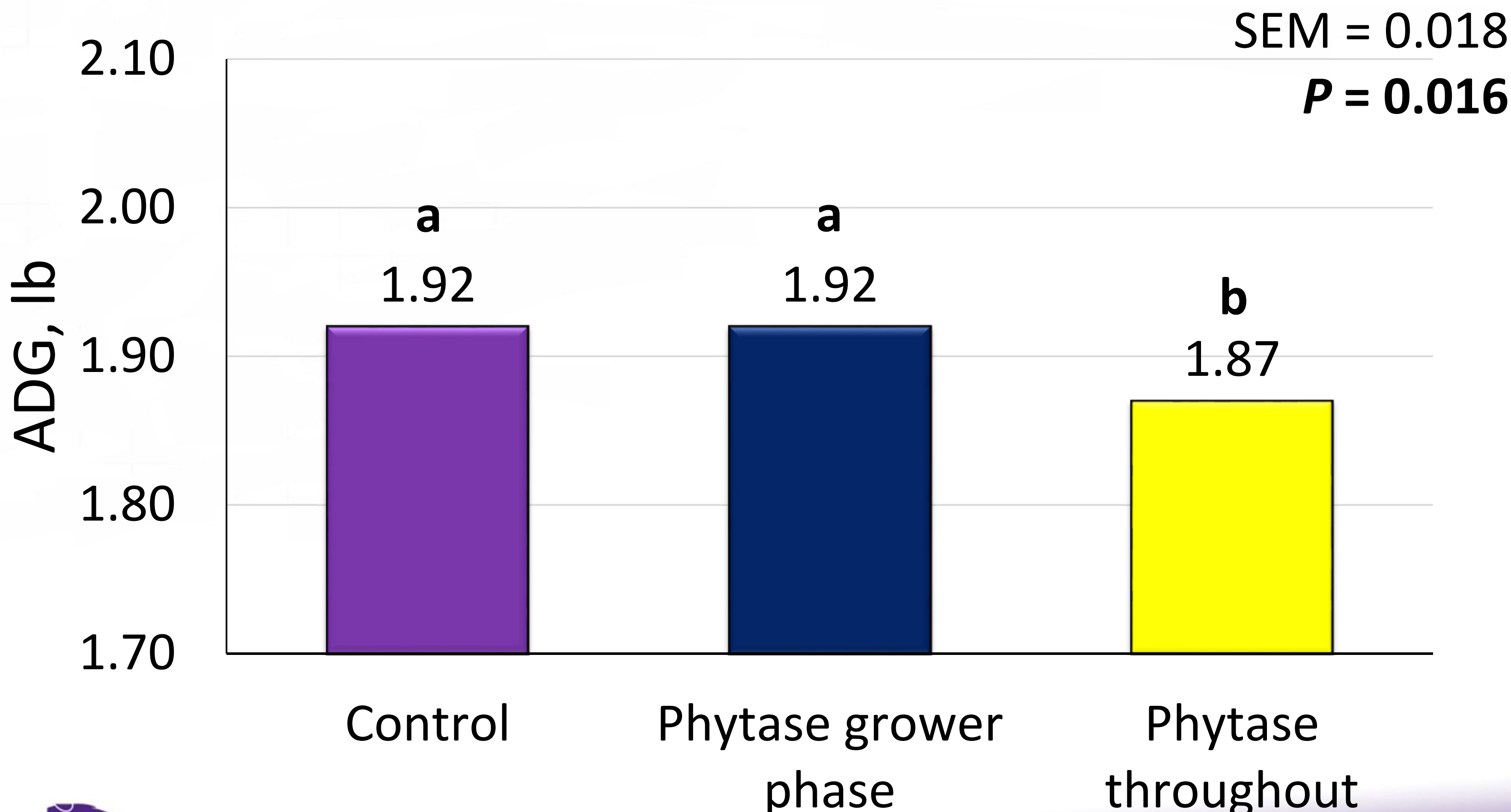
K·STATE Research and Extension

Vier et al., 2019

Knowledge for Life

Average Daily Gain, d 0 to 126

Phytase = 1,500FYT of HiPhos assuming full matrix release



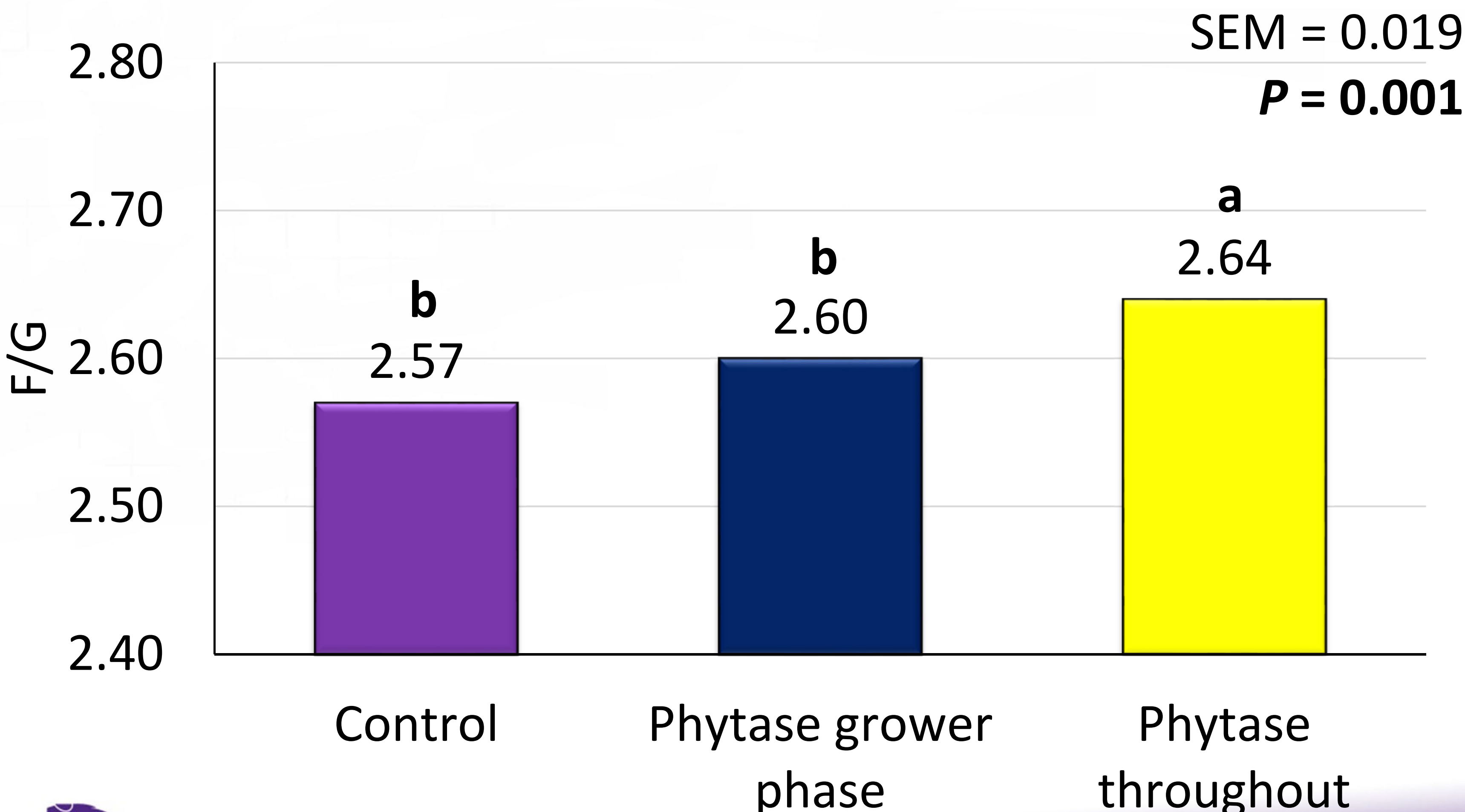
K-STATE Research and Extension

Vier et al., 2019

Knowledge for Life

Feed efficiency, d 0 to 126

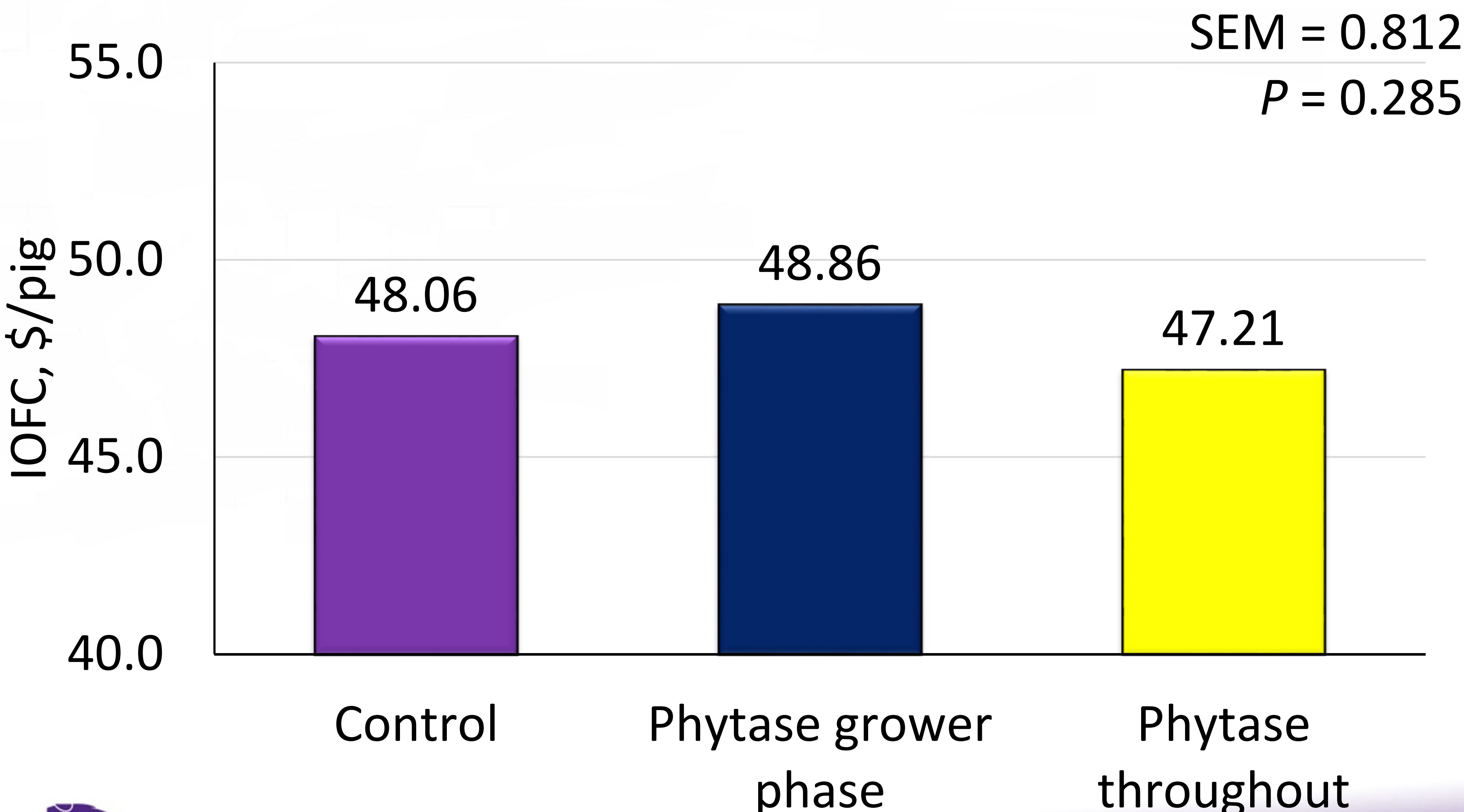
Phytase = 1,500FYT of HiPhos assuming full matrix release



Vier et al., 2019

Income Over Feed Cost

Phytase = 1,500FYT of HiPhos assuming full matrix release



Vier et al., 2019

Additional Research with Nutrient Release-

1,500 FTY/Kg add phytase

1. **Control:** no added phytase
2. **CaP:** assuming release values for Ca and P
3. **CaPAA:** assuming release values for Ca, P, and AA
4. **CaPAA + half NE:** assuming release values for Ca, P, AA, and half of the suggested NE release
5. **CaPAA + full NE:** assuming release values for Ca, P, AA, and the full NE release
6. **None:** assuming no release value

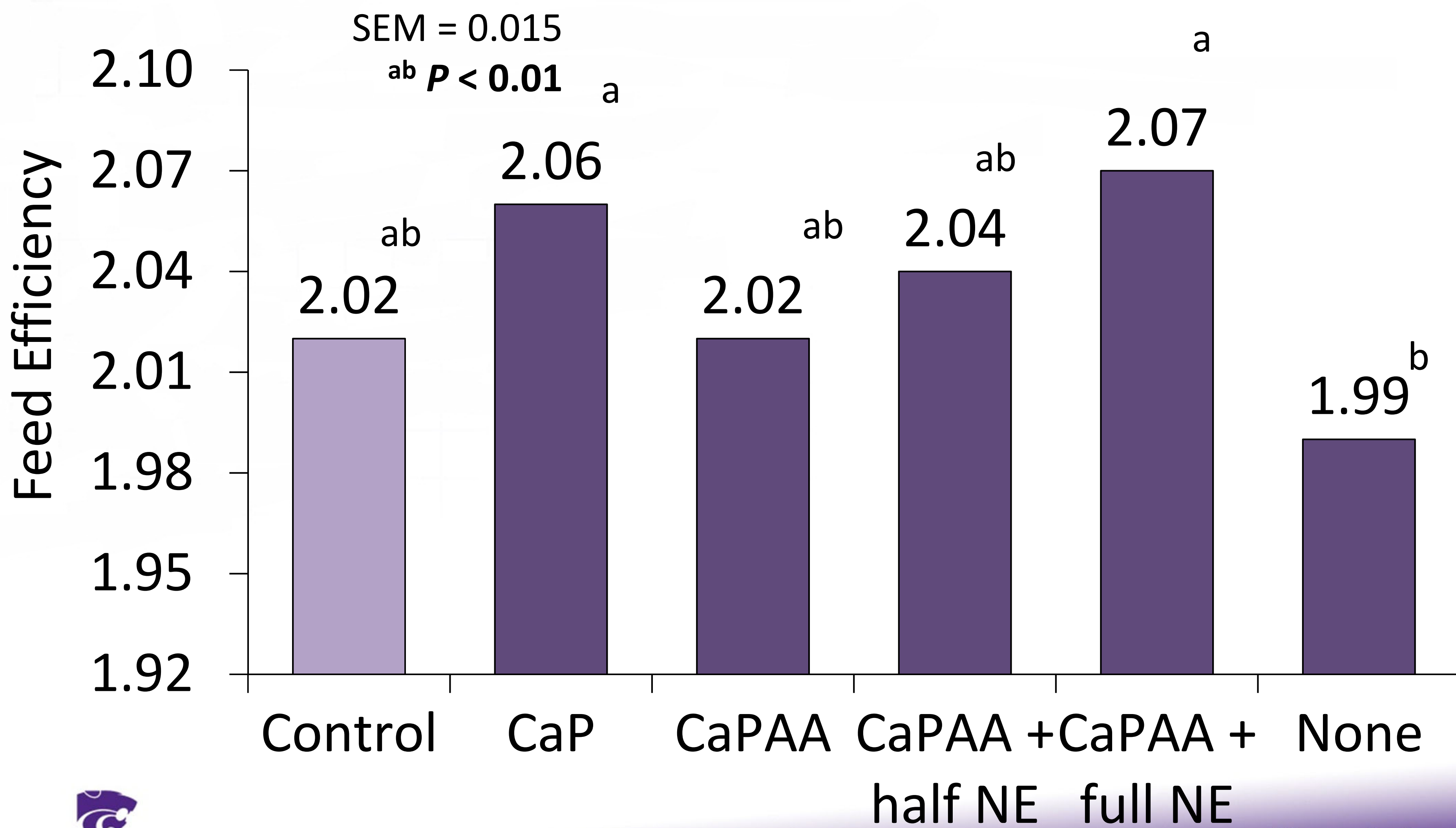
Diets were fed in two different phases.

– Phase 1 fed from d 0 to 29 (63 to 113 lb)

– Phase 2 fed from d 29 to 55 (113 to 160 lb)

Wensley et al., 2019

Feed Efficiency, d 0 to 55



Wensley et al., 2019

Development of a release curve for a new phytase ingredient

Evaluate the effects of a new phytase source, Smizyme TS G5 2,500 (Origination, Inc., Saint Paul, MN), on the growth performance and bone ash of 23- to 50-lb nursery pigs to develop an aP release curve

ORIGINATION, INC.
O2D

Calculated aP release (%) values based on different response criteria

Exp. 1	Phytase, FTU/kg					SEM	Probability, $P <$	
	150	250	500	750	1,000		Linear	Quad
ADG	0.031	0.052	0.094	0.109	0.139	0.019	<0.001	0.184
G:F	0.098	0.058	0.117	0.148	0.166	0.022	<0.001	0.096
Percentage bone ash	0.095	0.102	0.114	0.142	0.149	0.015	<0.001	0.028

Exp. 2	Phytase, FTU/kg				SEM	Probability, $P <$	
	250	500	1,000	1,500		Linear	Quad
ADG	0.057	0.107	0.112	0.136	0.013	<0.001	<0.001
G:F	0.083	0.123	0.100	0.154	0.022	<0.001	0.066
Percentage bone ash	0.088	0.091	0.143	0.152	0.024	<0.001	0.055

$$\textbf{ADG aP} = (\mathbf{0.197} \times \mathbf{FTU}) \div (\mathbf{584.956} + \mathbf{FTU})$$
$$\textbf{GF aP} = (\mathbf{0.175} \times \mathbf{FTU}) \div (\mathbf{248.348} + \mathbf{FTU})$$
$$\textbf{\% bone ash aP} = (\mathbf{0.165} \times \mathbf{FTU}) \div (\mathbf{178.146} + \mathbf{FTU})$$

Wensley et al., 2019

Kansas State University | applied swine nutrition

Economic model for optimum phosphorus levels

PIC

Input *(please fill yellow cells)*

Economic evaluation criteria	Carcass
Carcass price, $/lb	$0.49
Current carcass yield, %	73.4
Facility cost, $/pig/day	$0.12
Number of phases	6

	Current diets					Maximal growth	
	BW, lb		Energy, kcal NE/lb	STTD P, %	$/ton	STTD P, %	$/ton
Phase 1	55	75	1,100	0.33	$173.65	**0.40**	$174.03
Phase 2	75	111	1,111	0.30	$166.98	**0.37**	$167.22
Phase 3	111	142	1,126	0.27	$160.96	**0.34**	$161.15
Phase 4	142	185	1,138	0.26	$155.51	**0.31**	$155.65
Phase 5	185	235	1,156	0.23	$153.23	**0.28**	$153.32
Phase 6	235	285	1,163	0.21	$152.78	**0.25**	$152.92

Performance Output	
Performance difference between maximal growth and current diets, %	
Fixed Weight (space long)	
Growth rate	-1.13%
Feed efficiency	-0.14%
Carcass yield	0.34%
Fixed Time (space short)	
Growth rate	-1.13%
Feed efficiency	-0.29%
Carcass yield	0.34%

Economics Output	
Net profit difference between maximal growth and current diets, $/pig	
Fixed Weight (space long)	
IOFFC	-$0.08
Fixed Time (space short)	
IOFC	0.18

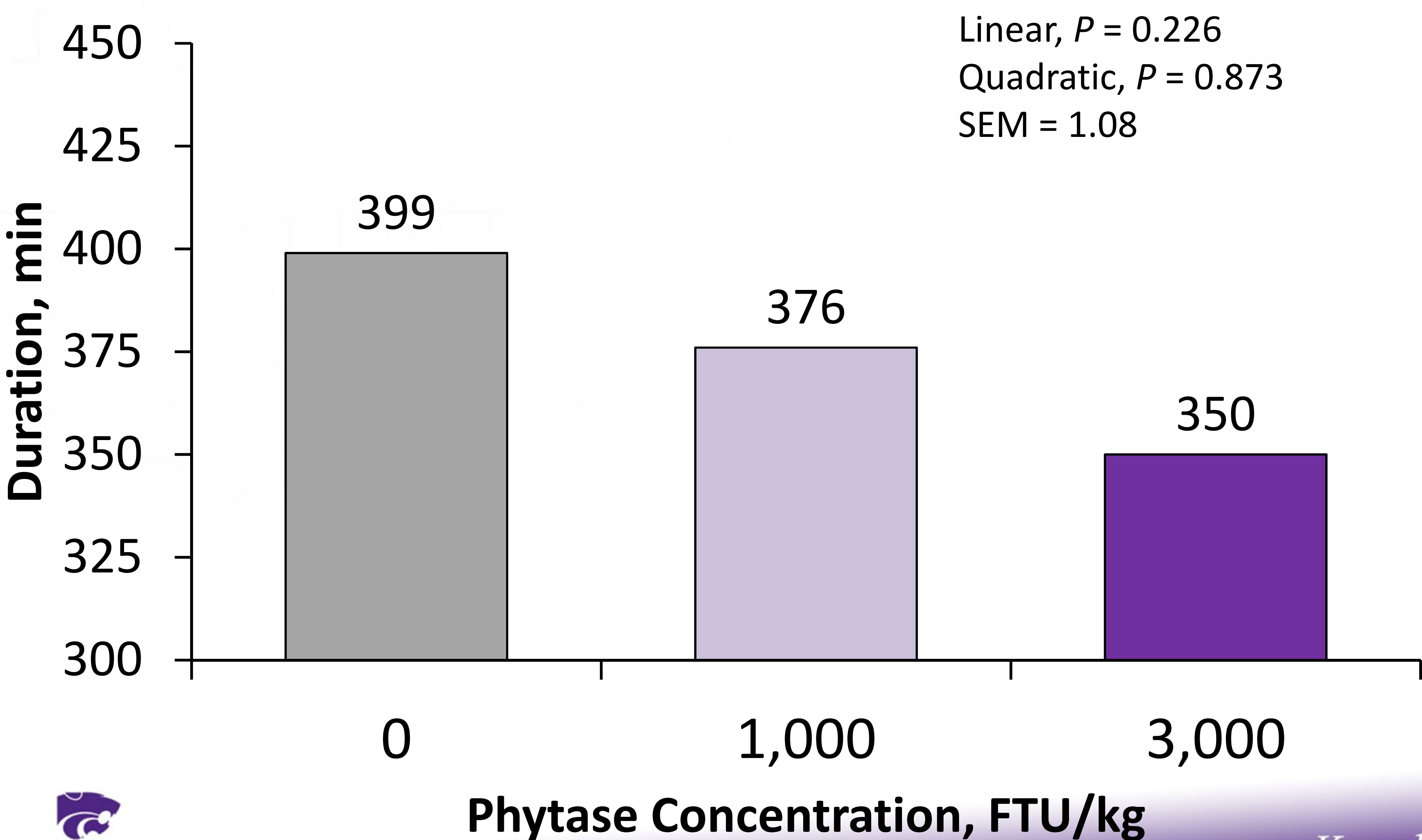
doi:10.17605/OSF.IO/PH8KF Vier et al., 2019

Superdose Phytase in Lactation Objective

Determine the effect of high levels of phytase fed to lactating sows on feed intake, farrowing duration, and sow and litter performance

- Treatments consisted of increasing phytase concentration in lactation diet at d 107
  - 0, 1,000, 3,000 FTU/kg of Ronozyme HiPhos

Farrowing Duration, min



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Batson et al., 2019

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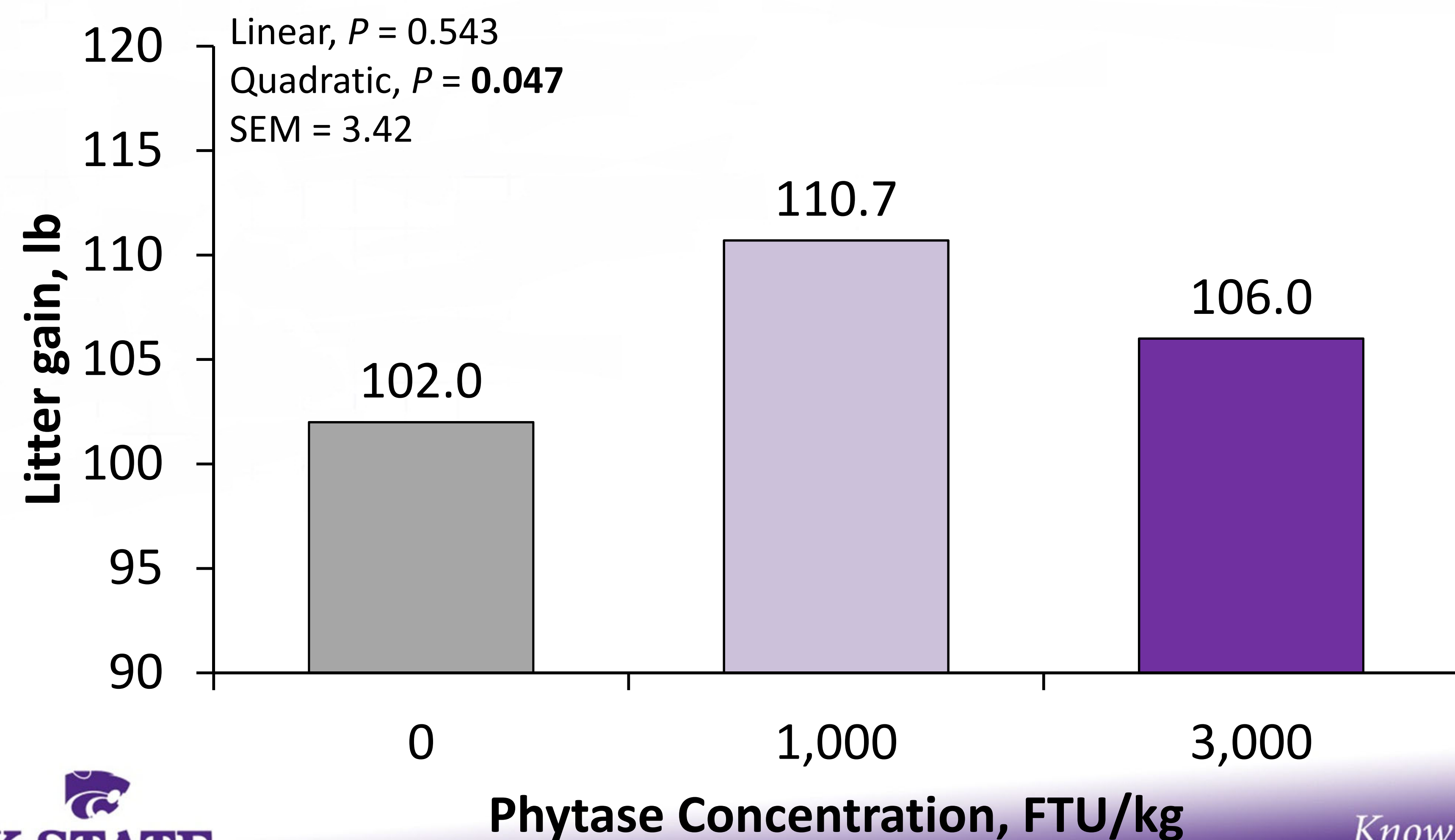
Overall litter gain



Batson et al., 2019

Effects of adding Algae-clay complex (ACC) in diets formulated in two different regimes based on energy and amino acid concentrations (High and Low) on growth performance and carcass characteristics of grow-finish pigs housed in a commercial research facility

NEW HORIZON FARMS

Feed+

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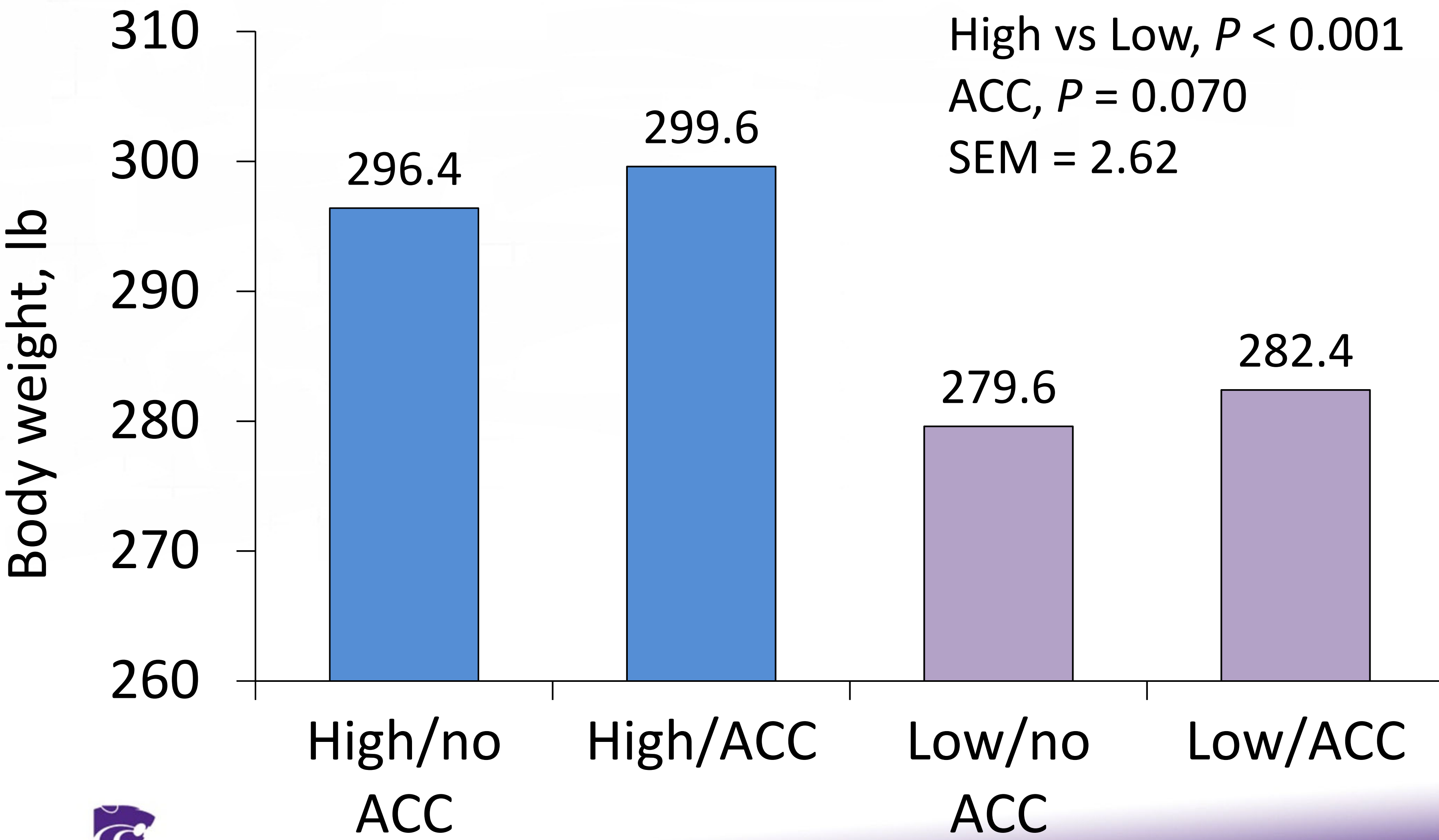
Final Body Weight



Del Tuffo et al., 2019

K-State Swine Nutrition Guide - 2019

Animal Sciences and Industry

Swine Nutrition Guide

- General Nutrition Principles
- Nursery Nutrition

Animal Sciences and Industry

Kansas State University
232 Weber Hall
Manhattan, KS 66506-8028

785-532-6533

Email: asi@ksu.edu

Swine Nutrition Guide

- General Nutrition - 13 factsheets
- Nursery Nutrition - 8 factsheets

Coming soon:

- Sow Nutrition - 5 Factsheets
- Finishing Nutrition - 8 Factsheets

www.ksuswine.org

Kansas State University | applied swine nutrition

KANSAS SECURE PORK SUPPLY

Kansas Secure Pork Supply Plan

The Kansas Secure Pork Supply Plan (KS SPS Plan) is a tool for the Kansas Swine Industry to be implemented for guidance when moving animals from uninfected farms during a foot-and-mouth disease (FMD), Classic Swine Fever (CSF), or African Swine Fever (ASF) outbreak in North America. The movement of animals with guidance from this document will help to support the economic viability of the Kansas swine industry during an outbreak.

The goals of the KS SPS Plan are to:

- Support the economic viability of the Kansas swine industry during and after an FMD, CSF or ASF outbreak
- Provide for efficient and effective response to minimize disease spread
- Support a continuous supply of pork to consumers
- Provide guidance to reduce disease spread throughout livestock sectors once stop movement orders are lifted

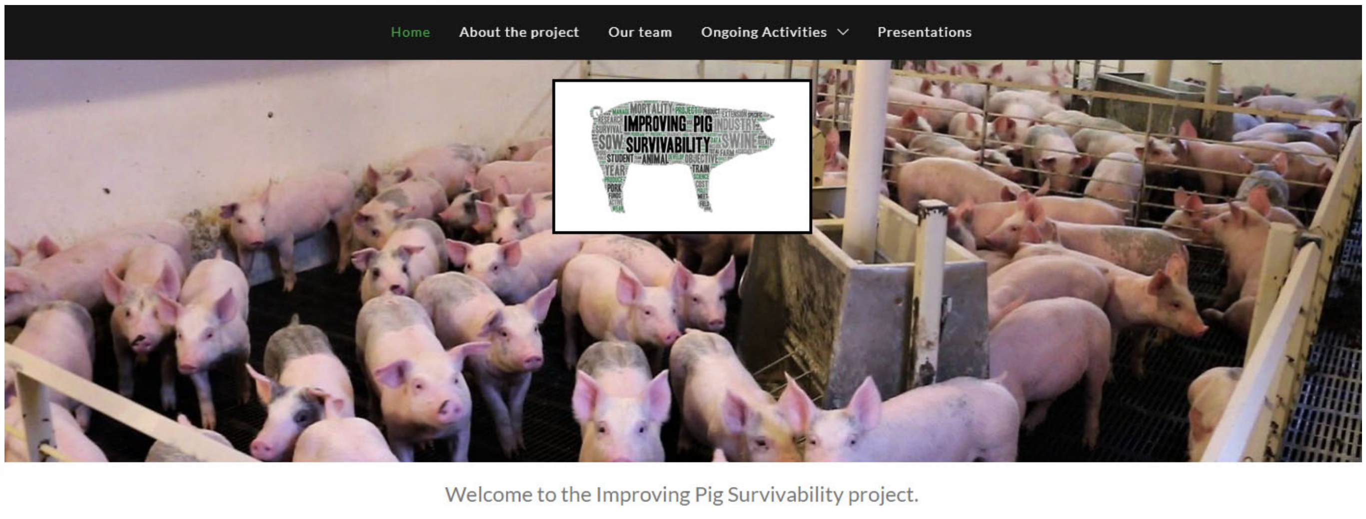
KS SPS Plan Document

- Draft Kansas Secure Pork Supply Summary Plan

Contact - Emily Voris
KDA, Animal Health Planner,
Emily.Voris@ks.gov 785-210-7741.

An integrated approach to improve whole herd pig survivability

https://piglivability.org



PURDUE EXTENSION | ANIMAL SCIENCES

K-STATE Research and Extension

IOWA STATE UNIVERSITY Extension and Outreach

Jason Ross, Joel DeRouchey, Michael Tokach, Jason Woodworth, Kara Stewart, Nick Gabler, Anna Johnson, Aileen Keating, Daniel Linhares, Suzanne Millman, John Patience, Chris Rademacher, Stephan Schmitz-Esser, Lee Schulz, Kent Schwartz, Ken Stalder, Amanda Chipman, Kristin Olsen

Bringing the swine industry together to discuss solutions and motivate change toward improving pig survivability.

IOWA STATE UNIVERSITY

KANSAS STATE UNIVERSITY

PURDUE UNIVERSITY

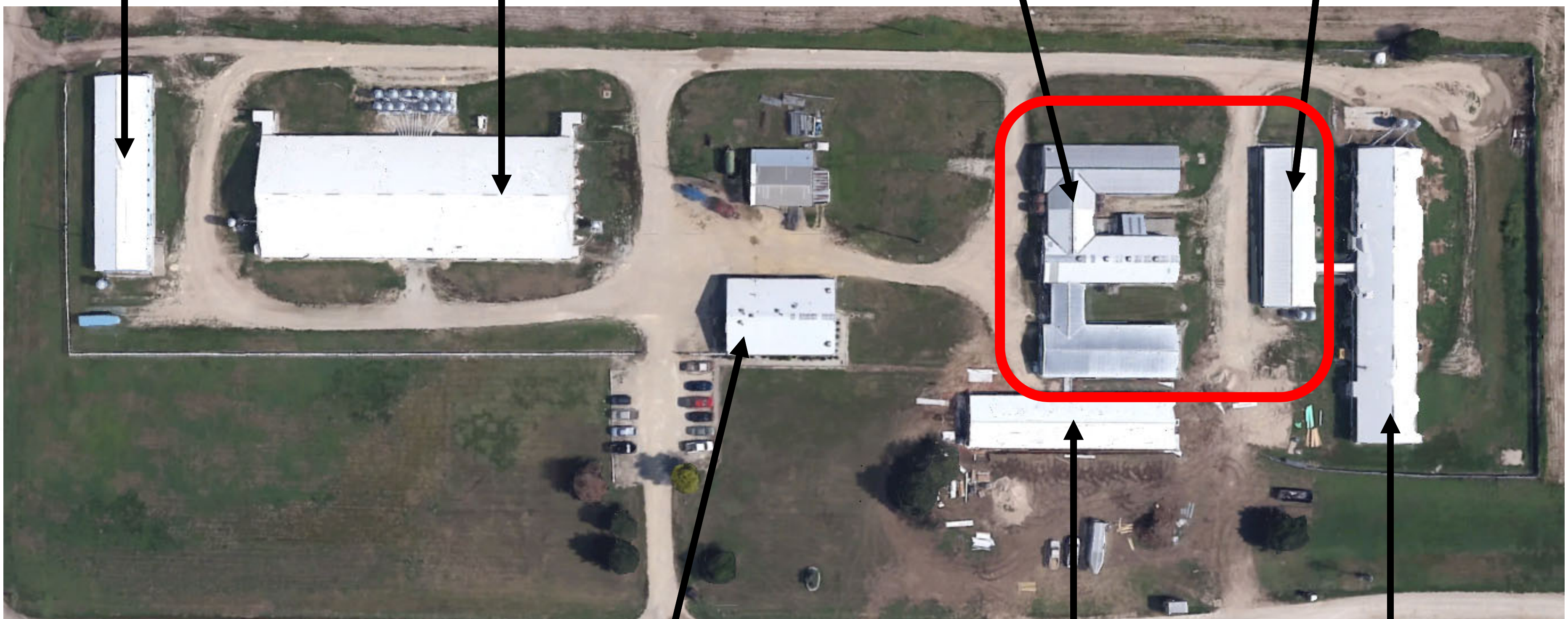
Kansas State University Swine Teaching and Research Center Update

West Finishing Barn
1980: $100,000

Finishing Barn
2009: $850,000

Farrowing &
Old Nursery
1968

Breeding
1968



Office, Classroom, & Student
Apartments
1968

South Nursery
2014: $350,000

Gestation 2000:
$250,000

Phase 1 and 2 Focus

- Phase 1: Replace farrowing facility built in 1968 and add group sow housing to existing gestation barn
  - Expected cost $500,000
  - Why – facilities are required to train undergraduate and graduate students and to conduct breakthrough and exploratory research before taking to field research facilities.
- Phase 2: Replace aging nursery facility built in 1968
  - Expected cost: $400,000
  - Similar to the farrowing facility, the nursery facility is critical for training of students and conducting research.

Phase 3 and 4 Focus

- Phase 3: New on-site student housing and classroom at the K-State Teaching and Research Center
  - Expected cost $300,000
  - Original building was built 50 years ago in 1968. Although it has been remodeled over the years to accommodate farm biosecurity, it is nearing the end of its useful life.
  - Facility would include an apartment to house 3 student employees and provide an office, workshop, and classroom.
- Phase 4: Establishment of endowed chairs and professorships
  - Endowed chairs and professorships are needed to ensure swine positions are maintained in the long-term future at Kansas State University and for salary to be competitive with industry positions.
  - Endowed Professorships require a $1 million endowment
  - Endowed Chairs require a $2 million endowment

Recognition of our Faculty Success - 2019

2019 Midwest ASAS Outstanding Young Teacher

2019 AFIA Award in Nonruminant Nutrition Research

2019 ASAS Early Career Achievement Award

2019 Henry L. Bolley Academic Achievement Award-NDSU

2019 Commerce Bank Distinguished Graduate Faculty Award

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Current Funding Status

- $250,000: Roy and Linda Henry
- $150,000: KSU Applied Swine Nutrition Team
- $125,000: Swine Enhancement Fund
  - Donations from supporters of our project including faculty, former students/families, industry
- $100,000: KS Soybean Commission
- $100,000: Livestock and Meat Industry Council

Continued fund raising efforts with past graduates, industry suppliers, integrators, KS producers, etc.

Phase 1 with KSU facilities – late spring 2020 groundbreaking

Building Memorable Experiences

K·STATE
Research and Extension

Knowledge for Life