KSU Swine Day 2017

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Research and Extension

Overview of feed science research

- 3-Sieve particle size analysis
- Hammermill tip speed
- Feed sampling

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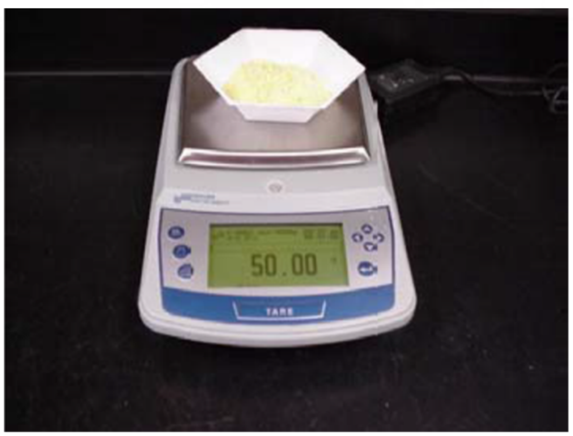
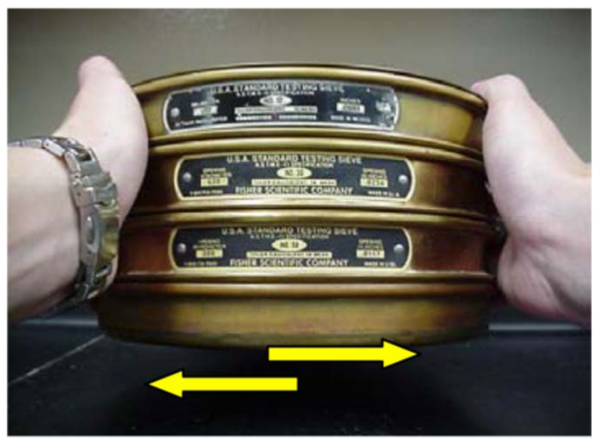
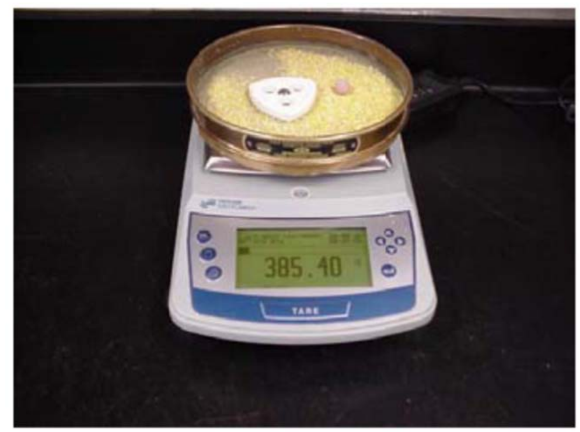
Knowledge for Life

3-Sieve Particle Size Analysis







3-Sieve Particle Size Analysis

1. 50 ± 5 g samples
2. No dispersing agent recommended
3. Hand shaken side-to-side for 90 seconds
4. Updated spread sheet <u>soon</u> on www.ksuswine.org

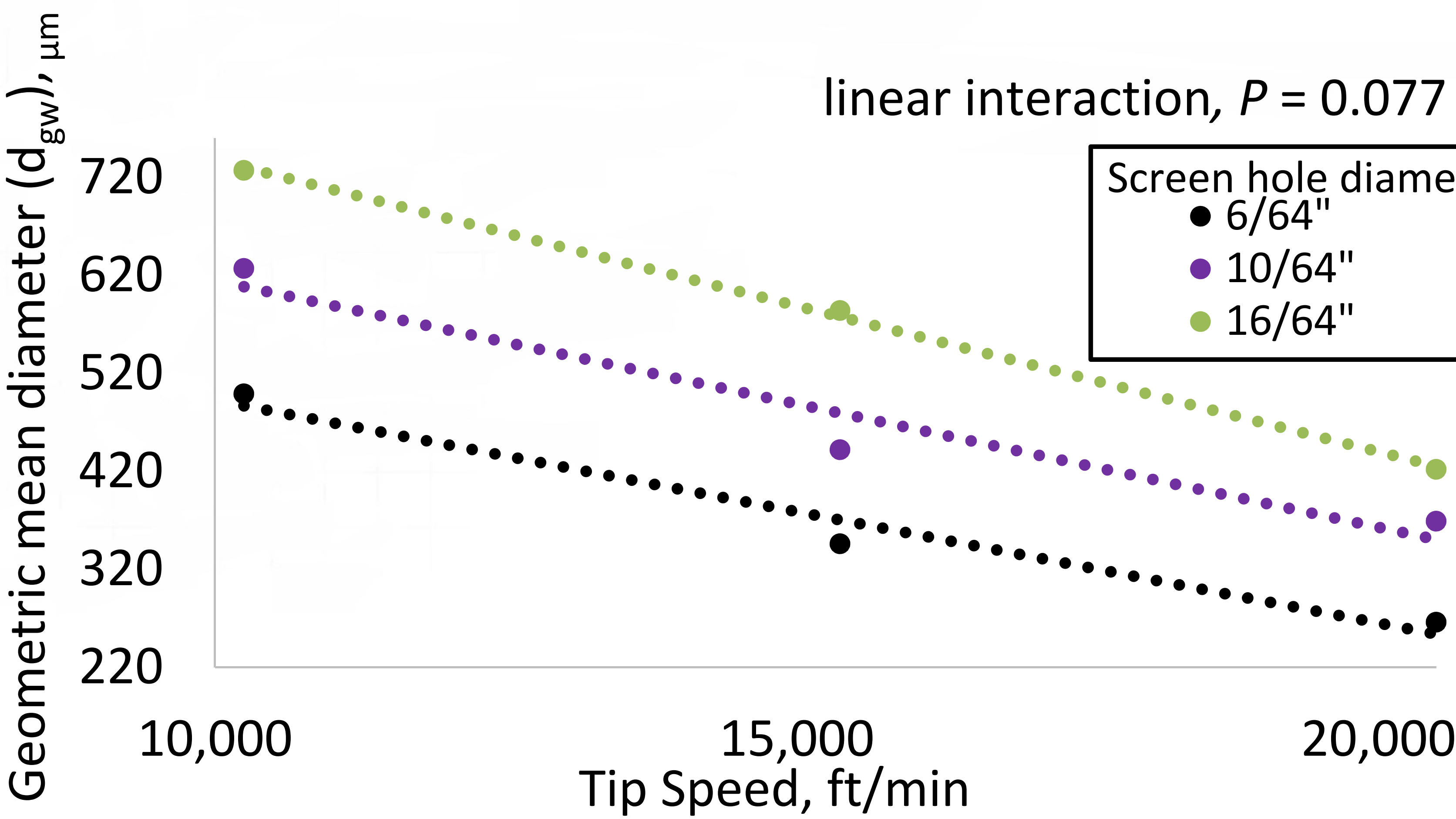
Swine Research and Extension

The Kansas State University Swine Extension program takes practical swine nutrition research and works with producers to facilitate rapid adoption of technology by the industry. The program also works with producers in the area of environmental management of swine facilities.

Swine Nutrition Resources

- PEDv Resources
- Premix & Diet Recommendations
- Swine Nutrition Guide, November 2007 Edition
- Calculators (Energy, Ingredient, F/G, and Pig space tools)
- Feeder Adjustment Cards
- Gestation Feeding Tools
- Particle Size Information
- Marketing Tools
- Aflatoxin fact sheet

Tip speed and screen hole diameter



Saensukjaroenphon et al. 2017

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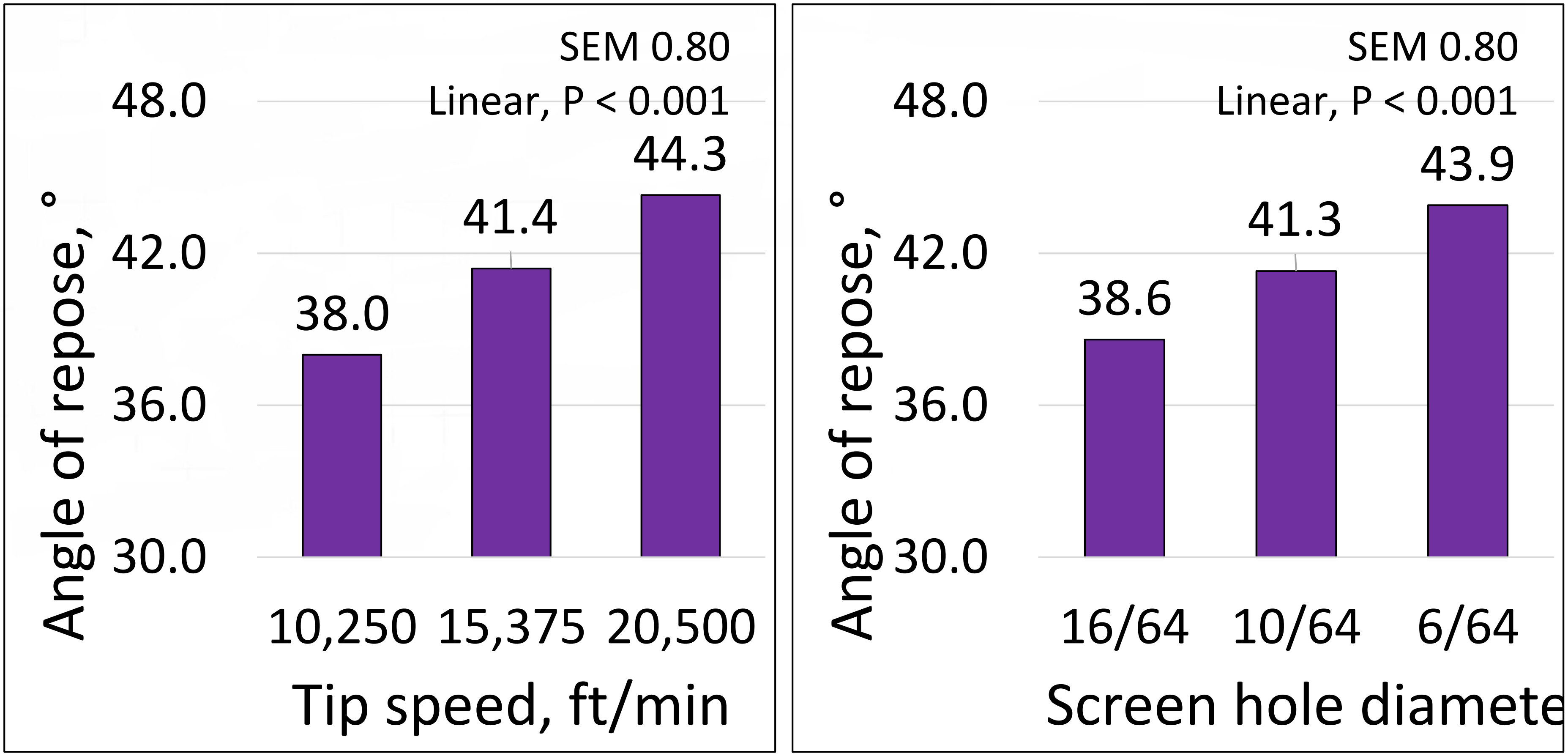
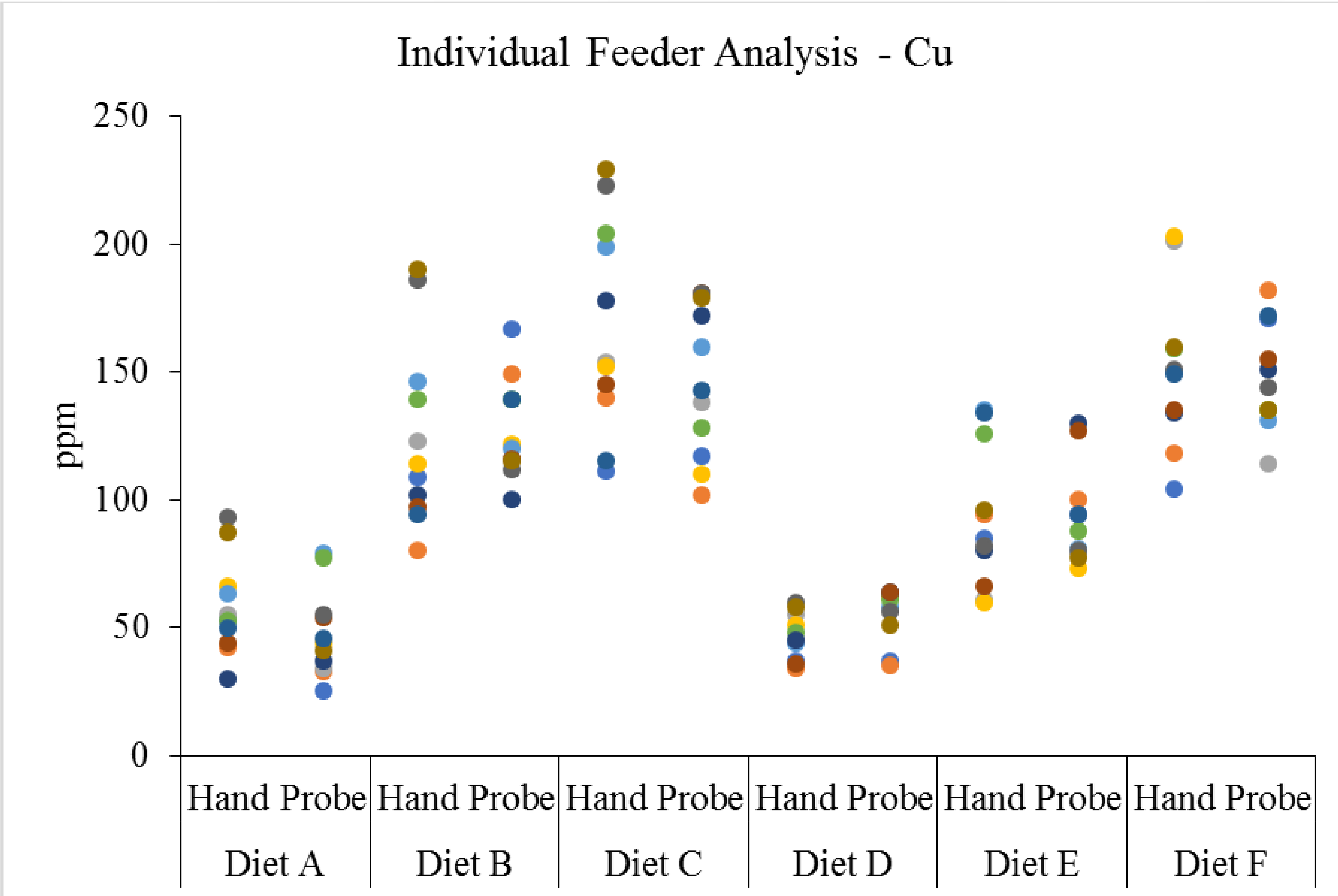
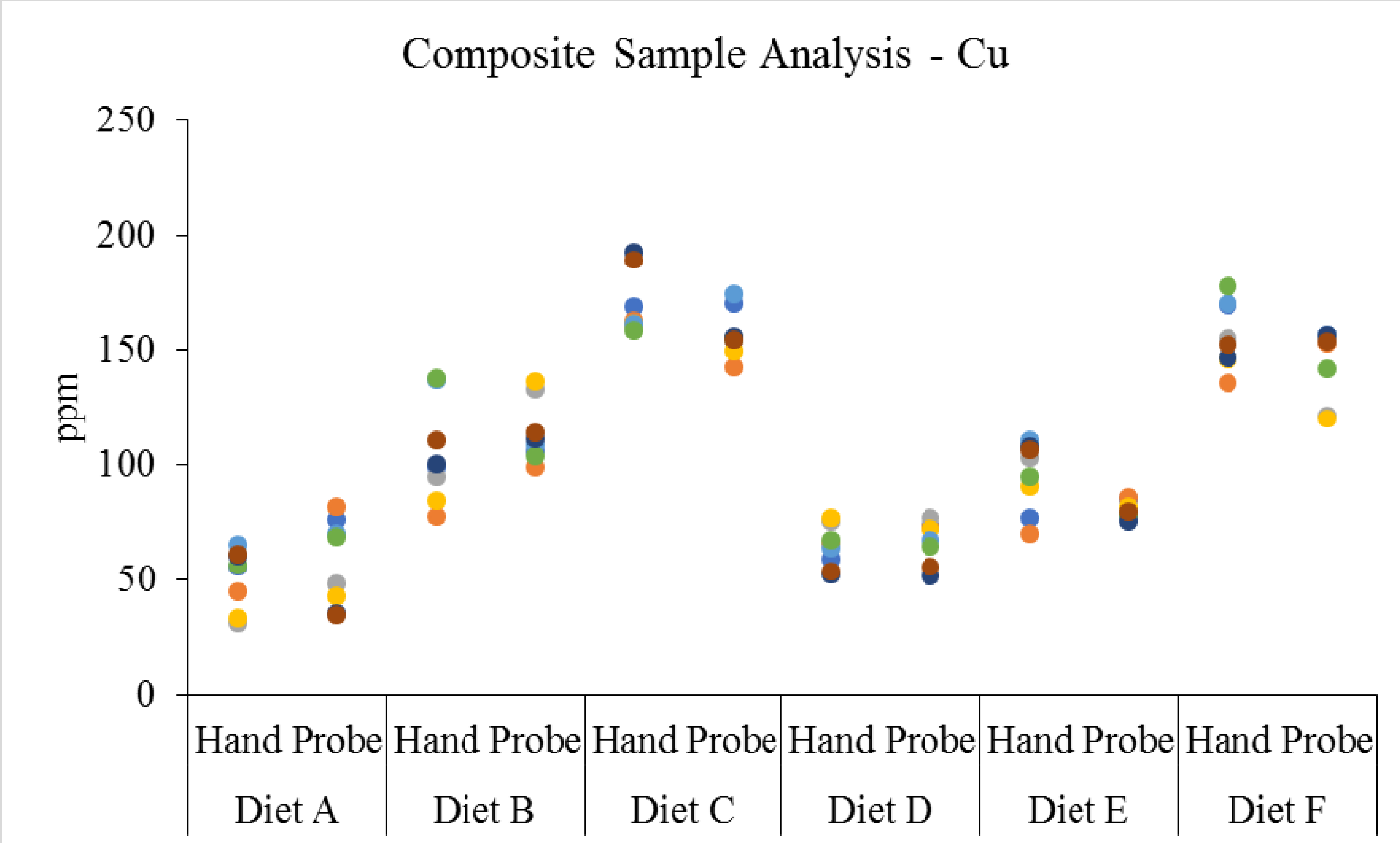
Main effects of tip speed and screen size on flowability



Saensukjaroenphon et al. 2017



Jones et al., 2017



Jones et al., 2017

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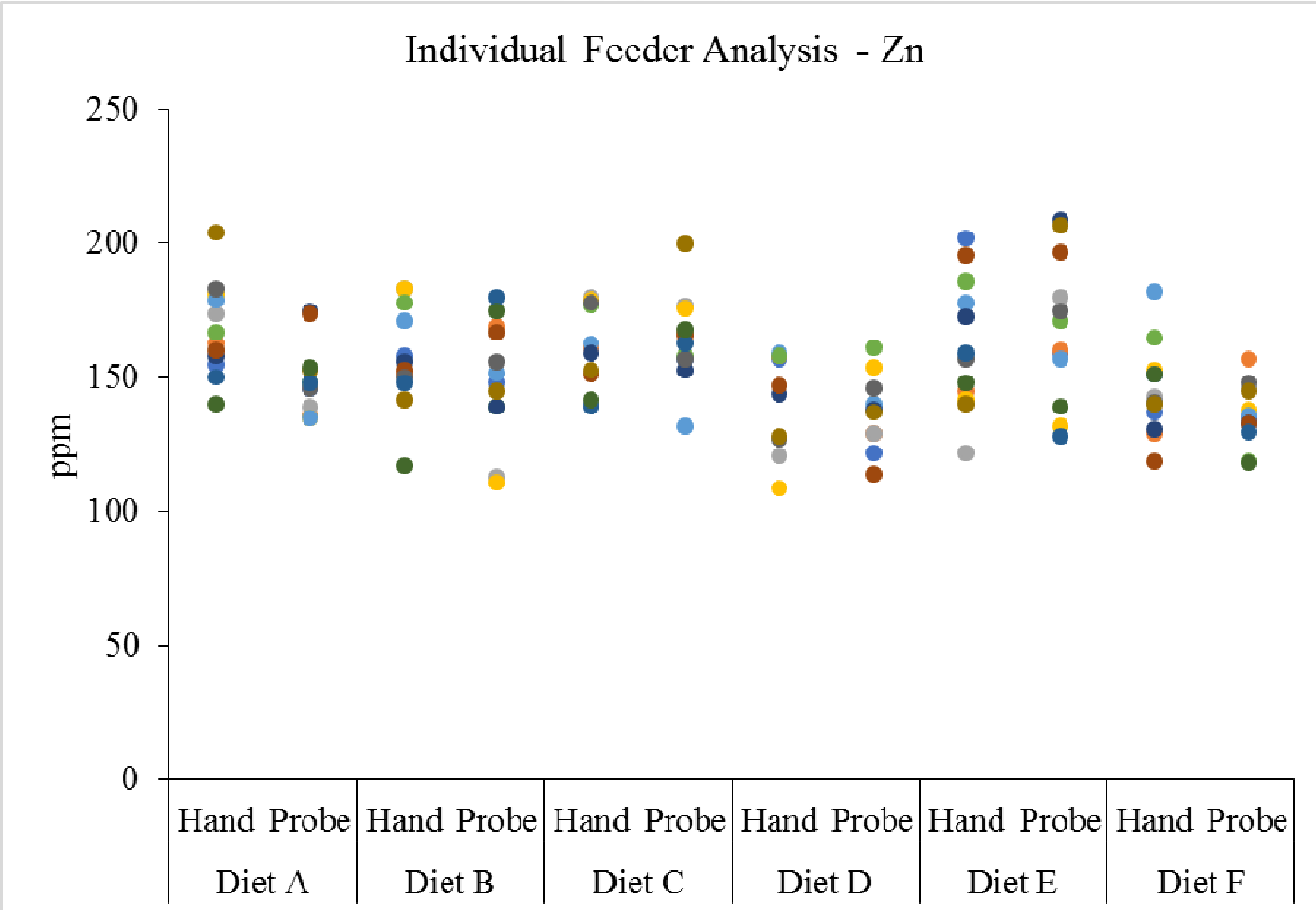
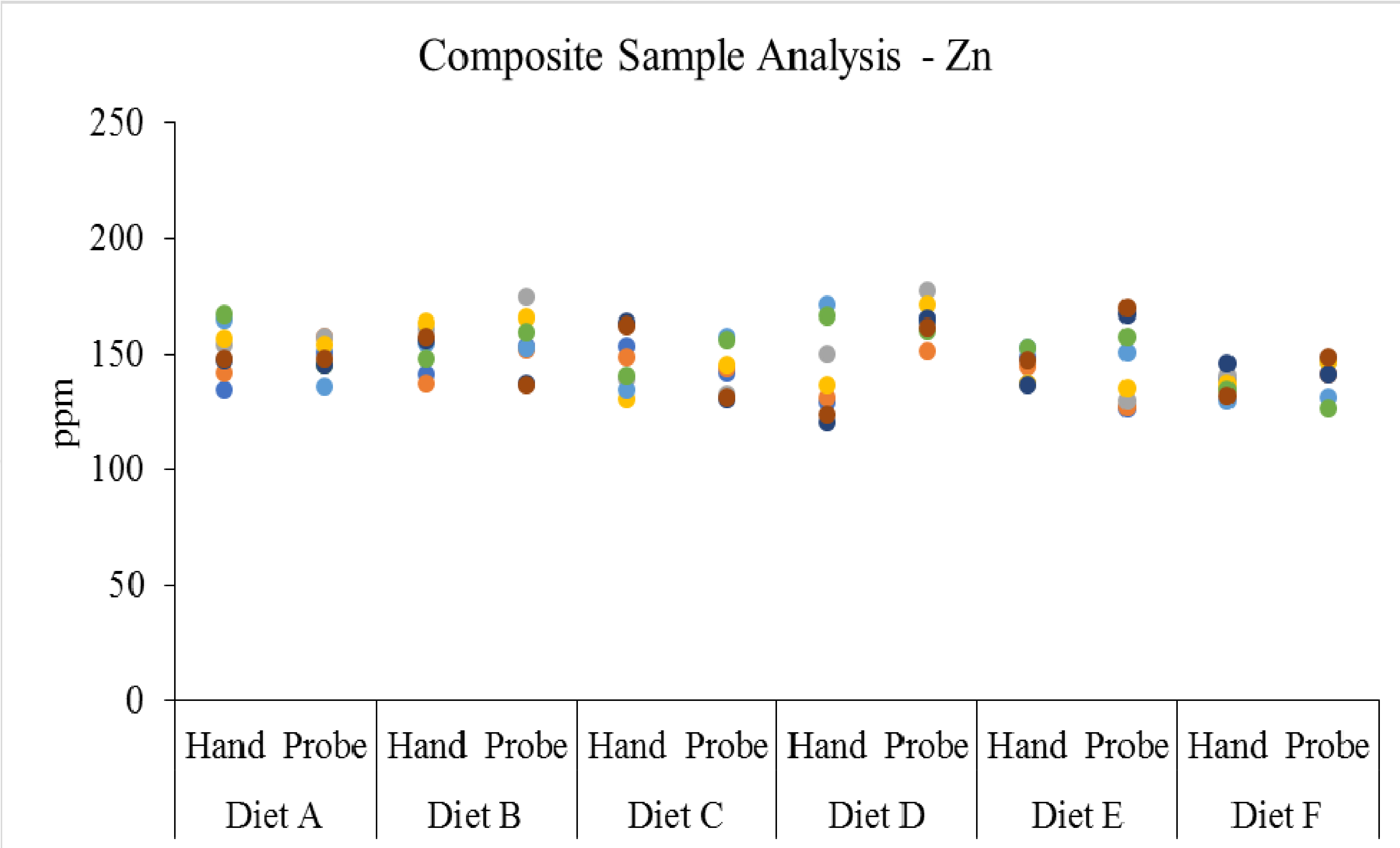


Jones et al., 2017



Jones et al., 2017

Sample Size Calculations for Cu

		Individual Feeder Sampling		Composite Samples	
		Hand	Probe	Hand	Probe
Margin of Error	C. I.	Feeders	Feeders	Samples	Samples
± 10 ppm	95%	39	15	9	6
± 15 ppm	95%	17	7	4	2
± 20 ppm	95%	10	4	2	1
± 25 ppm	95%	6	2	1	1
± 30 ppm	95%	4	2	1	1

Jones et al., 2017

Sample Size Calculations for Zn

		Individual Feeder Sampling		Composite Samples	
		Hand	Probe	Hand	Probe
Margin of Error	C. I.	Feeders	Feeders	Samples	Samples
± 10 ppm	95%	12	11	6	5
± 15 ppm	95%	5	5	2	2
± 20 ppm	95%	3	3	1	1
± 25 ppm	95%	2	2	1	1
± 30 ppm	95%	1	1	1	1

Jones et al., 2017

Summary

- 3-Sieve particle size analysis spread sheet is updated on www.ksuswine.org
- Variable frequency drives can be used to achieve particle size range for a specified hammermill screen size
  - Increasing tip speed from 10,250 to 20,500 ft/min reduced d_{gw} by 231, 258, and 350 μm when using a #6, #10, and #16.
- To minimize variation and reduce analytical cost, collect samples with a probe from 6 feeders and composite before analysis

Feed Safety

Cassie Jones
Kansas State University

November 16th, 2017
K-State Swine Day

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Feed Safety

Prevention

- Dust control
- Receiving procedures
- Personnel zoning
- Flushing and sequencing

Intervention

- Point-in-time
  - Thermal processing
  - Radiation
- Chemical additive application

Postvention

- Facility decontamination

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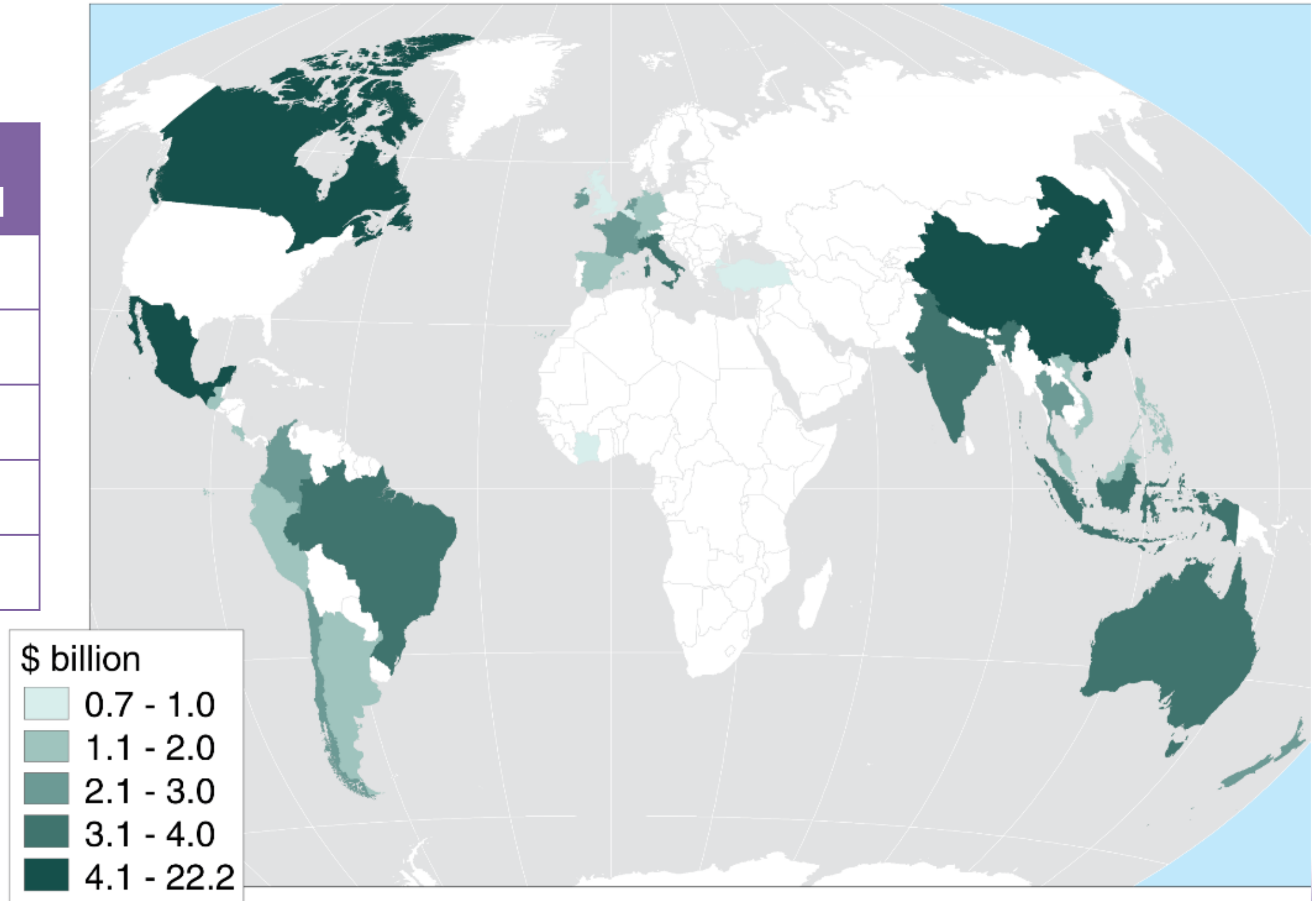
Sources of Feed Imports

Ingredient	Tons imported
Soybeans	98,623
Lys HCl	23,666
Soybean meal	7,311
Tetracycline	1,556
DL-Met	372

Top 30 U.S. agricultural import sources, 2013-15 average

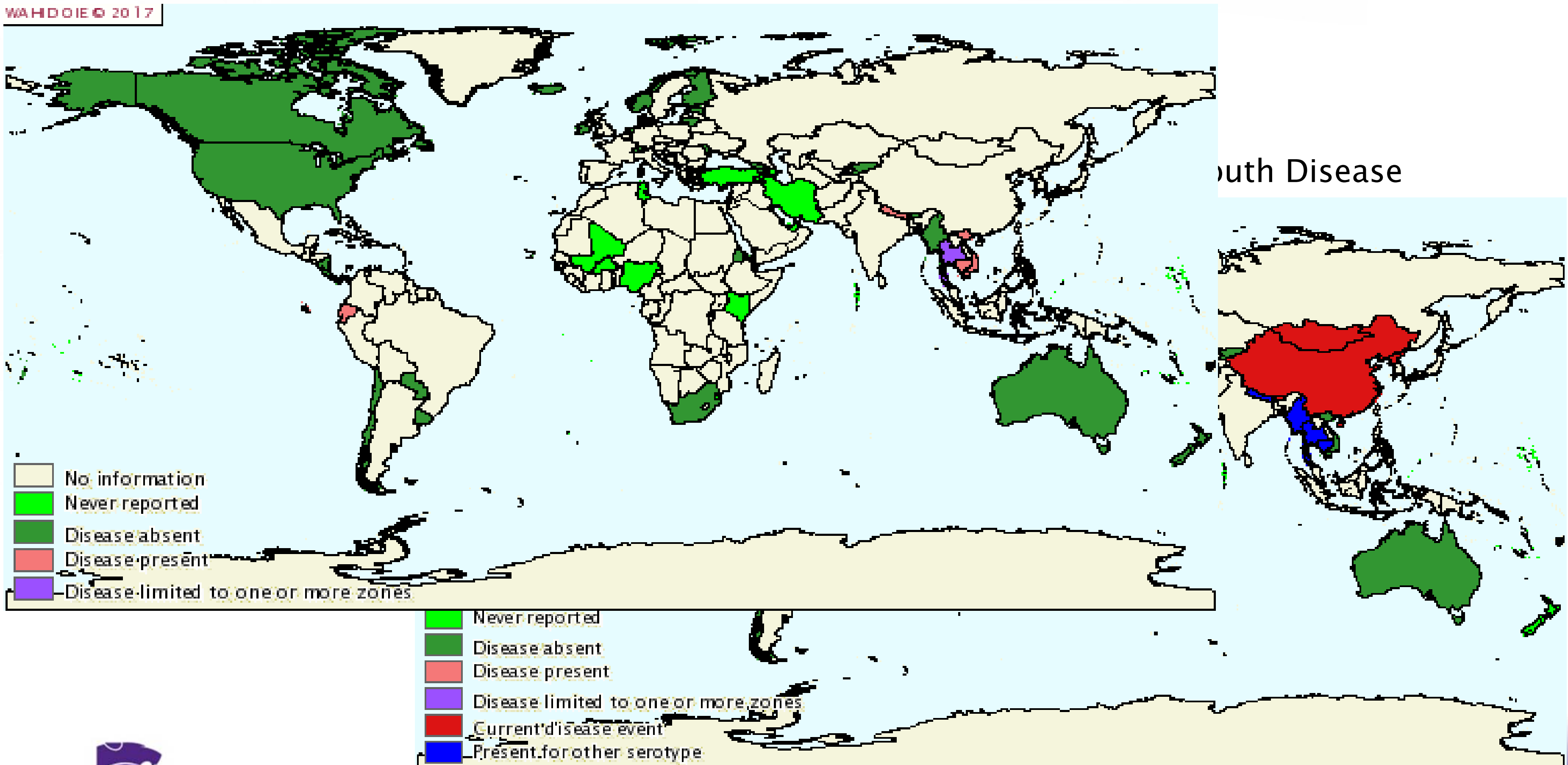


USDA, 2017
US Harmonized Tariff Schedule/Dee et al., 2016

Disease Distribution

Classical Swine Fever Virus

uth Disease

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Disease Survival During Transboundary Travel

Dee et al., 2017

Ingredient	PEDV	Senecavirus (FMDV)	African Swine Fever Virus	Porcine Sapelovirus (Swine Vesicular Disease Virus)	PCV2	Pseudorabies Virus	PRRSV
Soybean meal-Conventional							
Soybean meal-Organic							
Soy oil cake							
DDGS							
Lysine							
Choline							
Vitamin D							
Moist cat food							
Moist dog food							
Dry dog food							
Pork sausage casings							
Complete feed (+ control)							
Complete feed (- control)							
Stock virus (+ control)							

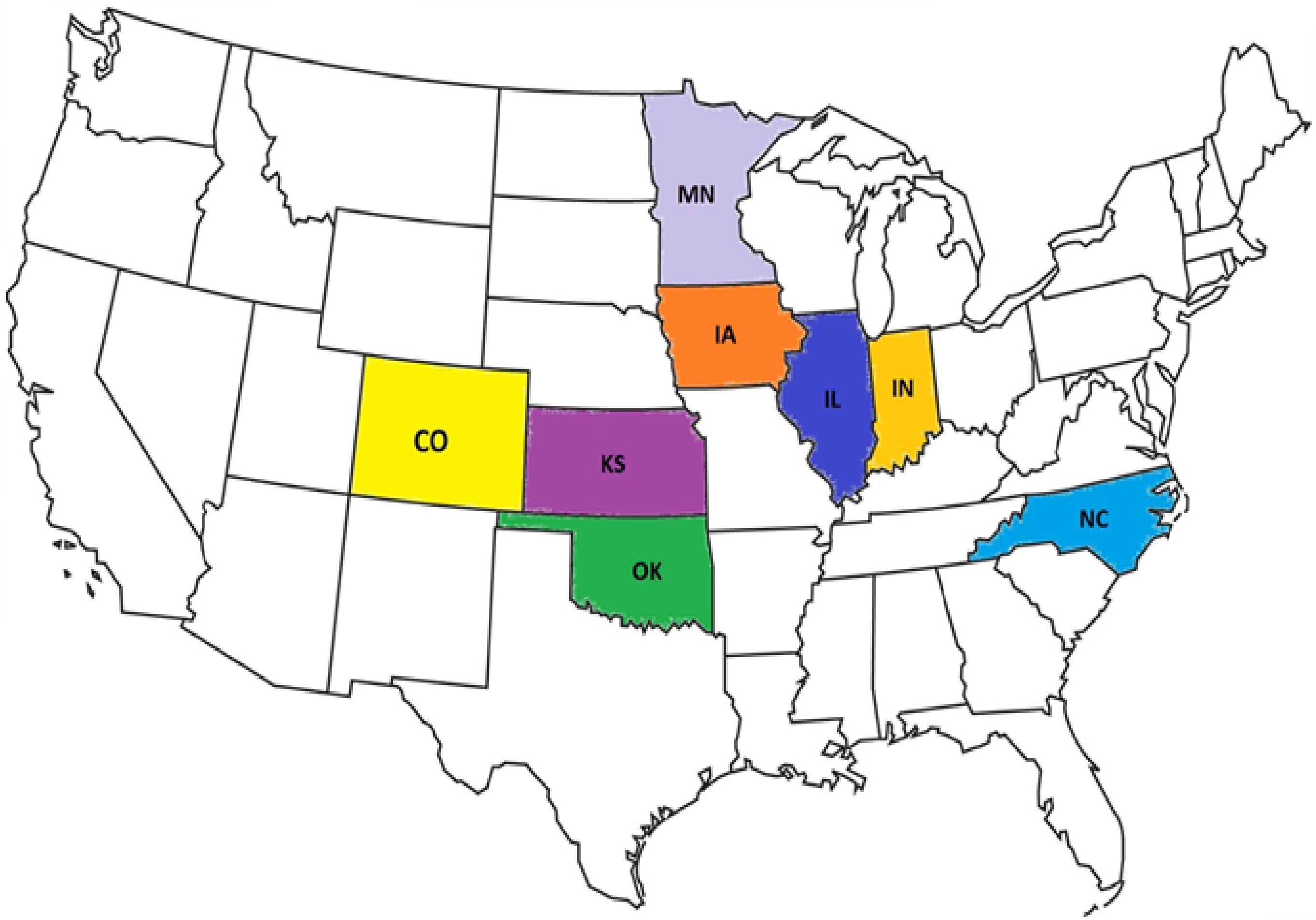
Current Projects

- Viruses
  - Porcine Epidemic Diarrhea Virus mitigation in swine feed
  - African Swine Fever Virus detection and mitigation in swine feed
  - Senecavirus A detection and mitigation with FMD modeling in swine feed
  - Detection and mitigation of transboundary foreign animal diseases
- Bacteria
  - *Salmonella* prevalence in U.S. swine feed mills
  - Factors influencing *Salmonella* growth in poultry fat intended for pet food
- Mycotoxins
  - Corn cleaning to reduce contamination with aflatoxin and fumonisin
  - Swine feeding experiments to evaluate additive impacts
- Antimicrobial replacement strategies
- Feed safety regulatory training

K-State Feed Safety Team

- Animal Scientists
  - Dr. Cassie Jones, feed safety
  - Dr. Jason Woodworth, swine nutrition
- Feed Scientists
  - Dr. Charles Stark, feed mill operations
  - Dr. Chad Paulk, feed quality
- Food Scientists
  - Dr. Valentina Trinetta, microbiology
- Microbiologists
  - Dr. Valentina Trinetta, food science
  - Dr. Raghu Amachawadi, microbiology
  - Dr. T.G. Nagaraja, microbiology
- Diagnostic/Veterinary Medicine
  - Dr. Jianfa Bai, molecular diagnostics
  - Dr. Natalia Cernicchiaro, epidemiology
  - Dr. Steve Dritz, swine health
  - Dr. Megan Niederwerder, virology
  - Dr. Bob Rowland, virology
- Outside Collaborators
  - Iowa State University Veterinary Diagnostic Laboratory
  - Murdoch University
  - Pipestone Applied Research
- Sponsors
  - National Pork Board/USDA
  - Swine Health Information Center
  - State of Kansas National Bio and Agro-Defense Facility Fund

Salmonella in swine feed mills



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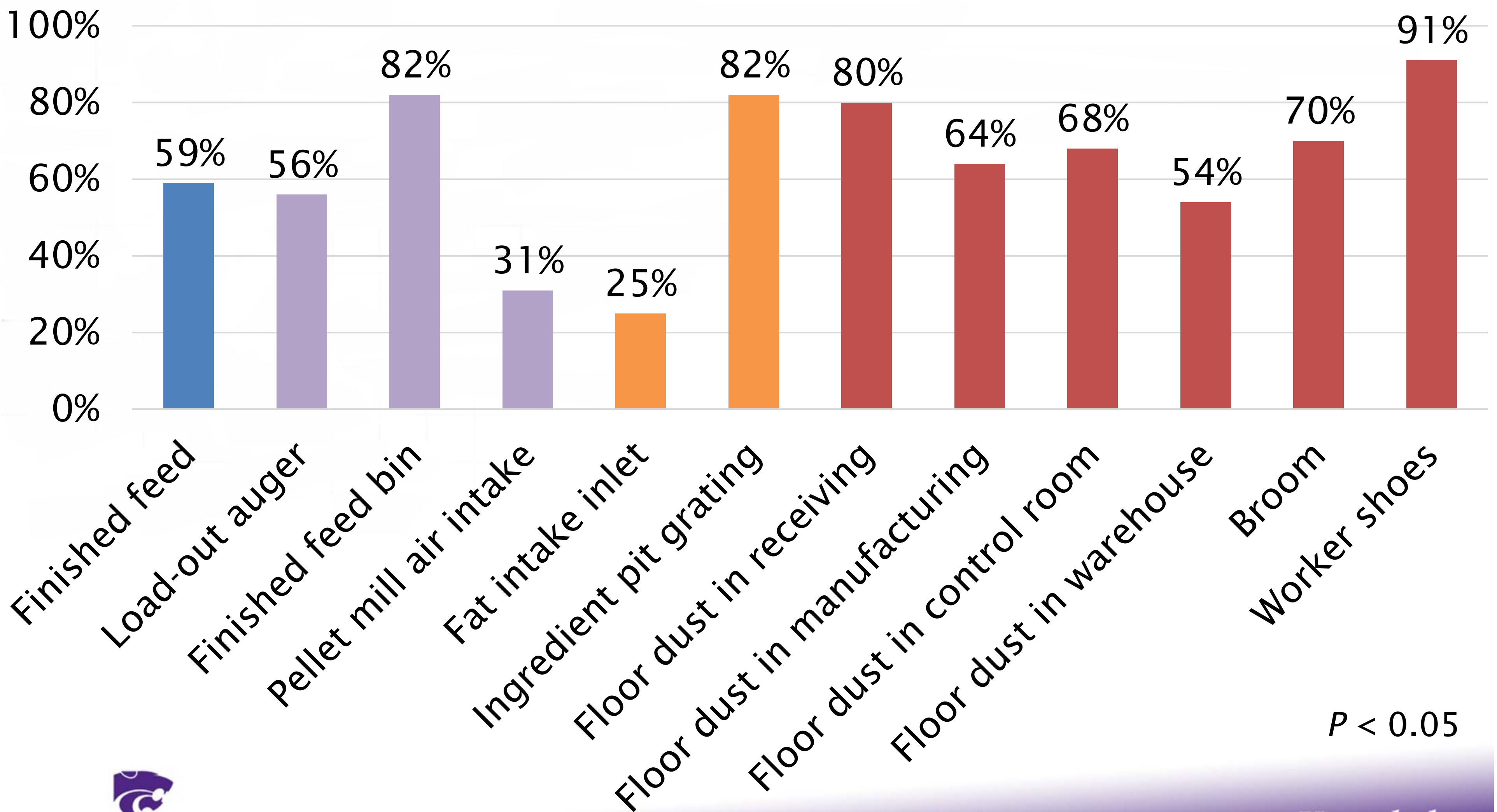
Boccatto et al., 2017

Knowledge for Life

Salmonella in swine feed mills



$P < 0.05$

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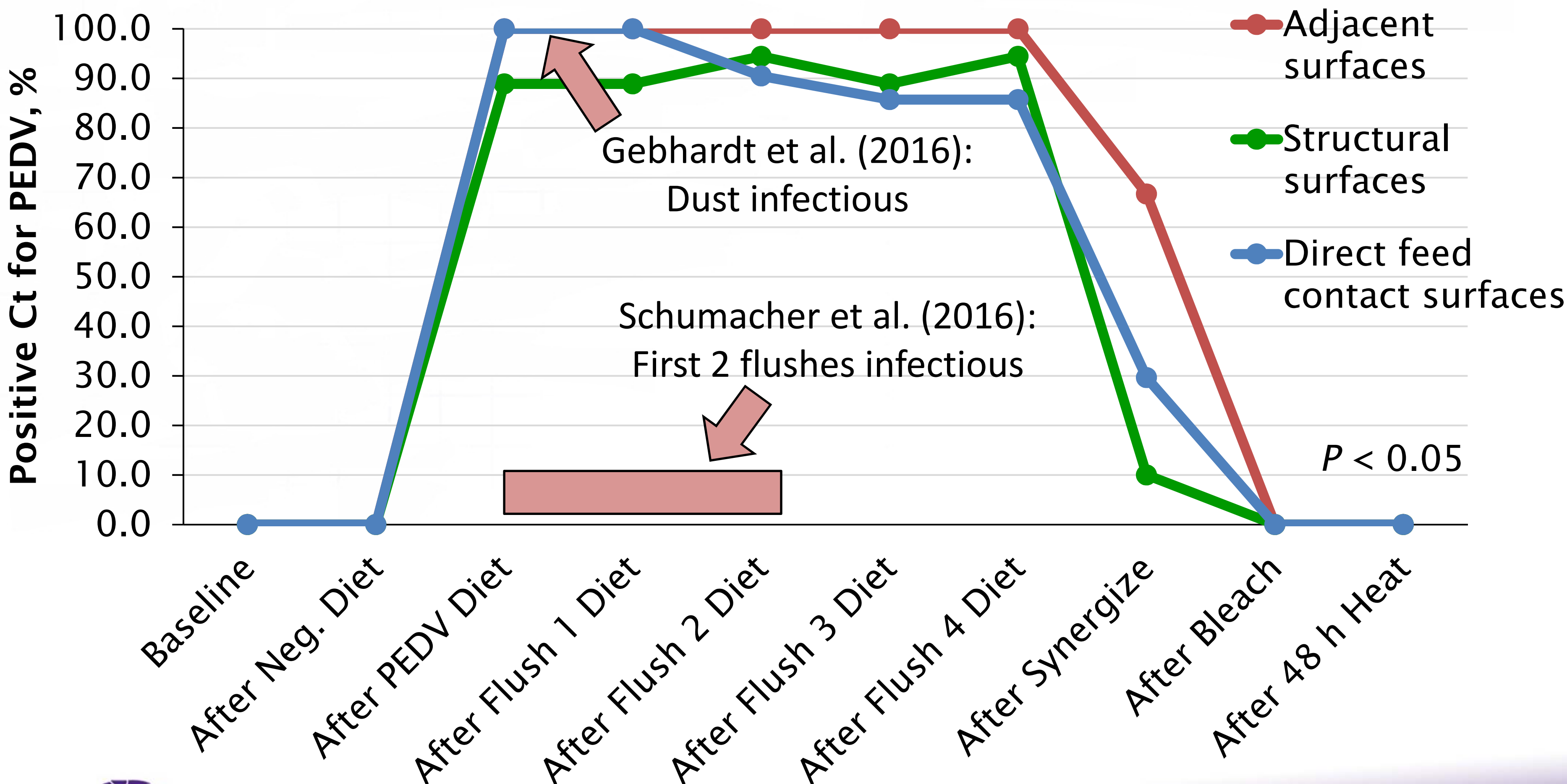
Boccatto et al., 2017

Knowledge for Life

Environmental contamination after PEDV-inoculated feed



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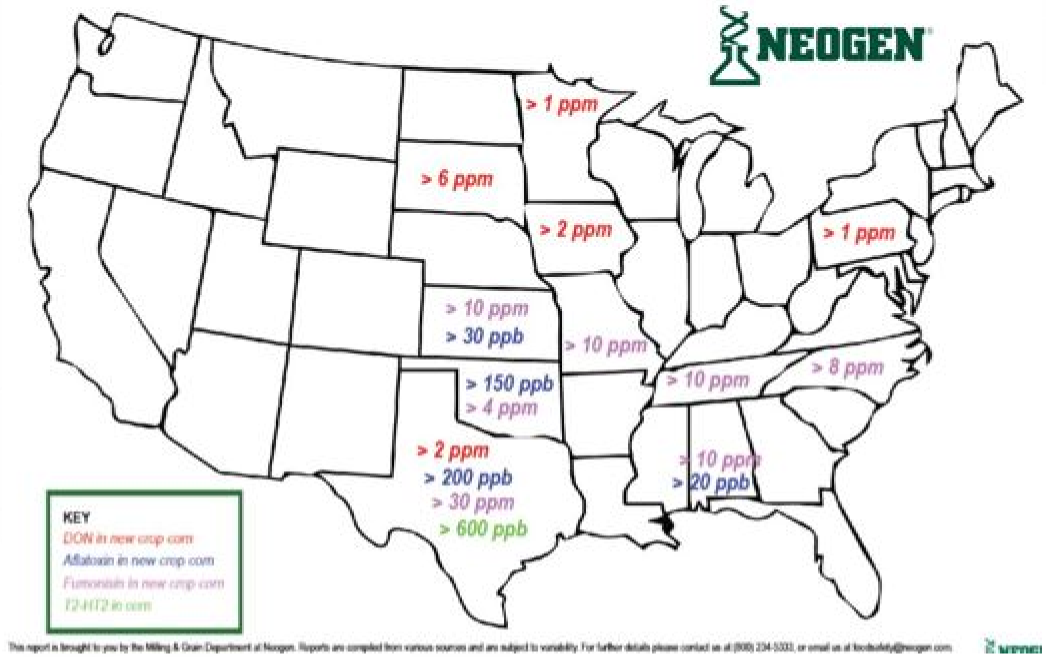
Schumacher et al., 2017

Knowledge for Life

Feed Mill Biosecurity

- Control traffic
- Do NOT add dust back to feed to save on shrink

Management of High Mycotoxin Corn



Maximum levels of mycotoxins in swine feed and ingredients established or recommended in FDA guidance		
Aflatoxin	Finishing swine > 100 pounds	200 ppb
	Breeding swine	100 ppb
	Immature animals	20 ppb
Deoxynivalenol/ vomitoxin		5 ppm (< 20% of the diet)
Fumonisins		20 ppm (< 50% of the diet)

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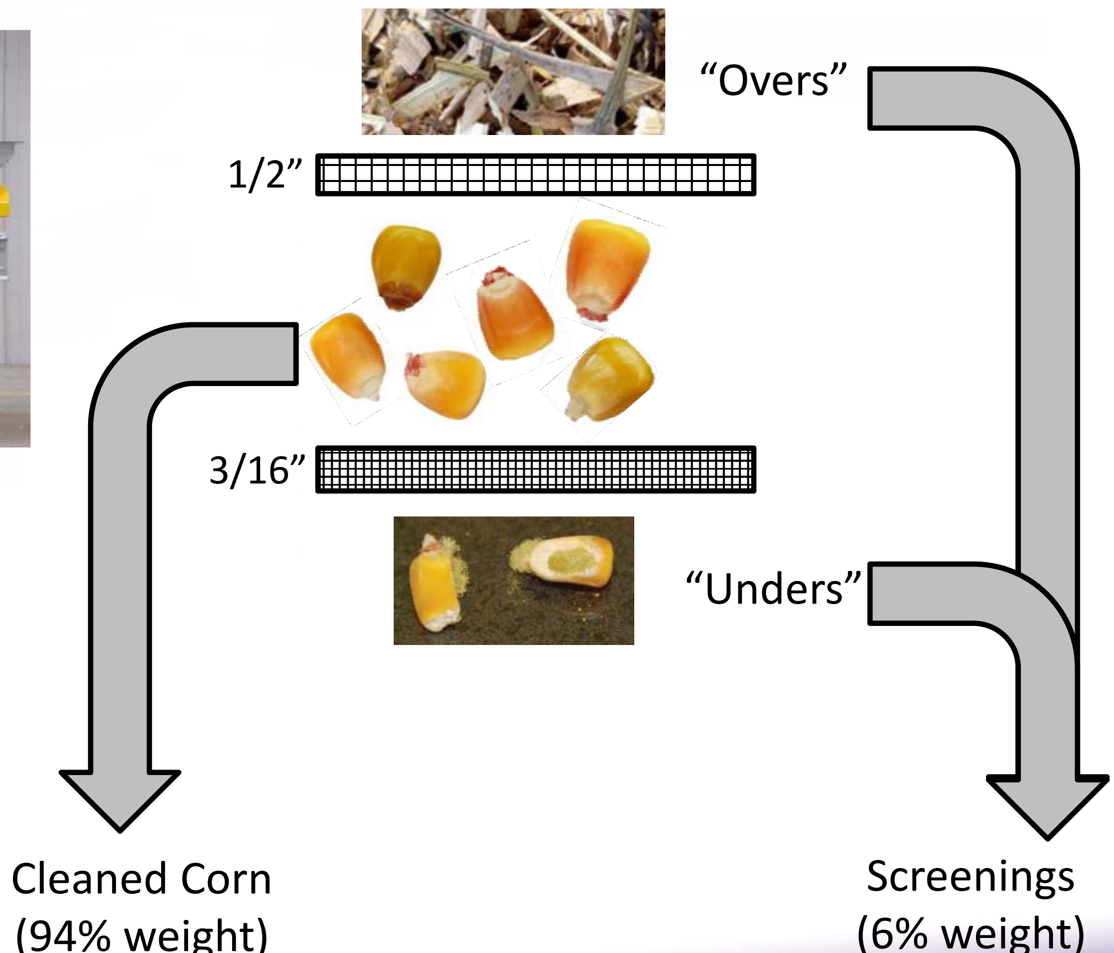
Yoder et al., 2017

Knowledge for Life

Management of High Mycotoxin Corn



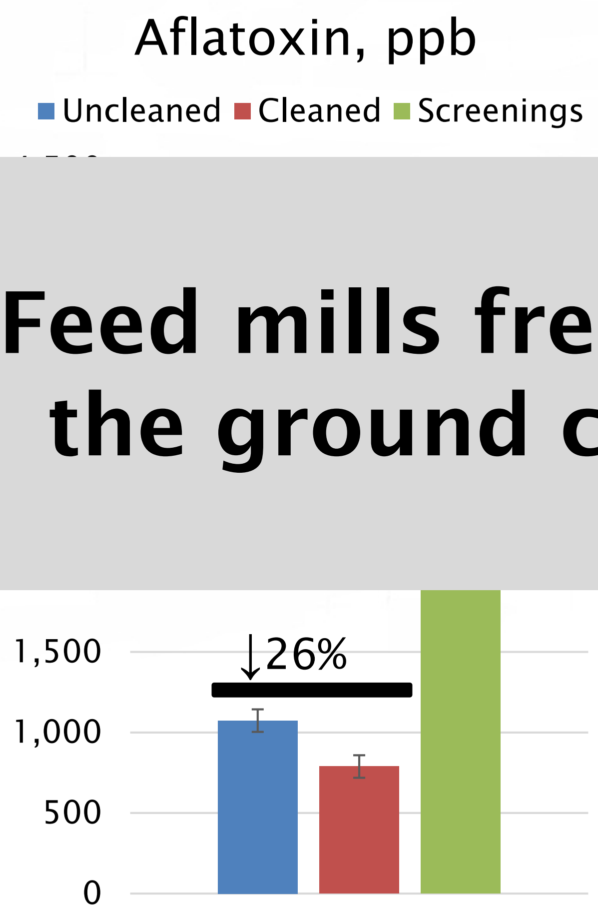
- > 3 tons single load corn
- 20 lots, 3 cleaning runs per lot
- Composite samples analyzed for mycotoxins

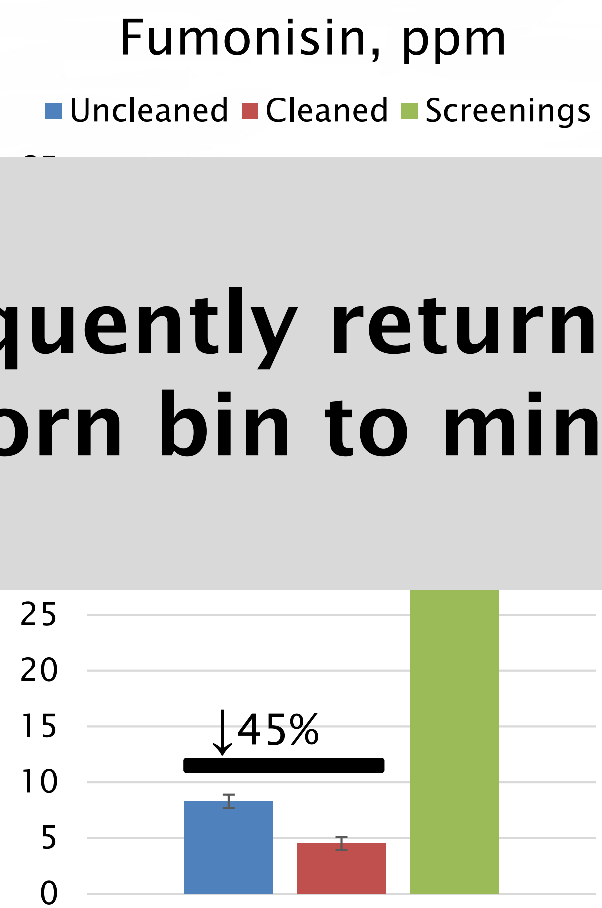
Yoder et al., 2017

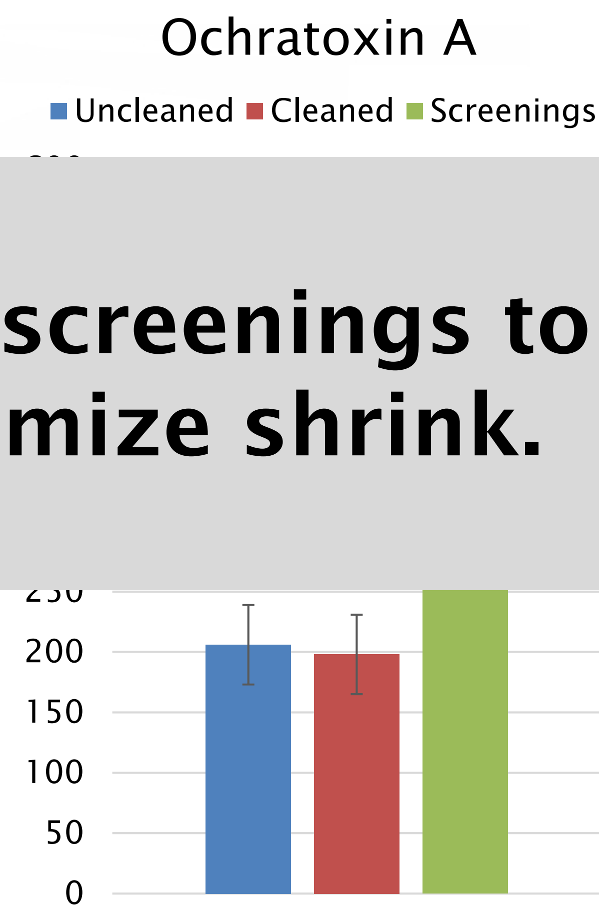
Management of High Mycotoxin Corn

$P < 0.05$

Feed mills frequently return screenings to the ground corn bin to minimize shrink.







Take Home Messages

- Extend farm-based biosecurity practices to the feed mill
  - Restrict traffic
  - Strategic flushing/sequencing
  - Proactive interventions
- Control dust, control dust, control dust
- Cleaning can reduce mycotoxin risk
- Shrink is expensive, but consider risk of:
  - Disease transmission via dust
  - Pulses of high mycotoxin levels

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Congratulations!

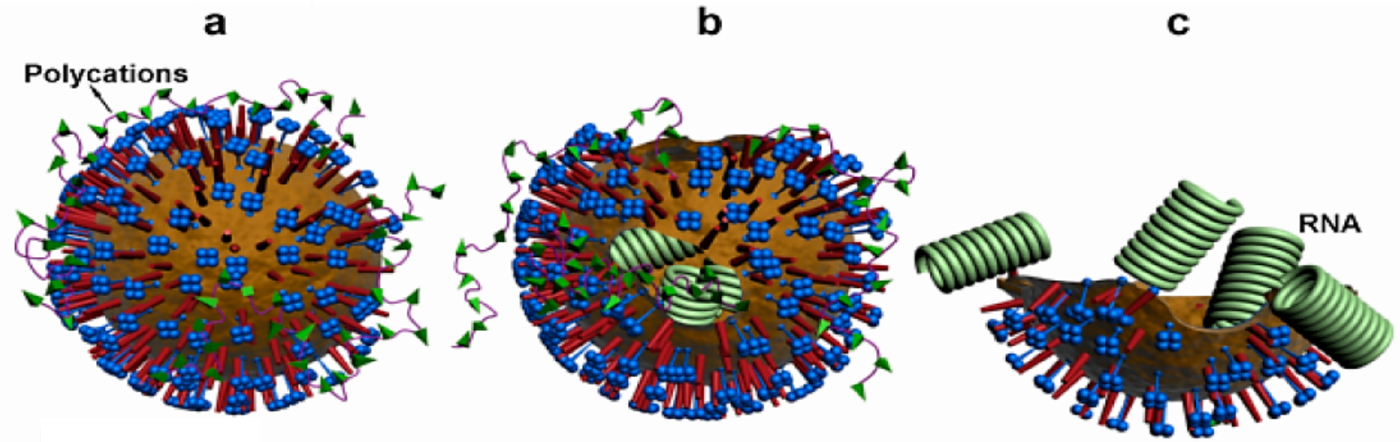
- Graduate Student Achievements
  - **Hilda Calderón Cartagena** - K-State Presidential Doctoral Scholarship
  - **Roger Cochrane** – K-State Presidential Doctoral Scholarship, Endeavour Research Fellow in Australia
  - **Jordan Gebhardt** - Midwest ASAS 1st place PhD oral presentation; AASV 1st place poster presentation
  - **Kiah Gourley** – Midwest ASAS 2nd place oral presentation, K-State Donoghue Graduate Scholarship, Feed Energy Excellence in Ag Scholarship, International Ingredients Pinnacle Award, College of Ag Nunemacher Scholarship
  - **Jose Soto** –Evonik Future Leaders Scholar

Congratulations!

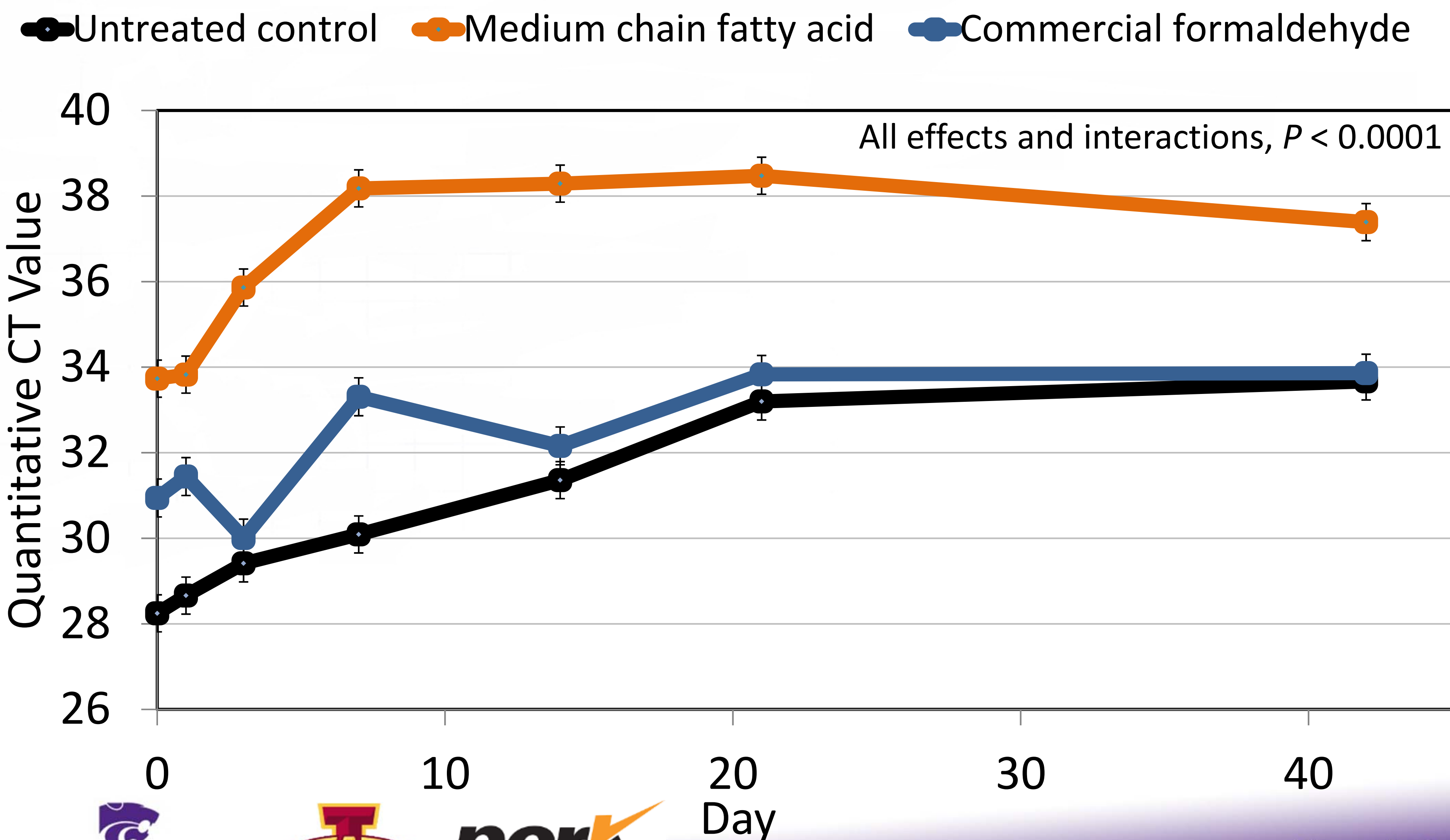
- Graduate Student Achievements
  - **Lori Thomas** – K-State Donoghue Graduate Scholarship, Australasian Pig Science Travel Award
  - **Carine Vier** - Midwest ASAS 1st place PhD poster presentation, Australasian Pig Science Travel Award, Bob and Karen Thaler Graduate Student Swine Nutrition Scholarship
  - **Arkin Wu**– Australasian Pig Science Travel Award
- Undergraduate Student Achievements
  - **Gage Nichols**, Midwest ASAS oral undergraduate competition and NPB Scholarship recipient

Medium Chain Fatty Acids

- Fatty acids with 6-12 carbons
- Not common in most feed ingredients
- Potential modes of action
  - Bind with cell membrane proteins
  - Incorporation into the cell membrane
  - Causes destabilization of the cell membrane bi-layer



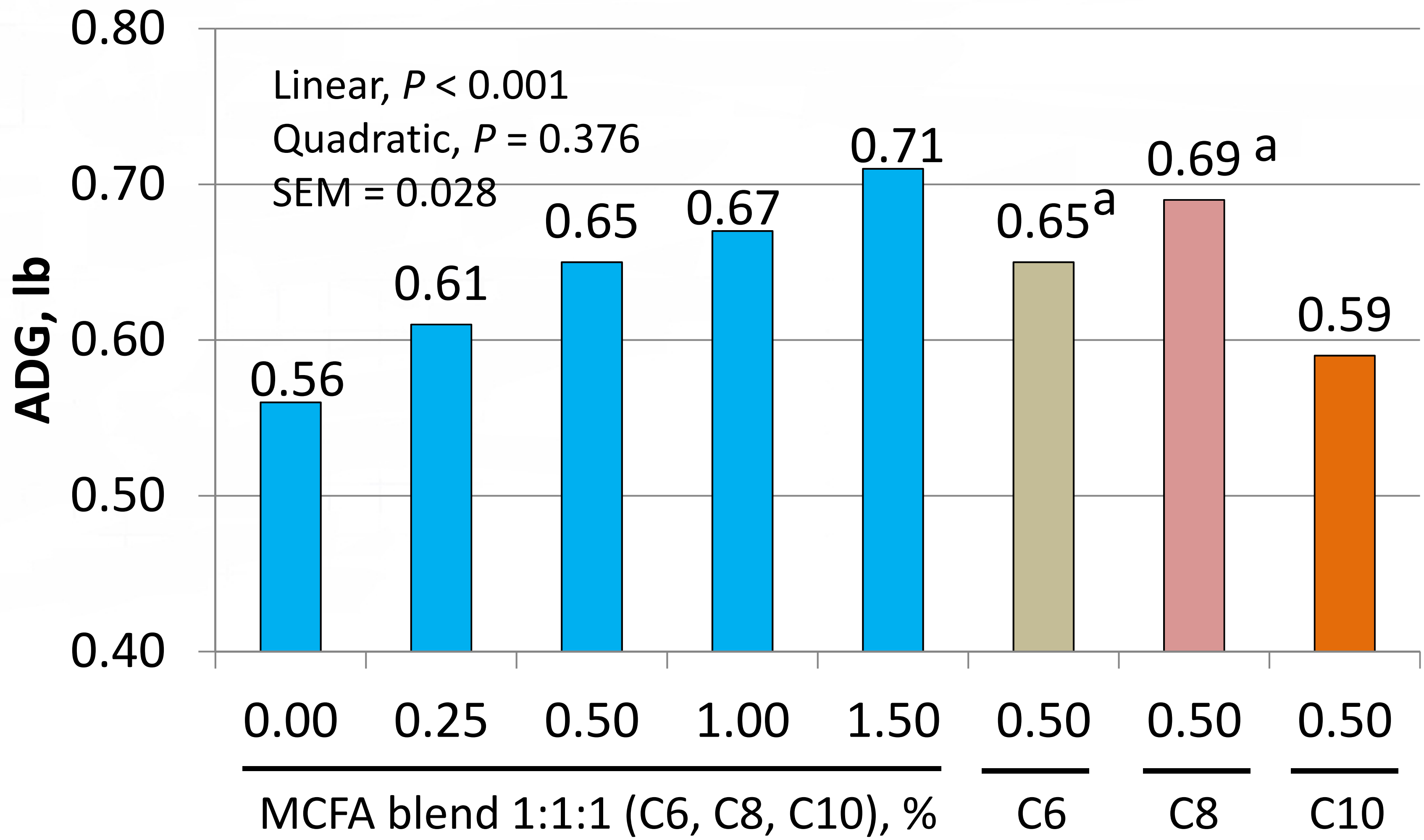
Treating **Complete Diet** with MCFA reduces PEDV



Cochrane et al., 2015

Knowledge *for* Life

Medium chain fatty acid inclusion on nursery pig growth performance (15 to 25 lb)



[a]vs control $P< 0.02$

Gebhardt et al., 2017

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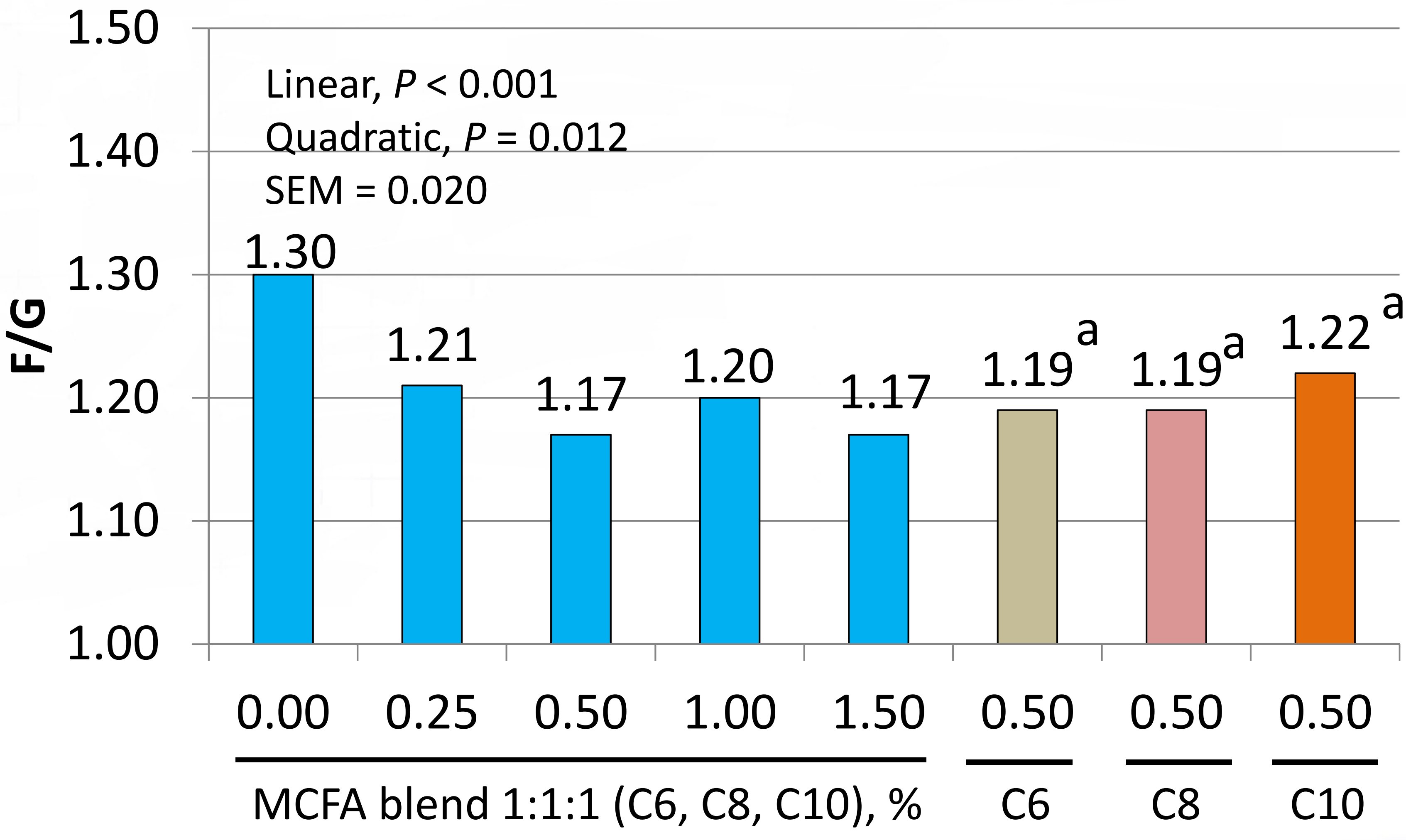
Knowledge for Life

Medium chain fatty acid inclusion on nursery pig growth performance (15 to 25 lb)



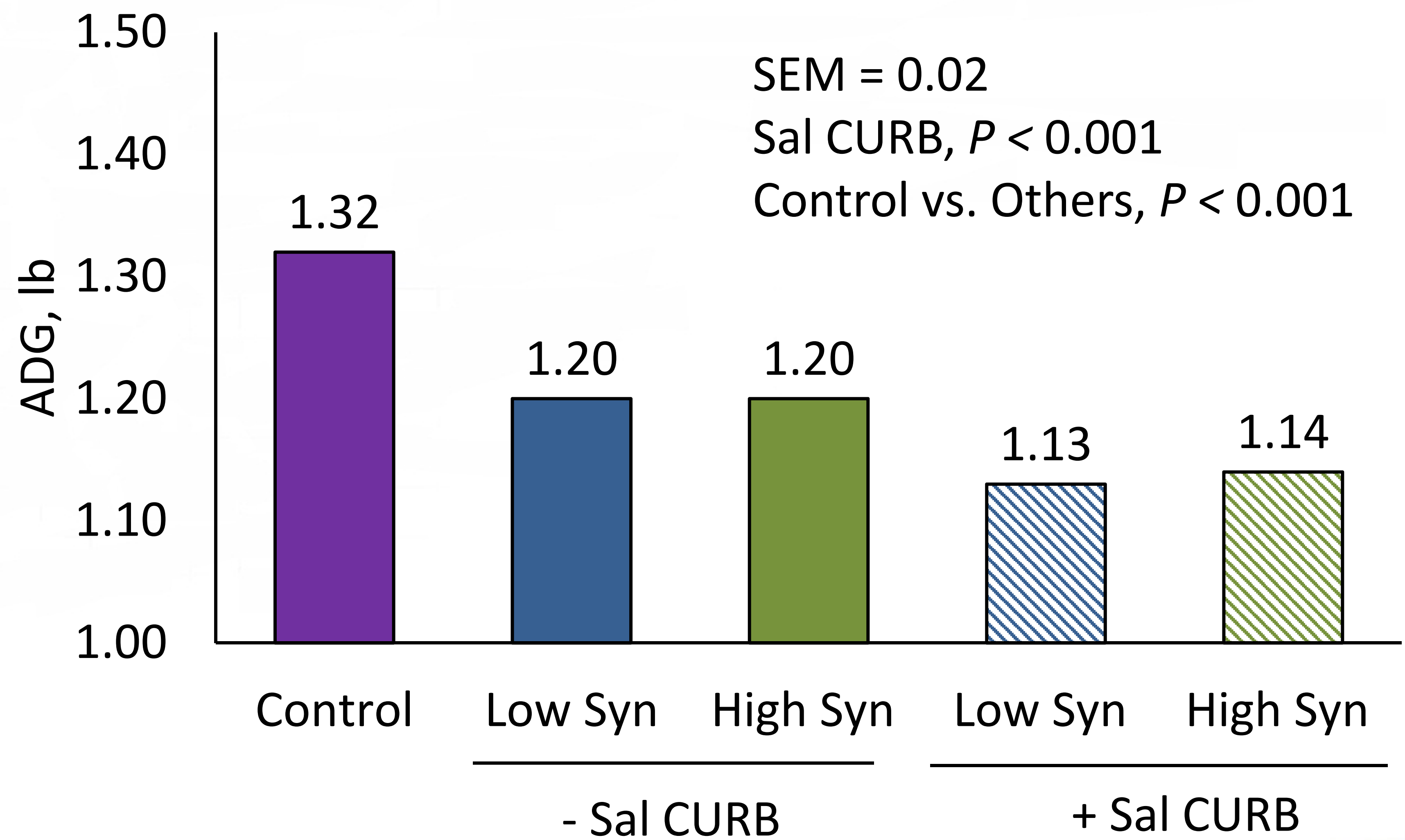
[a]vs control *P*= 0.005

Gebhardt et al., 2017

Formaldehyde treatment of feed

- Treating diets with formaldehyde is a beneficial practice recognized by the poultry industry.
- Formaldehyde is effective at reducing PEDV infectivity in contaminated feed and ingredients (Cochrane et al., 2015).
- Formaldehyde is known to produce reactions with numerous groups of AA residues of proteins (Metz et al., 2004).
- Little data on formaldehyde impacts on swine performance

Effect of Sal Curb and crystalline AA level on ADG



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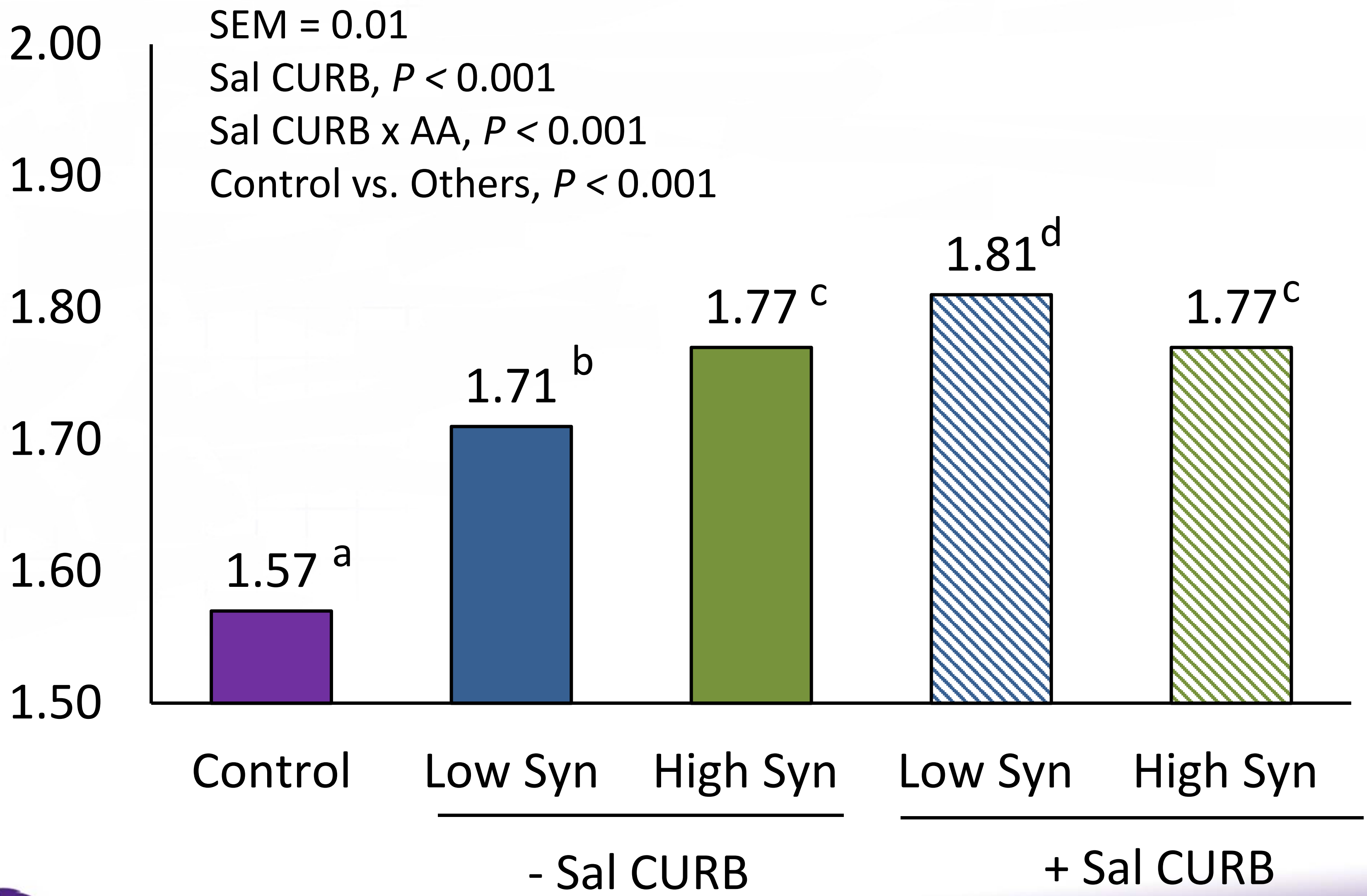
KEMIN

Williams et al., 2017

Knowledge for Life

Effect of Sal Curb and crystalline AA level on F/G



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Williams et al., 2017

Knowledge for Life

Lysine Content, %

Item	Control	-Sal Curb		+ Sal Curb	
		Low Syn	High Syn	Low Syn	High Syn
Calculated					
Total Lys	1.64	1.36	1.33	1.36	1.33
Free Lys	0.41	0.05	0.34	0.05	0.34
Analyzed					
Total Lys	1.59	1.32	1.28	1.21	1.24
Available Lys	1.56	1.32	1.29	1.19	1.25
Free Lys	0.30	0.06	0.25	0.06	0.26

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Williams et al., 2017

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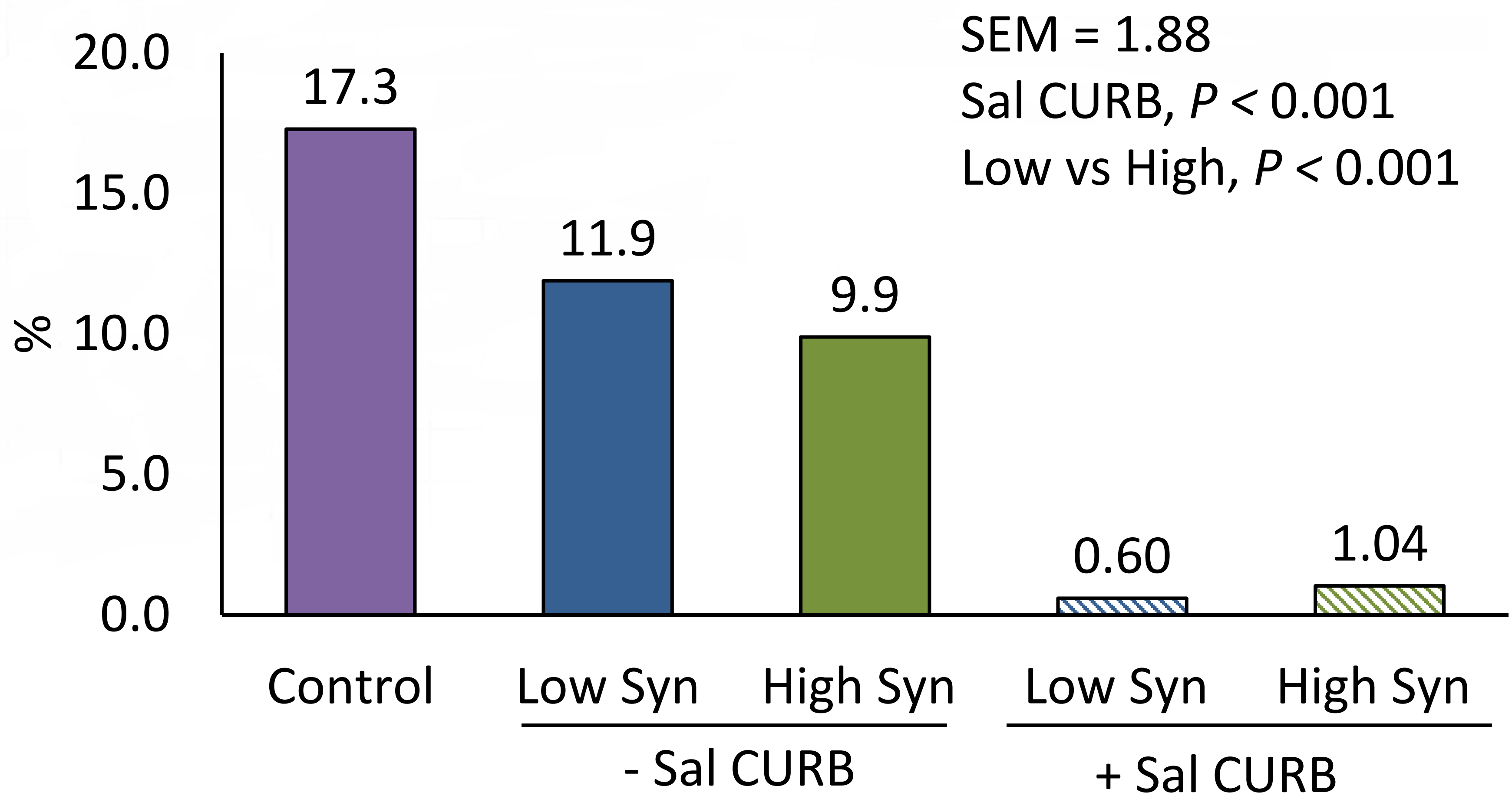
Effect of Sal Curb and crystalline AA level on abundance of *Lactobacillaceae*



Williams et al., 2017

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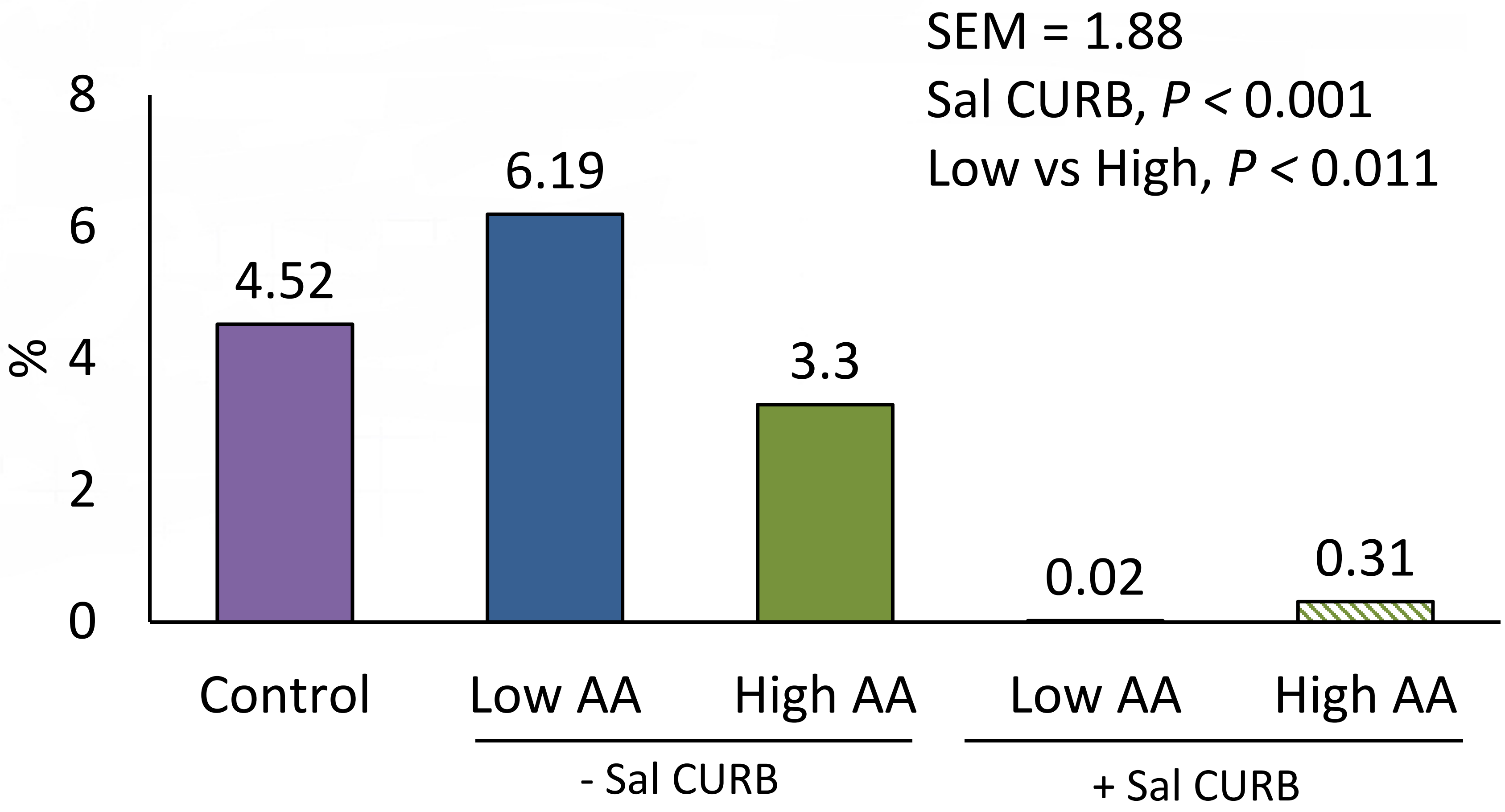
Effect of Sal Curb and crystalline AA level on abundance *Streptococcaceae*



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Williams et al., 2017

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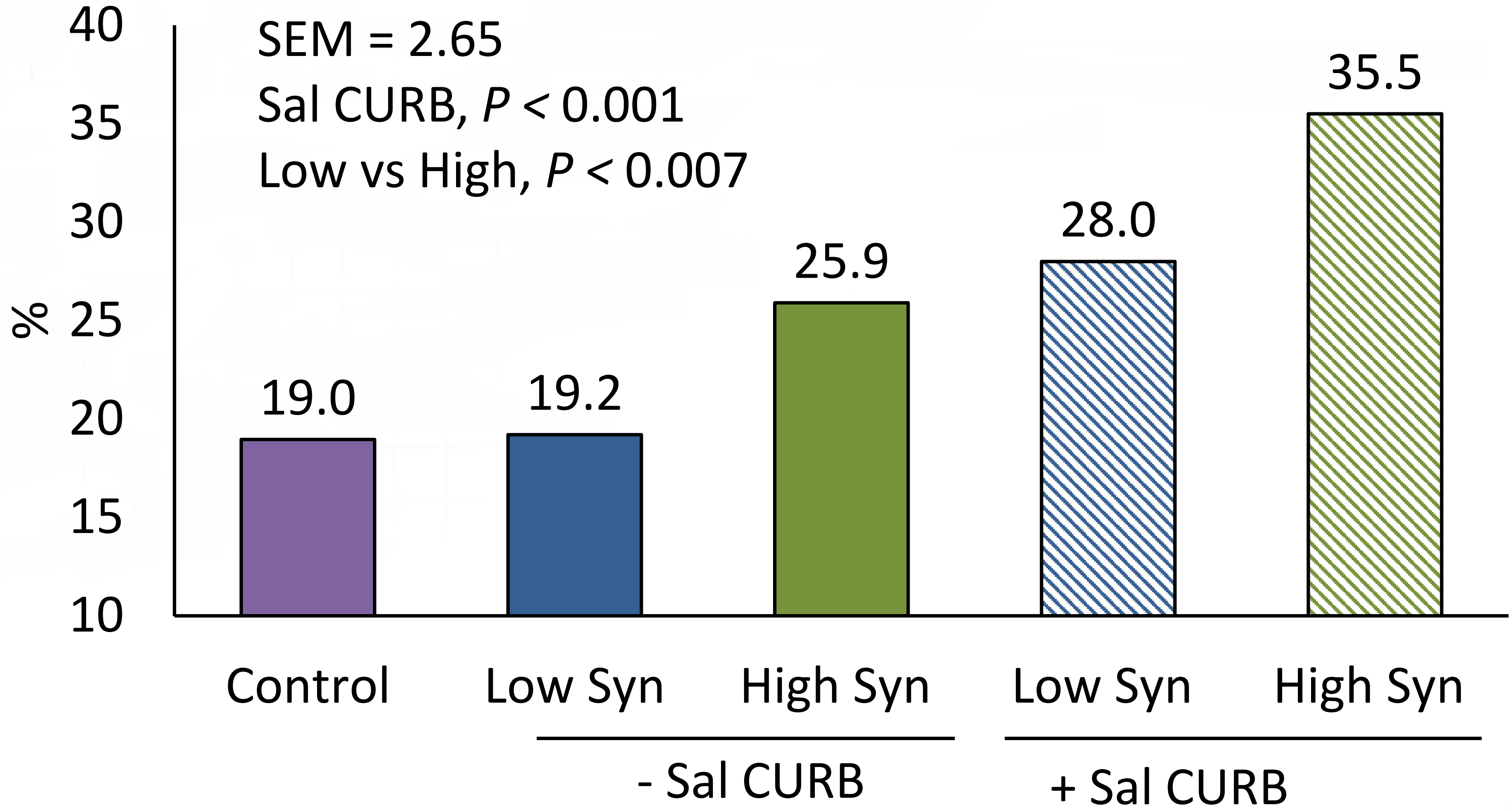
Effect of Sal Curb and crystalline AA level on abundance *Clostridiaceae*



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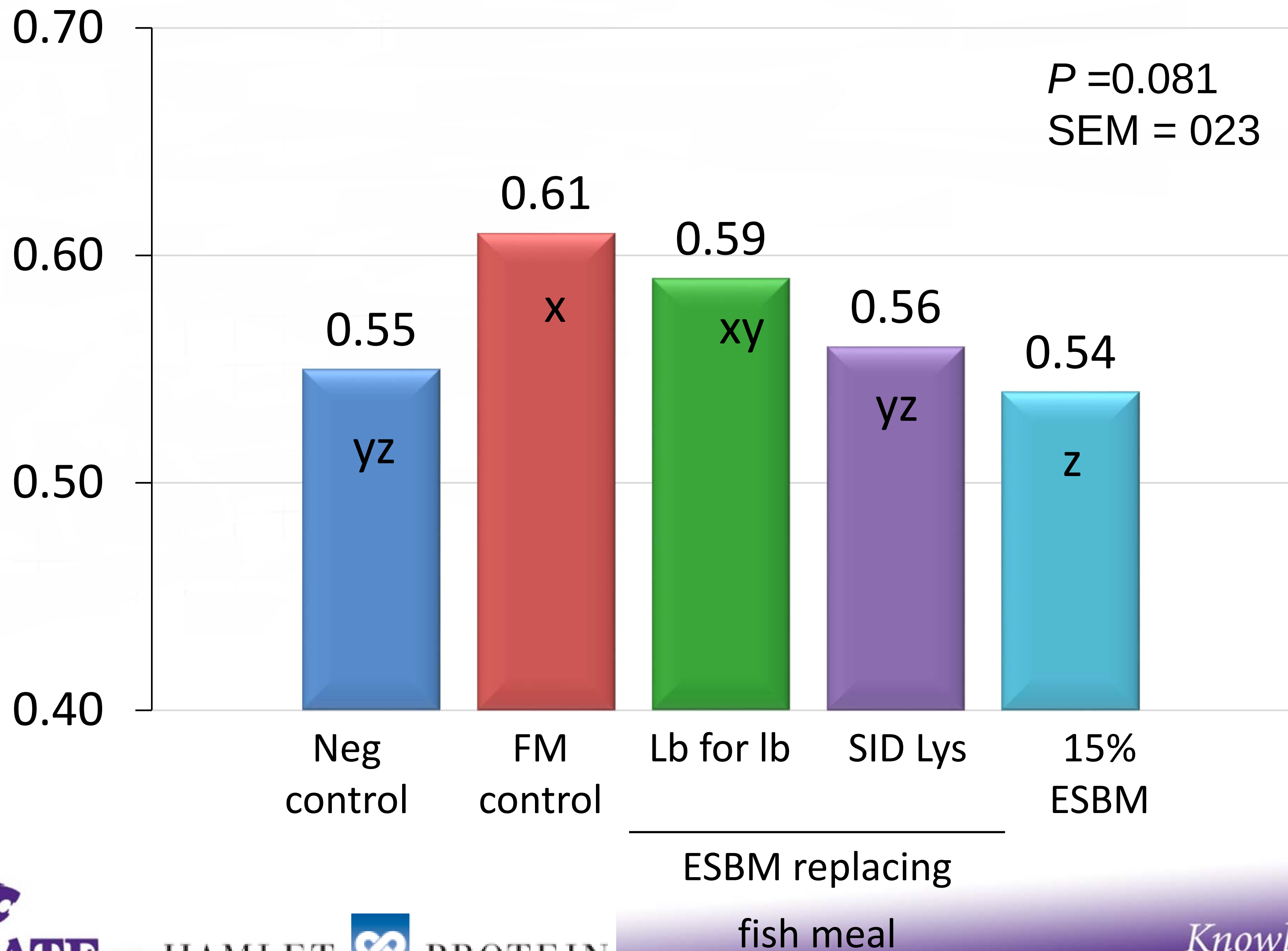
Williams et al., 2017

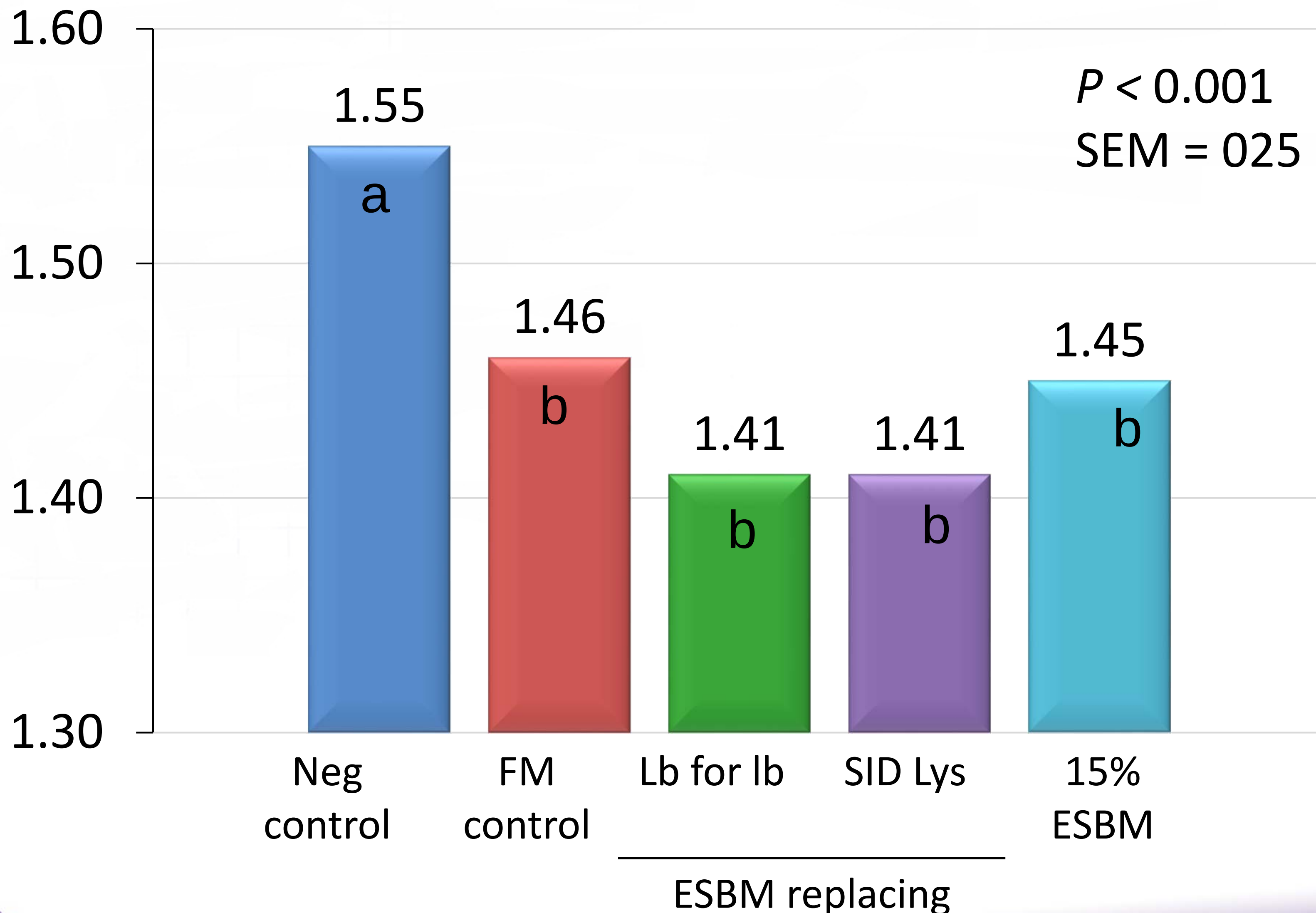
Knowledge for Life

Effects of replacing fish meal with ESBM on ADG



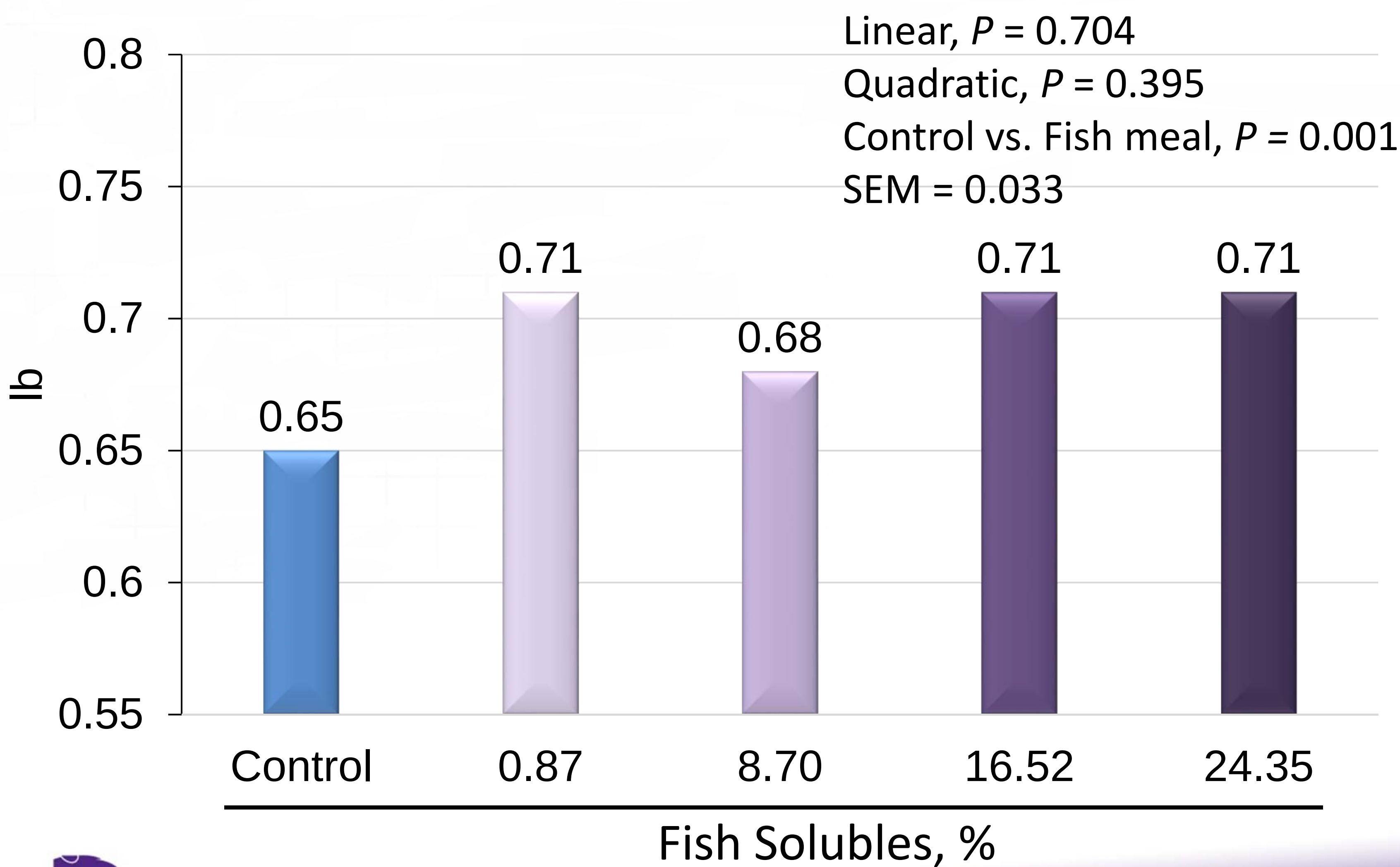
Jones et al., 2017

Effects of replacing fish meal with ESBM on F/G



Jones et al., 2017

Increasing fish solubles in fish meal on ADG



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Jones et al., 2017

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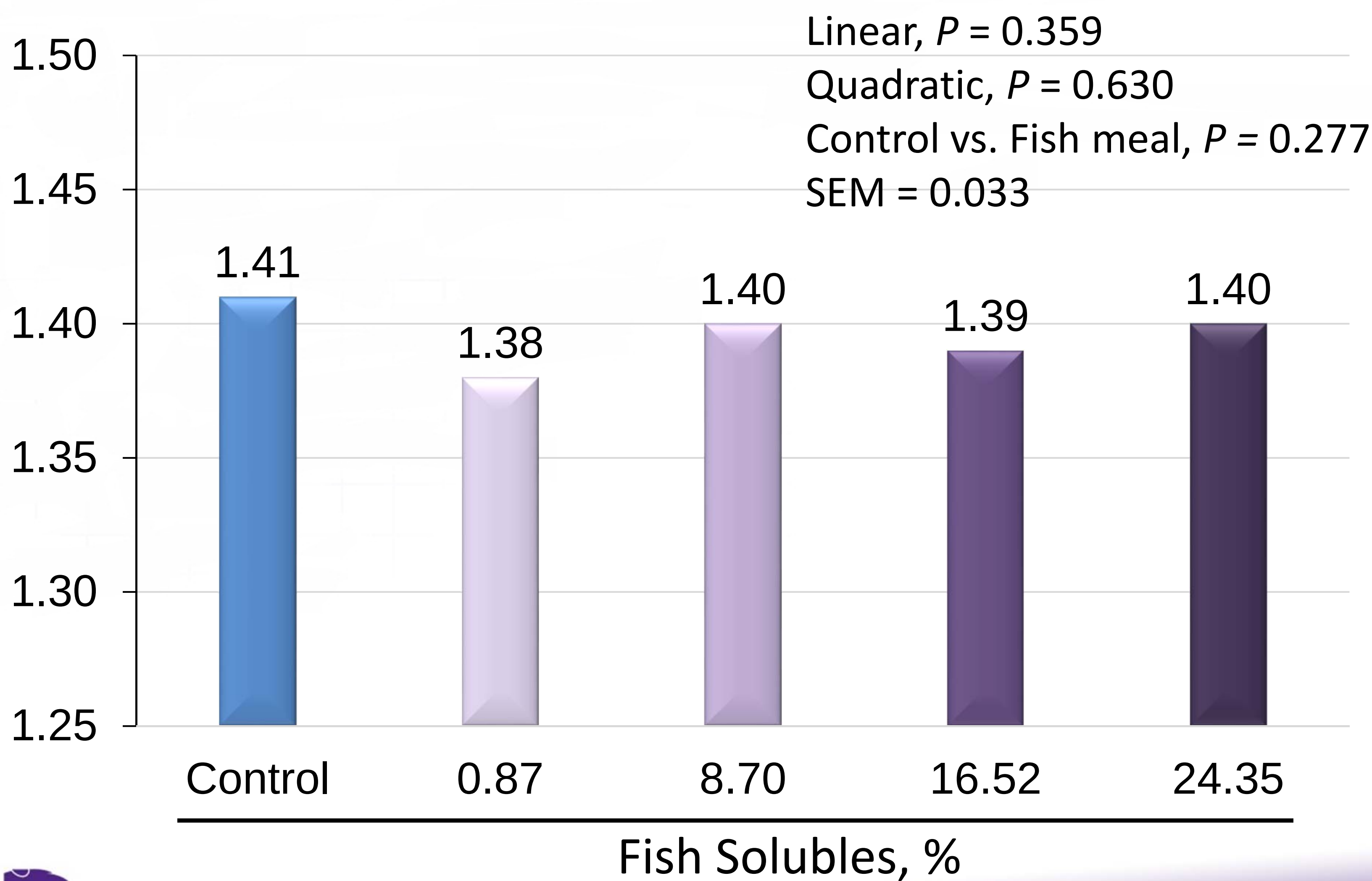
Increasing fish solubles in fish meal on F/G



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Jones et al., 2017

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Recent Graduates with Statistics Emphasis:

Chad Paulk
PhD

Sureemas
Nitikanchana
DVM PhD

Marcio
Goncalves
DVM PhD

Josh Flohr
PhD

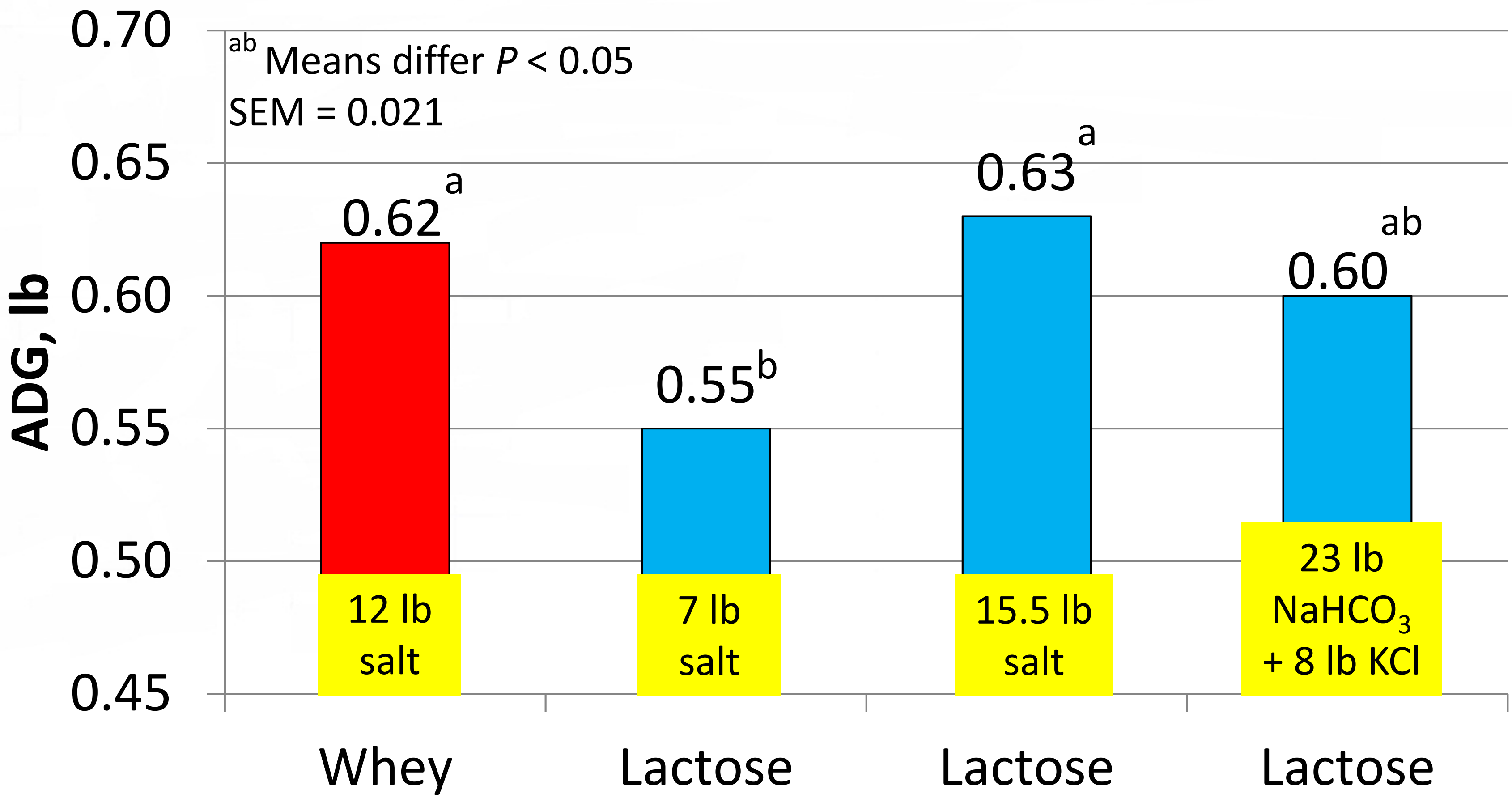
Special Recognition to our current Statistical Team:

- Hilda Calderón Cartagena, MS
- Kessinee Chitakasempornkul, MS
- Carine Vier DVM

- Dr. Nora Bello DVM PhD
- Dr. Trevor Hefley PhD
- Dr. Chris Vahl PhD

- Dr. Ernie Minton – Ag Experiment Station Support

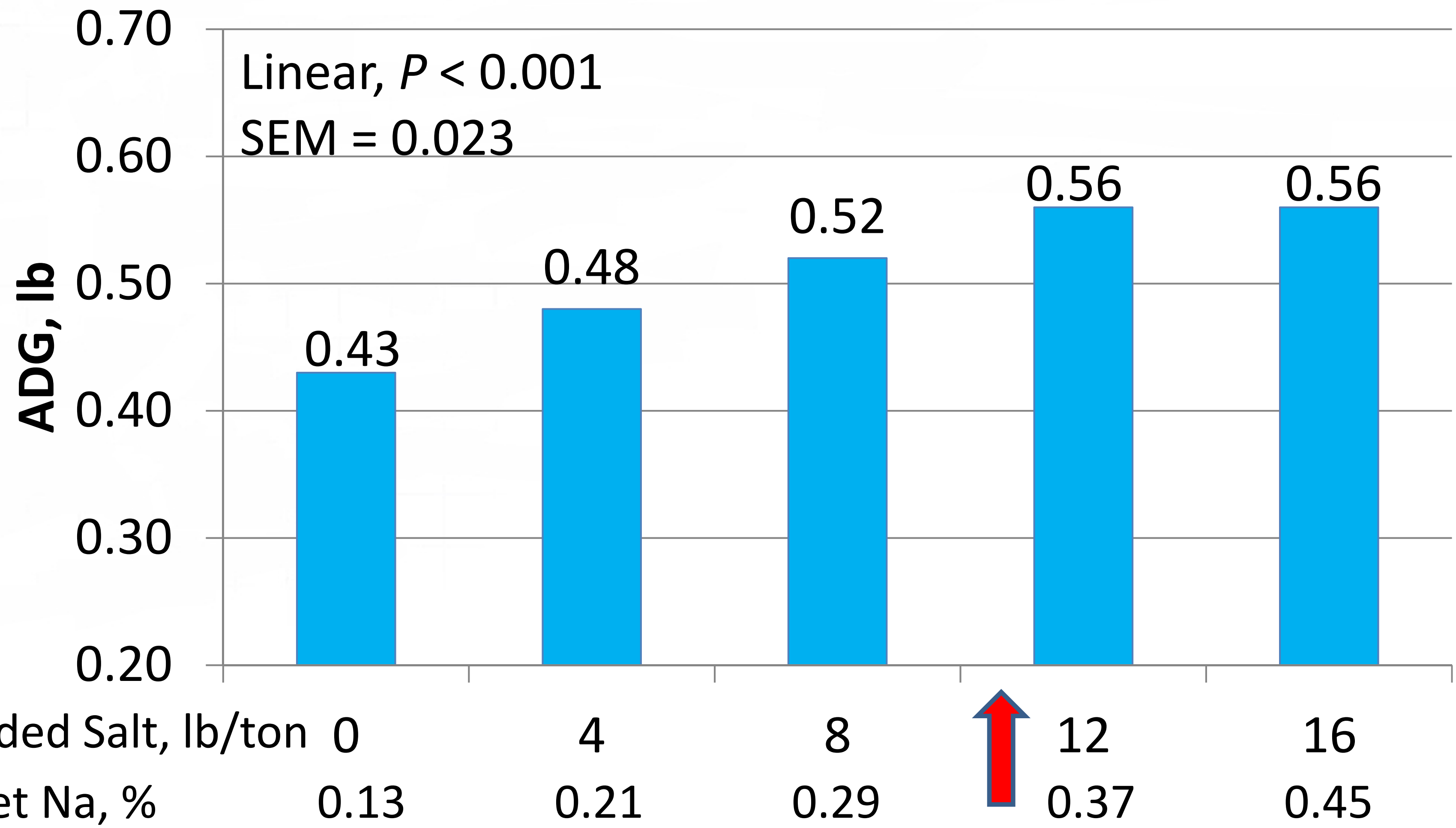
Added Na and Cl for 15–24 lb nursery pigs



Diet Na, %	0.37	0.18	0.35	0.35
Diet Cl, %	0.75	0.47	0.72	0.45

Shawk et al., 2016

Added salt for **15–22** lb nursery pigs on ADG



NRC, 2012
0.35% Na

Shawk et al., 2016

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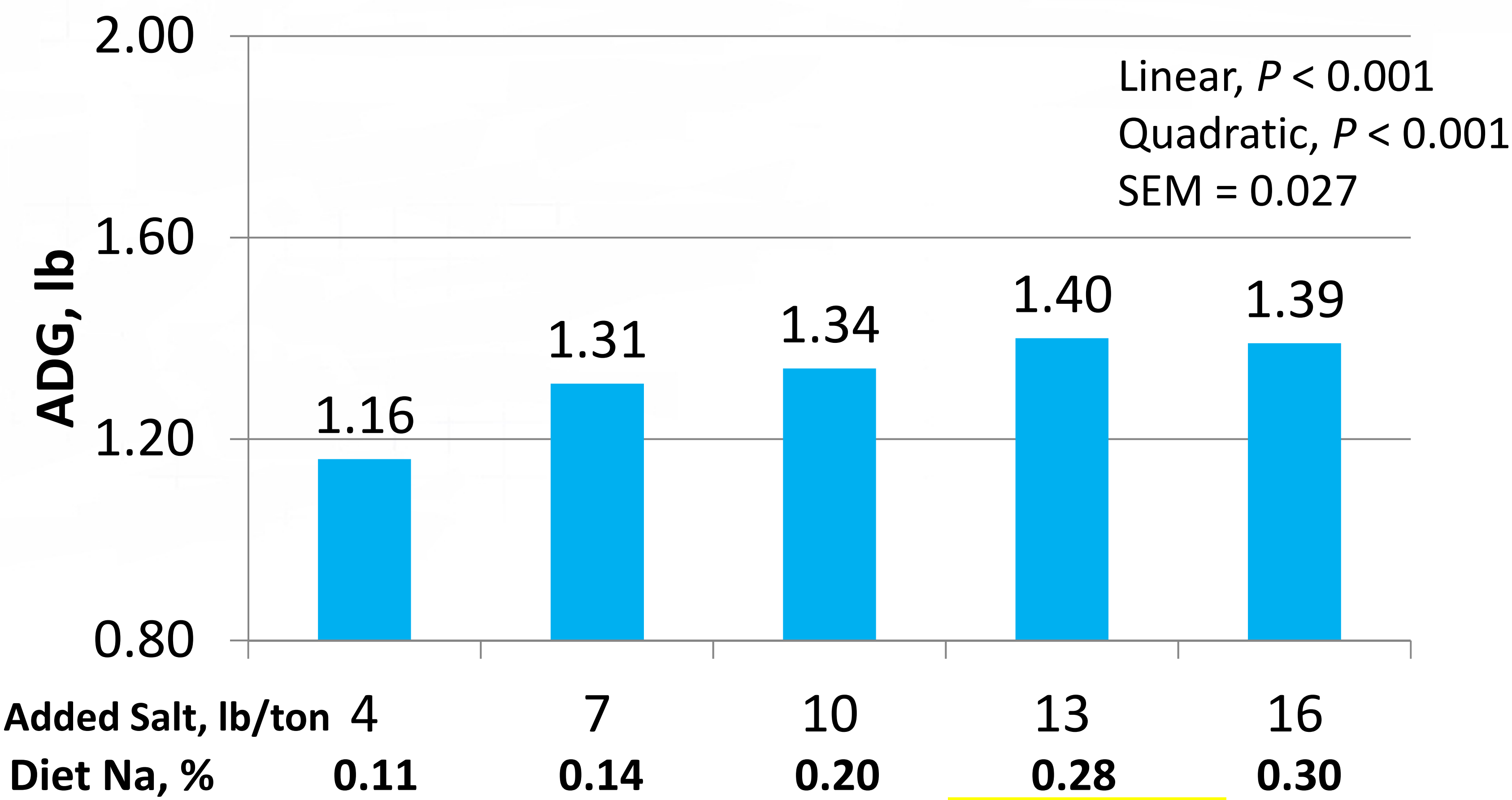
Added salt for **25–45** lb nursery pigs on ADG



NRC, 2012
0.28% Na

Shawk et al., 2017

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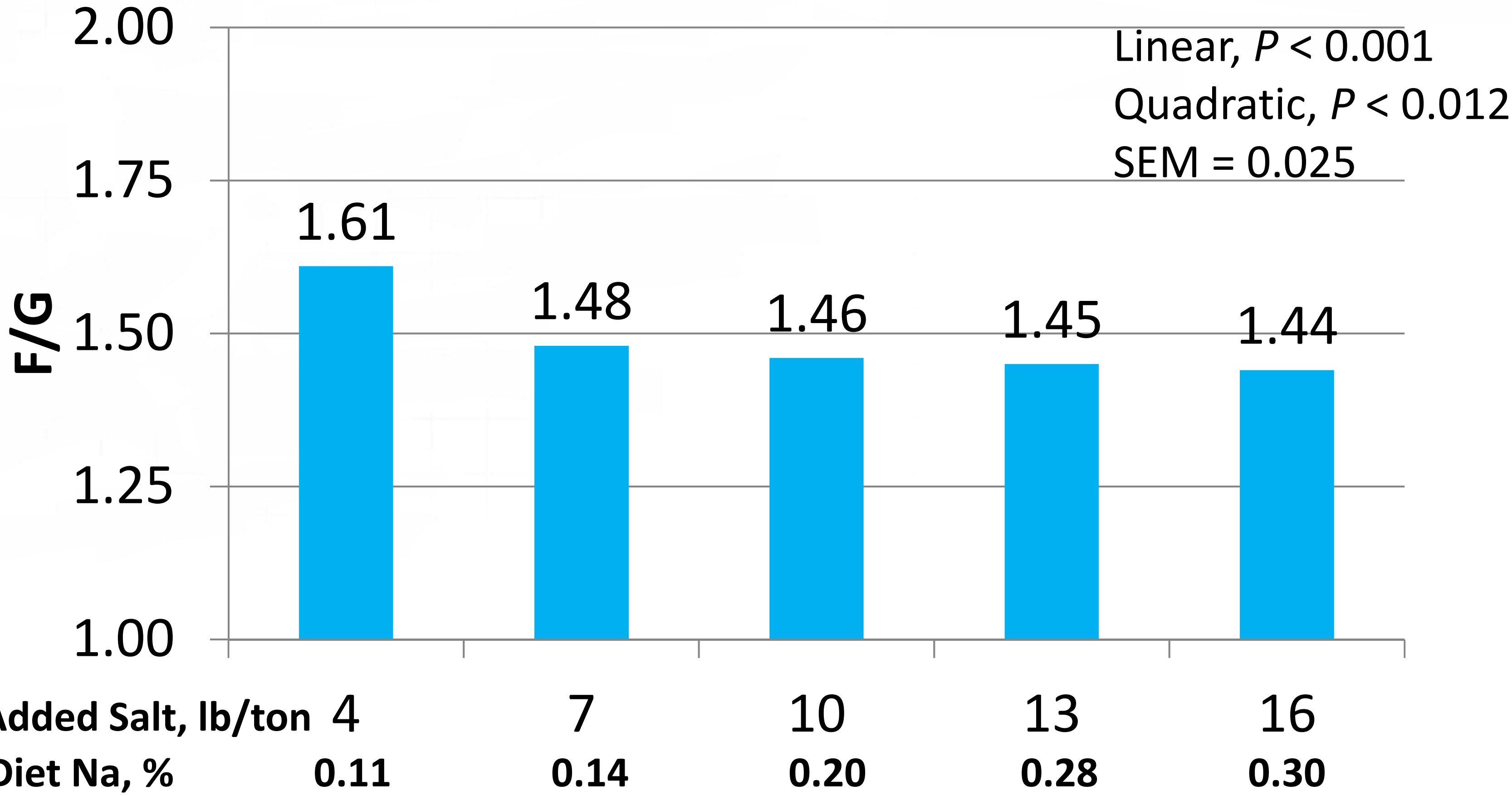
Added salt for **25–45** lb nursery pigs on F/G



NRC, 2012
0.28% Na

Shawk et al., 2017

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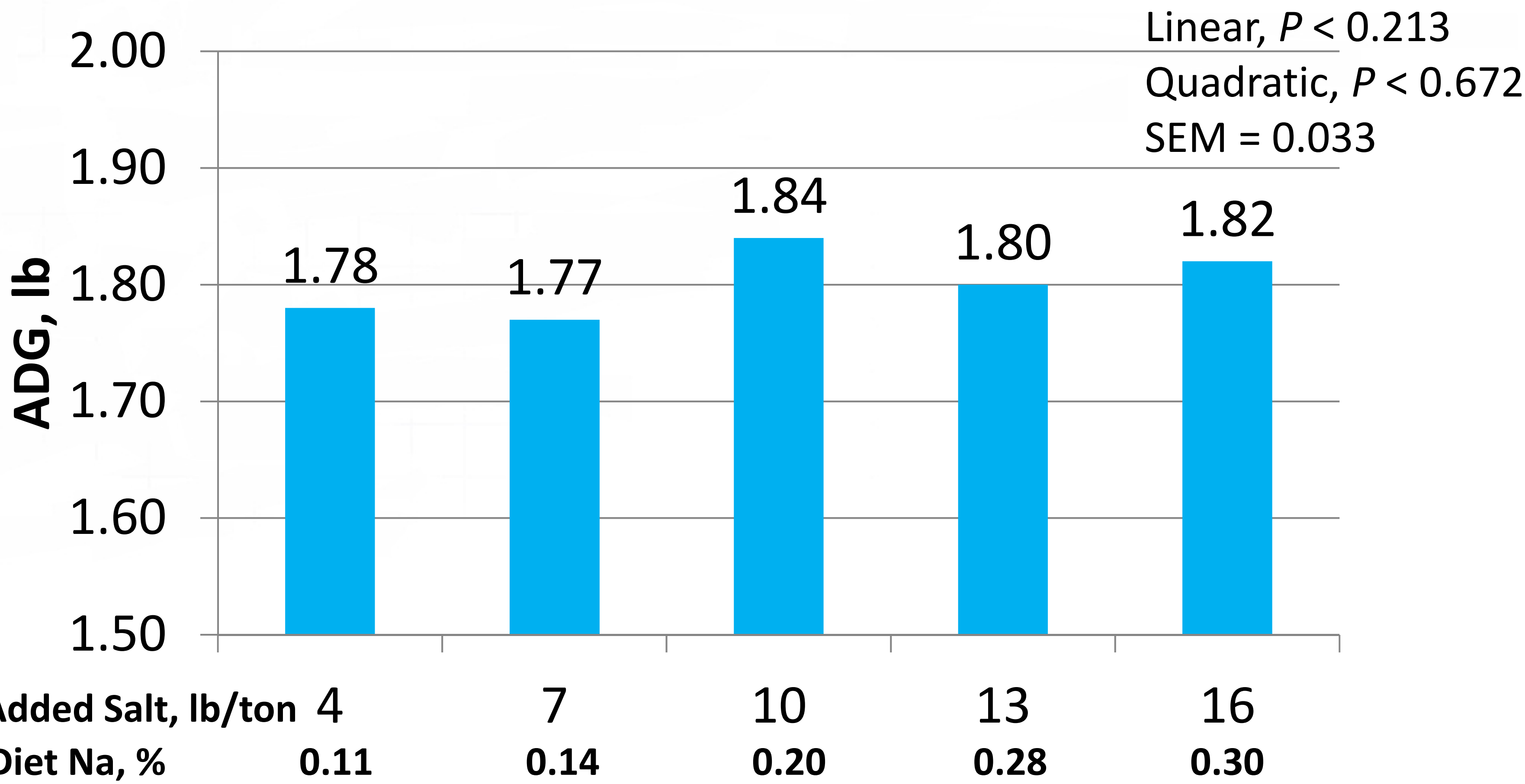
Added salt for **45-67** lb nursery pigs on ADG



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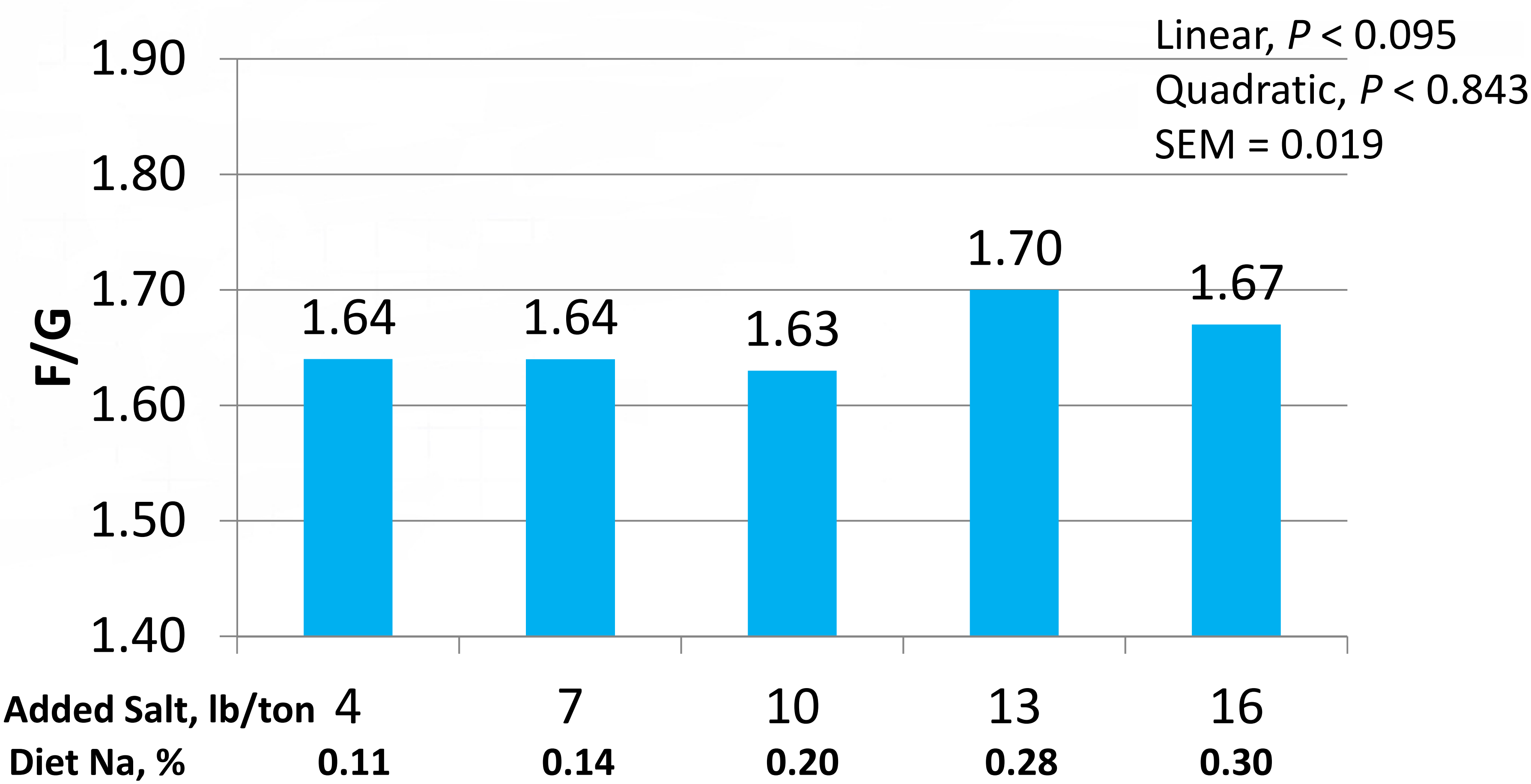
Shawk et al., 2017

NRC, 2012
0.28 to 0.10% Na

Knowledge for Life

Added salt for **45-67** lb nursery pigs on F/G



NRC, 2012
0.28 to 0.10% Na

Shawk et al., 2017

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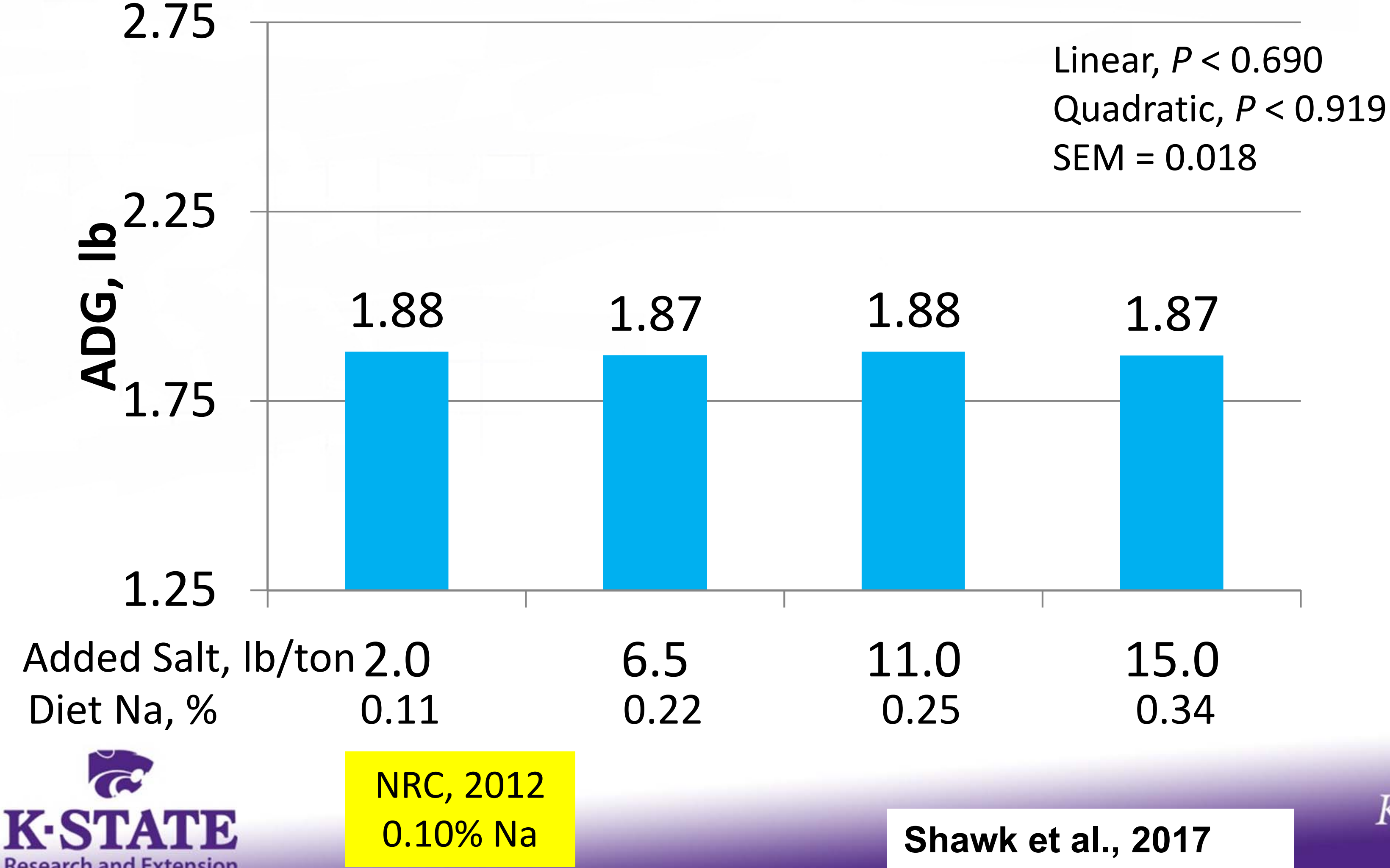
Added salt for 60–140 lb pigs on ADG



Shawk et al., 2017

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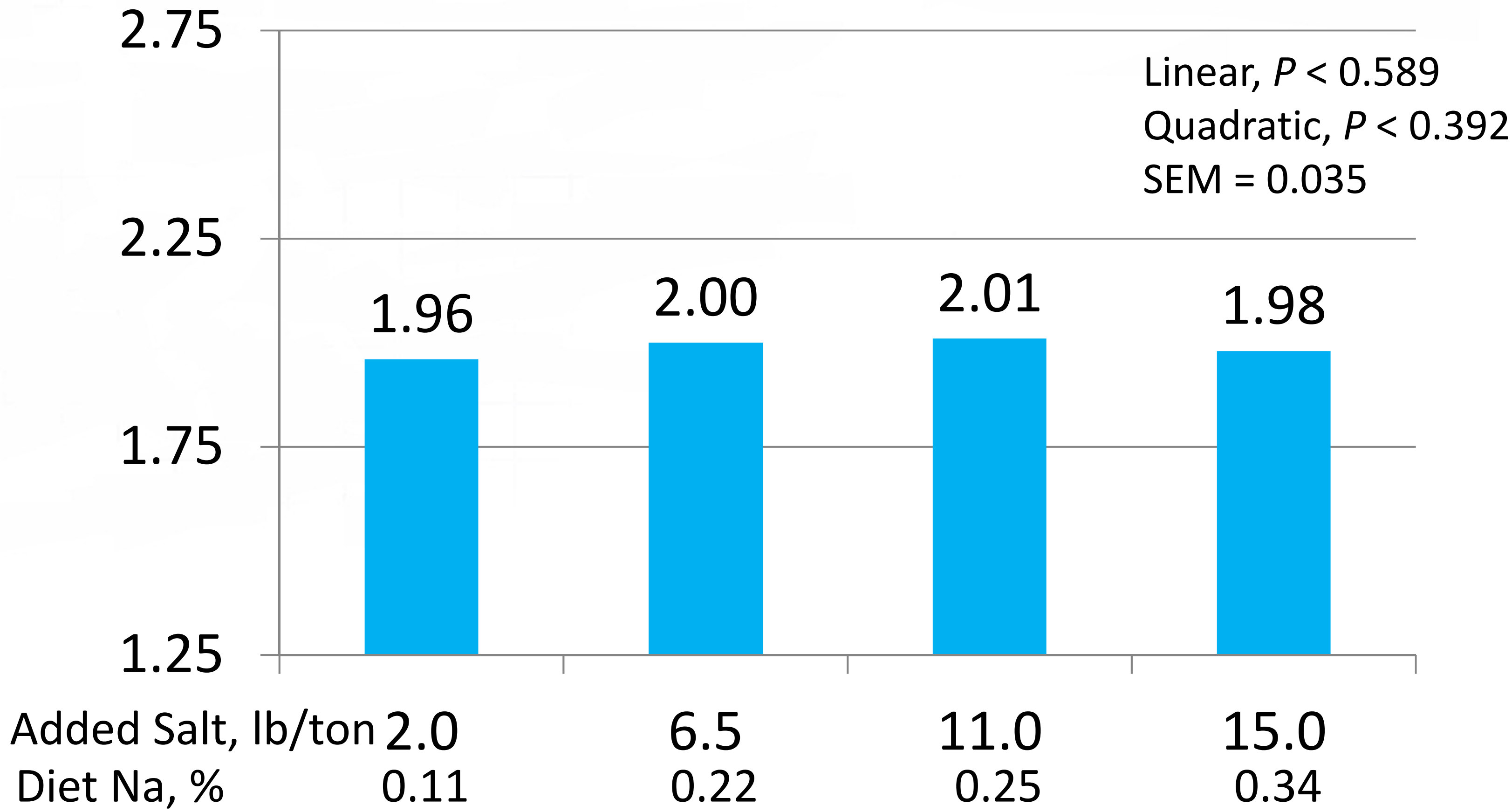
Knowledge for Life

Added salt for 60–140 lb pigs on F/G



NRC, 2012
0.10% Na

Shawk et al., 2017

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Knowledge for Life

Determining the standardized total tract digestible phosphorus requirement of nursery pigs

PIC

NHF
NEW HORIZON FARMS

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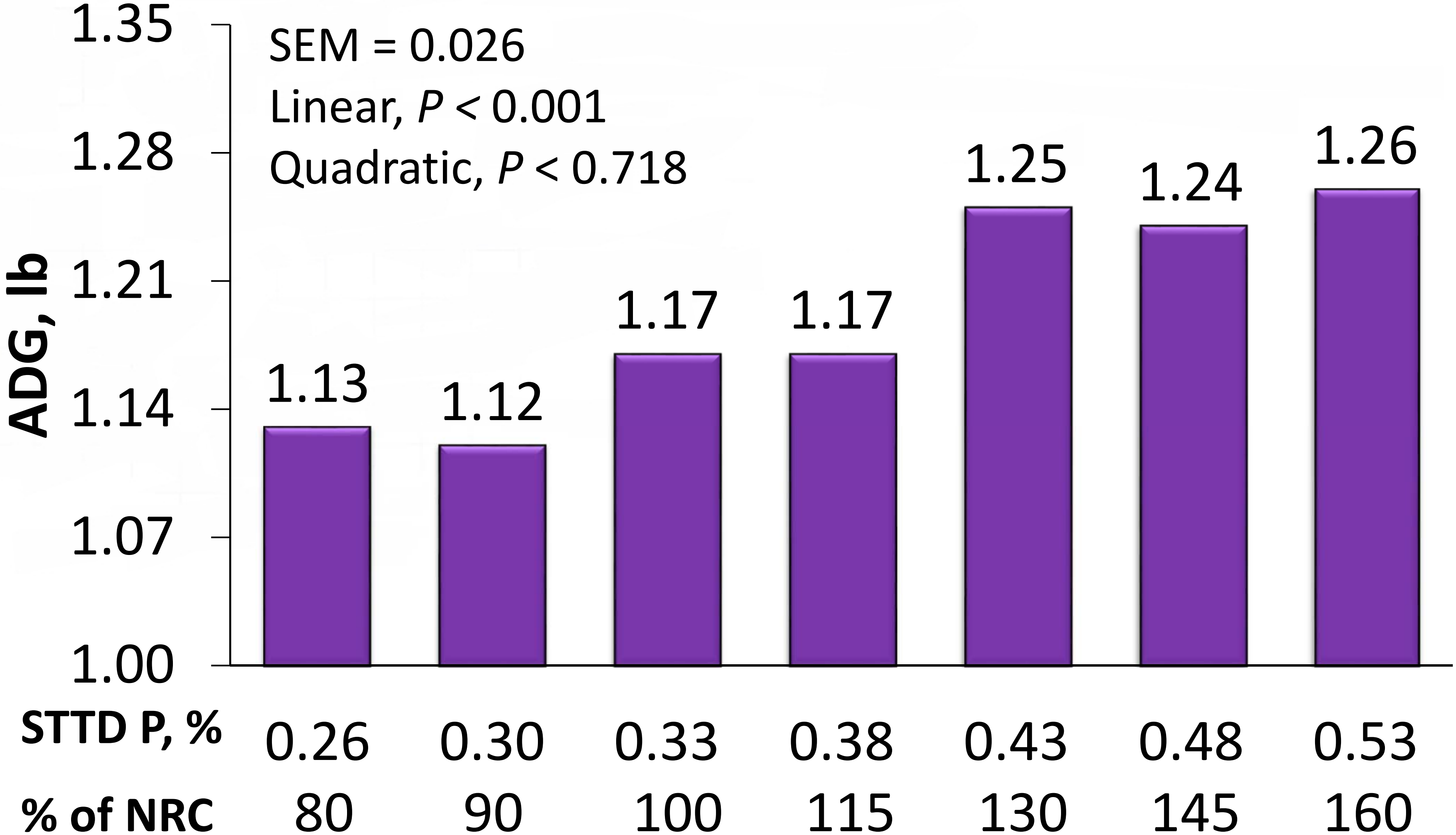
Standardized total tract digestible phosphorus ADG, 25 to 50 lb pigs



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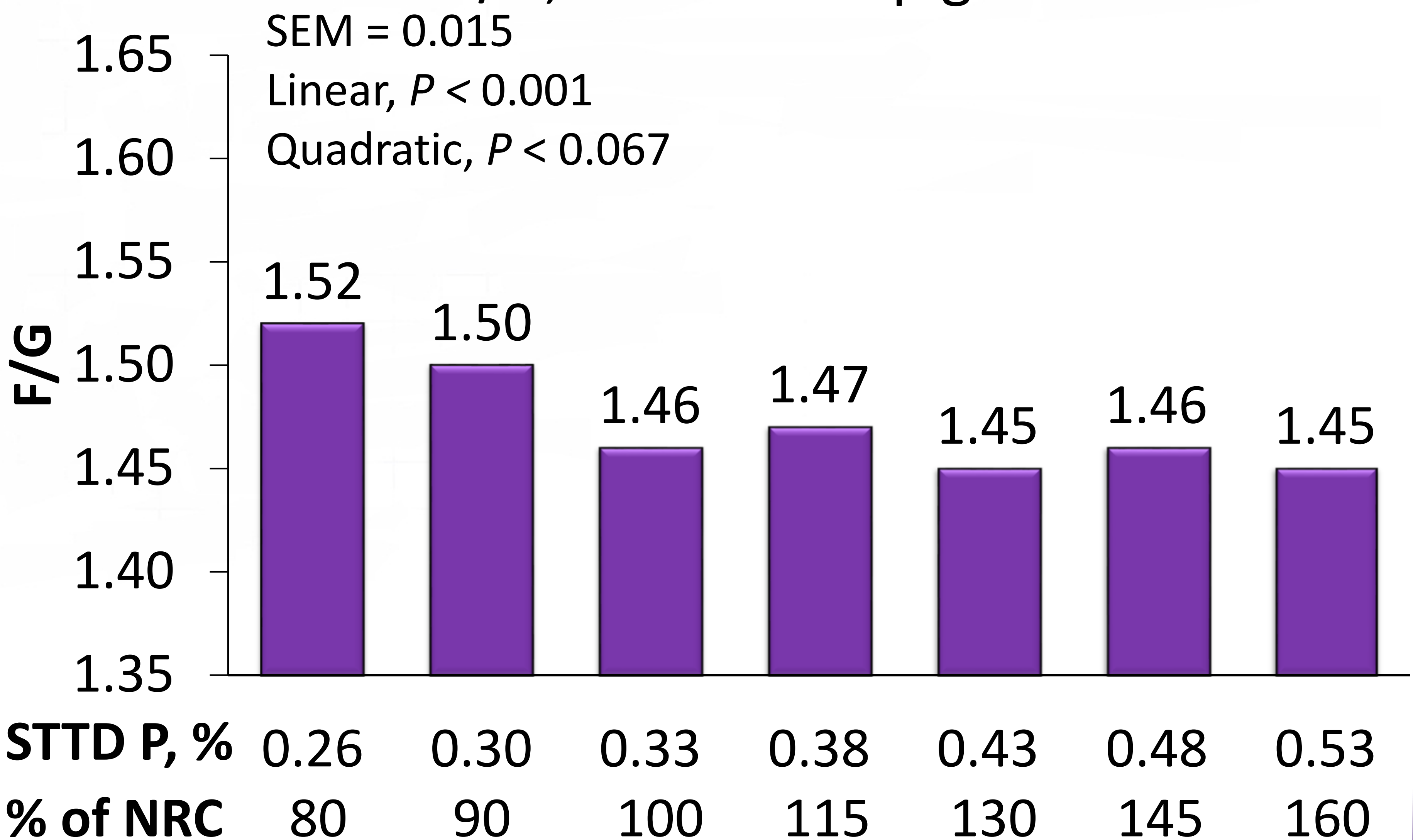
Vier et al., 2017

Knowledge for Life

Standardized total tract digestible phosphorus F/G, 25 to 50 lb pigs



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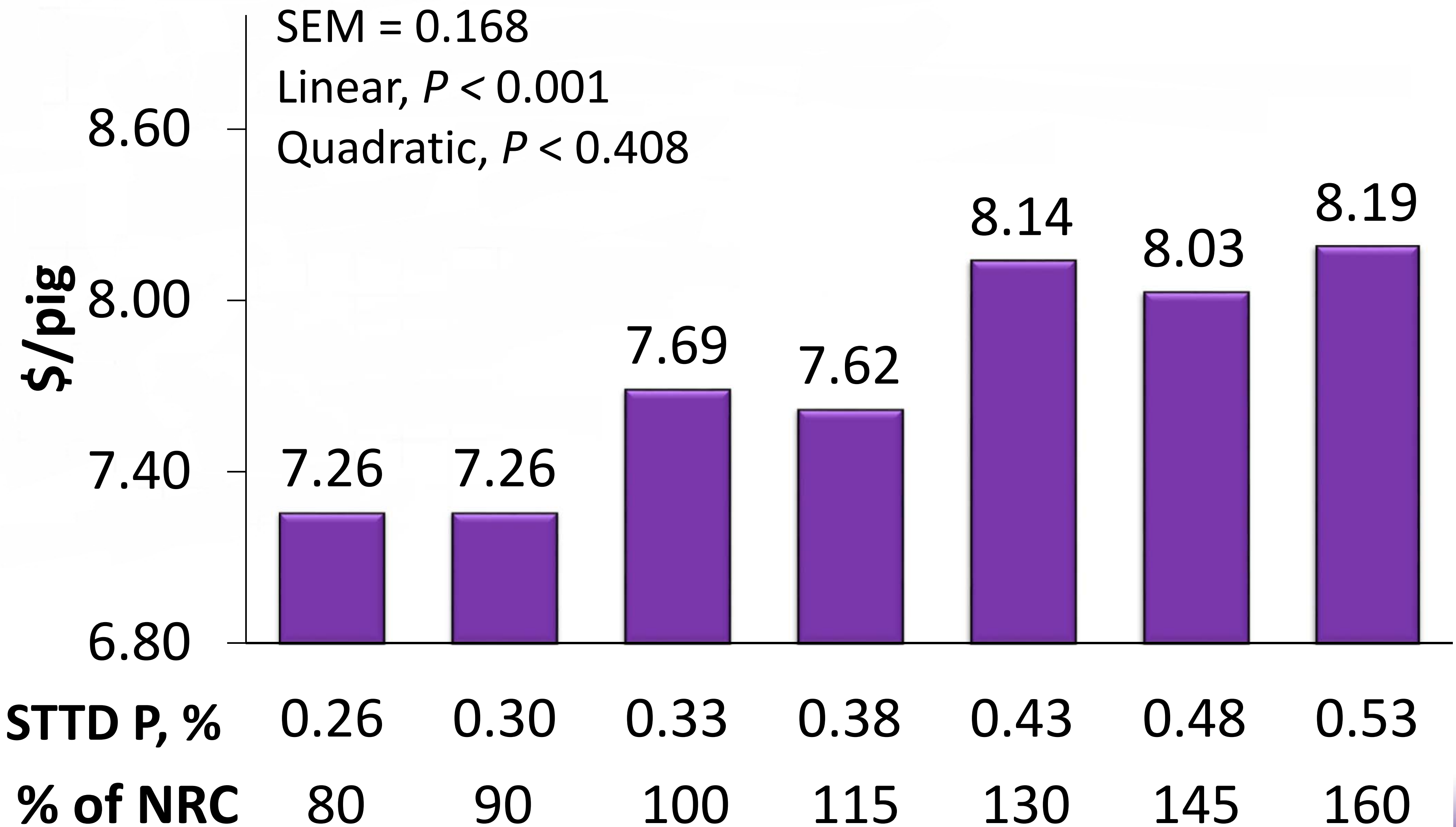
Vier et al. 2017

Knowledge for Life

Standardized total tract digestible phosphorus Income over feed cost, 25 to 50 lb pigs



Vier et al., 2017

Effects of dietary Ca:P ratio on growth performance of nursery pigs

- Objective:

  To determine the growth performance of nursery pigs fed 2 levels of Ca in combination with 3 standardized total tract digestible (STTD) P treatments.

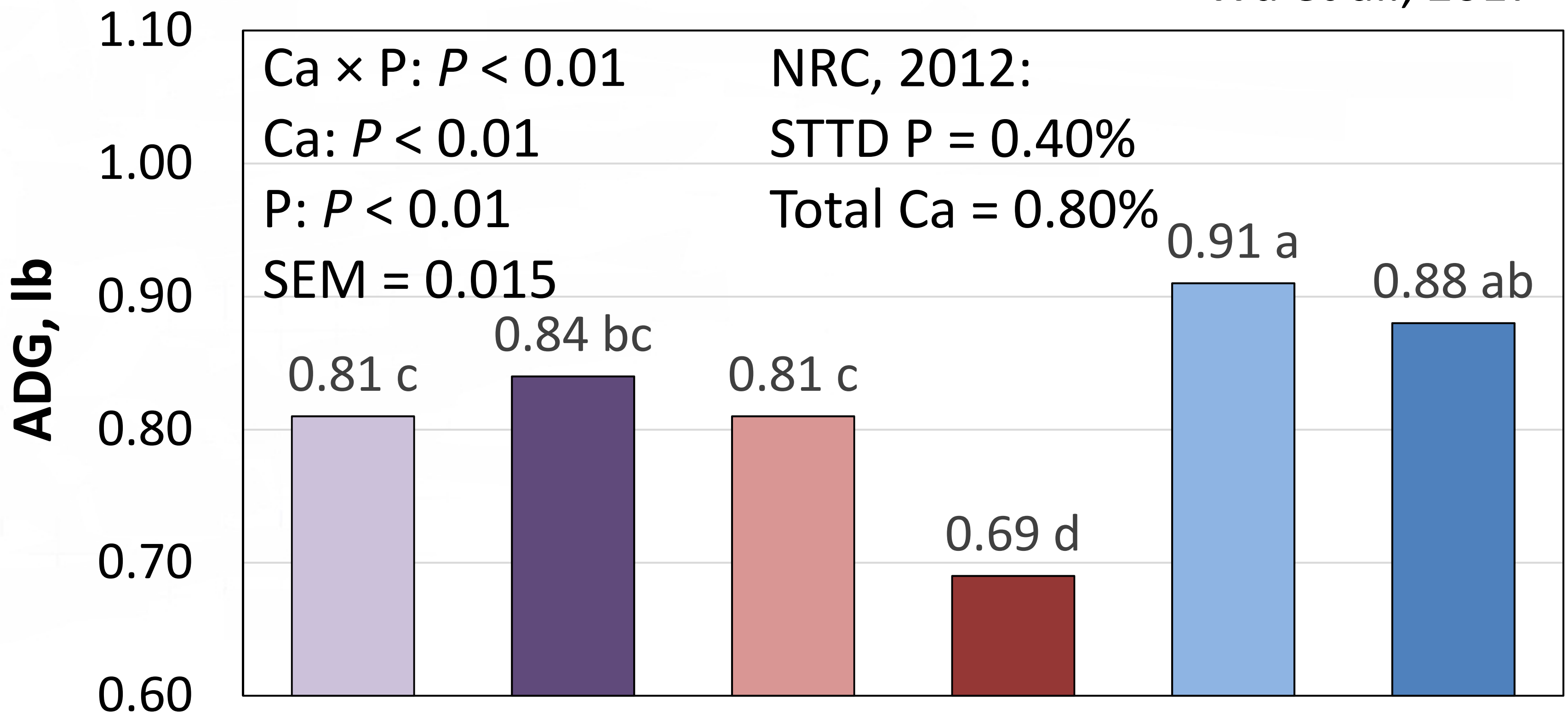
DSM

PIC

KALMBACH FEEDS SINCE 1963

Effects of dietary Ca:STTD P ratio on ADG (d 0 to 28)

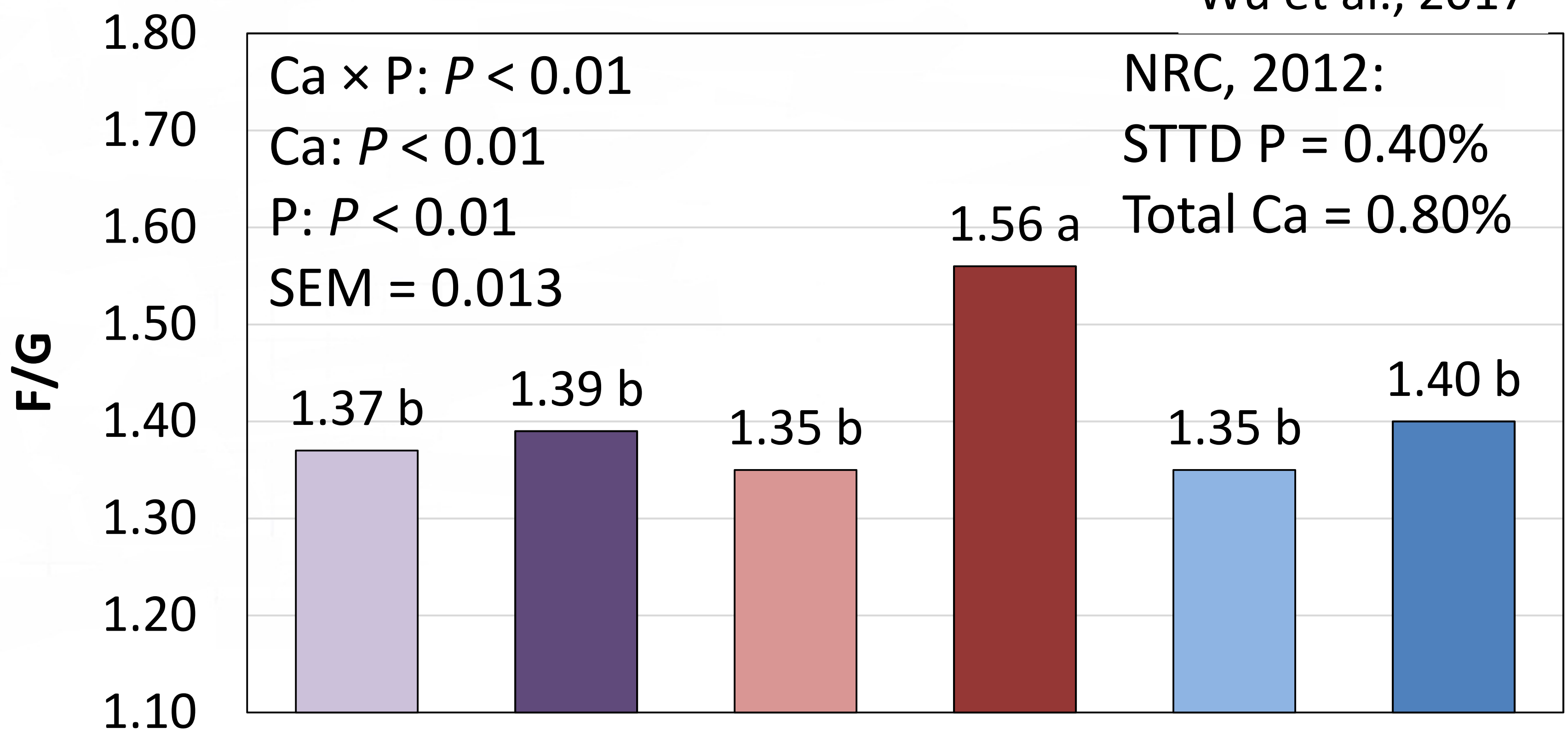
Wu et al., 2017



Analyzed Ca	0.58	1.03	0.58	1.03	0.46	0.91
Ca with phytase	-	-	-	-	0.58	1.03
STTD P no phytase	0.45	0.45	0.33	0.33	0.33	0.33
STTD P w/phytase	-	-	-	-	0.45	0.45
Total Ca:STTD P	1.29	2.29	1.76	3.12	1.29	2.29

Effects of dietary Ca:STTD P ratio on F/G (d 0 to 28)

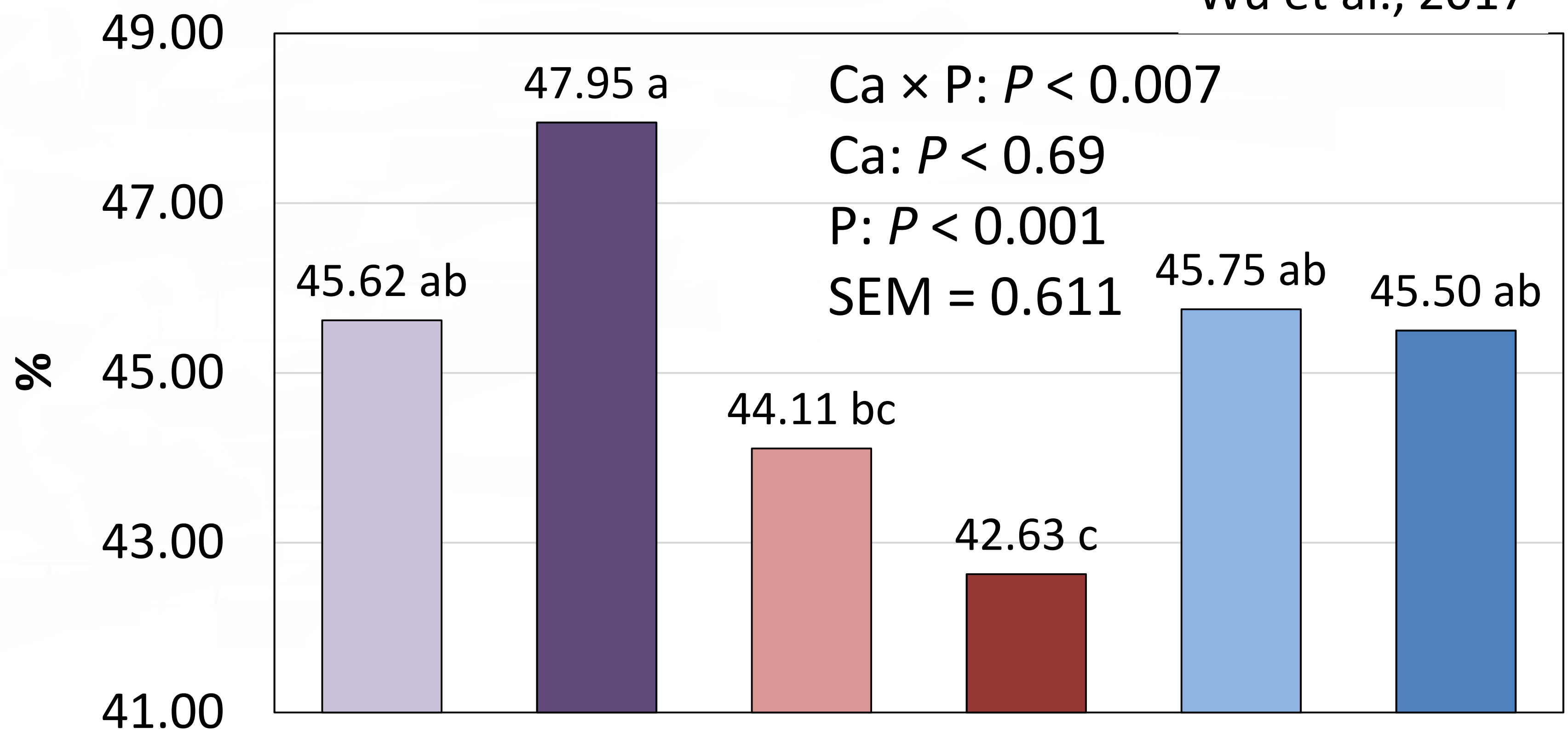
Wu et al., 2017



Analyzed Ca	0.58	1.03	0.58	1.03	0.46	0.91
Ca with phytase	-	-	-	-	0.58	1.03
STTD P no phytase	0.45	0.45	0.33	0.33	0.33	0.33
STTD P w/phytase	-	-	-	-	0.45	0.45
Total Ca:STTD P	1.29	2.29	1.76	3.12	1.29	2.29

Effects of dietary Ca:STTD P ratio on bone ash (d 0 to 28)

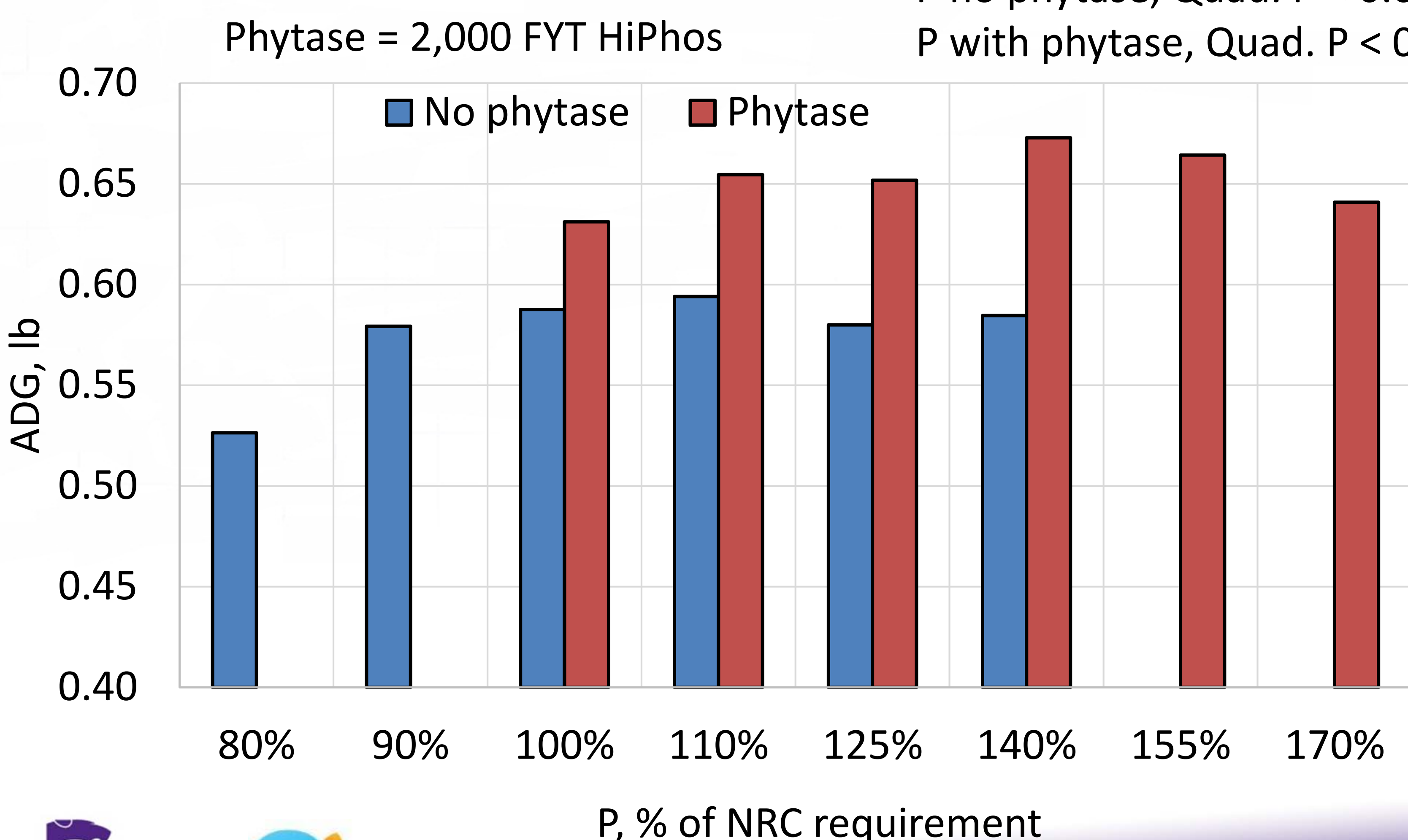
Wu et al., 2017



Analyzed Ca	0.58	1.03	0.58	1.03	0.46	0.91
Ca with phytase	-	-	-	-	0.58	1.03
STTD P no phytase	0.45	0.45	0.33	0.33	0.33	0.33
STTD P w/phytase	-	-	-	-	0.45	0.45
Total Ca:STTD P	1.29	2.29	1.76	3.12	1.29	2.29

Phosphorus and phytase on nursery pig ADG

Phytase, $P < 0.001$
P no phytase, Quad. $P < 0.005$
P with phytase, Quad. $P < 0.031$



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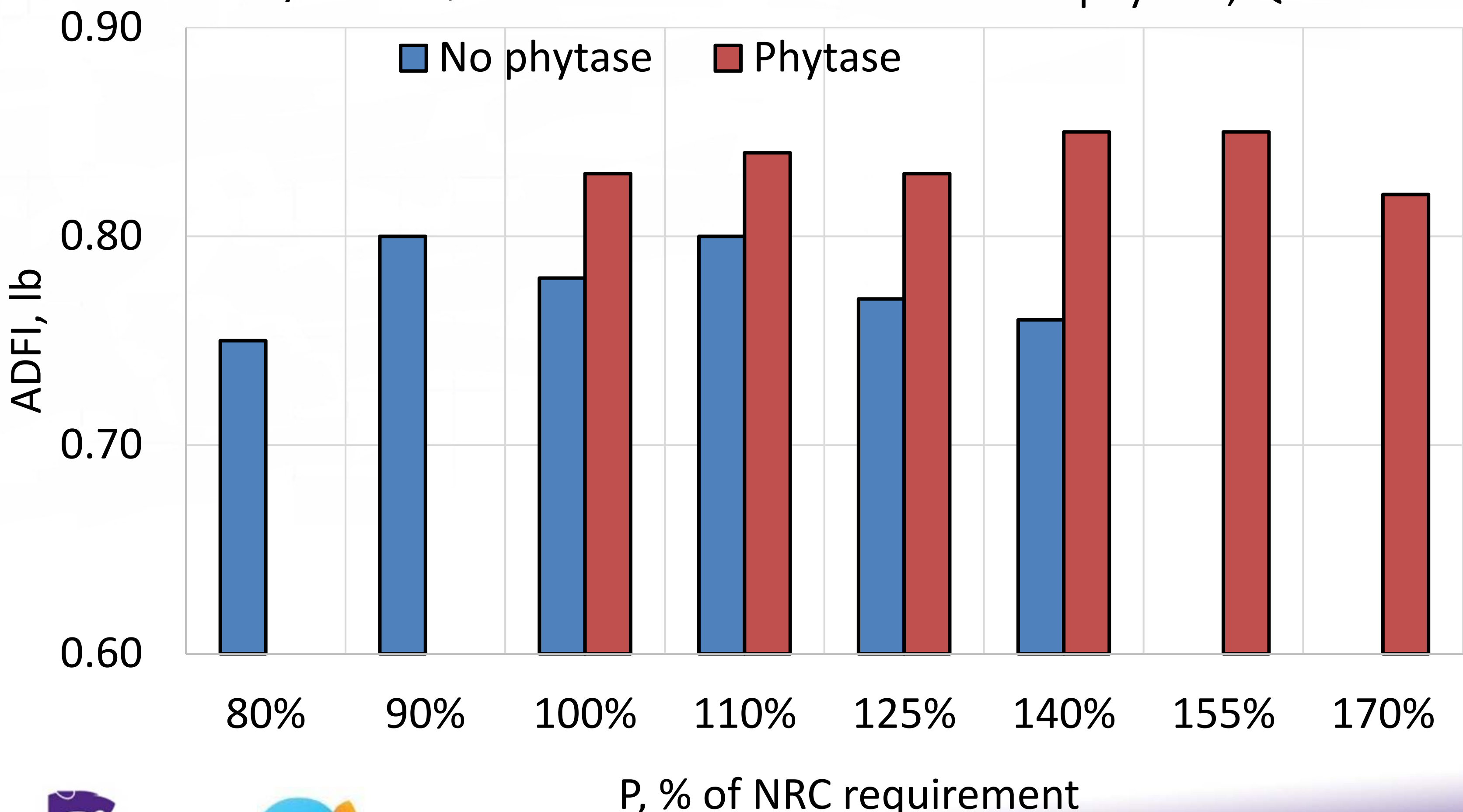
Wu et al., 2018

Knowledge for Life

Phosphorus and phytase on nursery pig ADFI

Phytase, $P < 0.001$
P no phytase, Quad. $P < 0.043$
P with phytase, Quad. $P < 0.262$

Phytase = 2,000 FYT HiPhos



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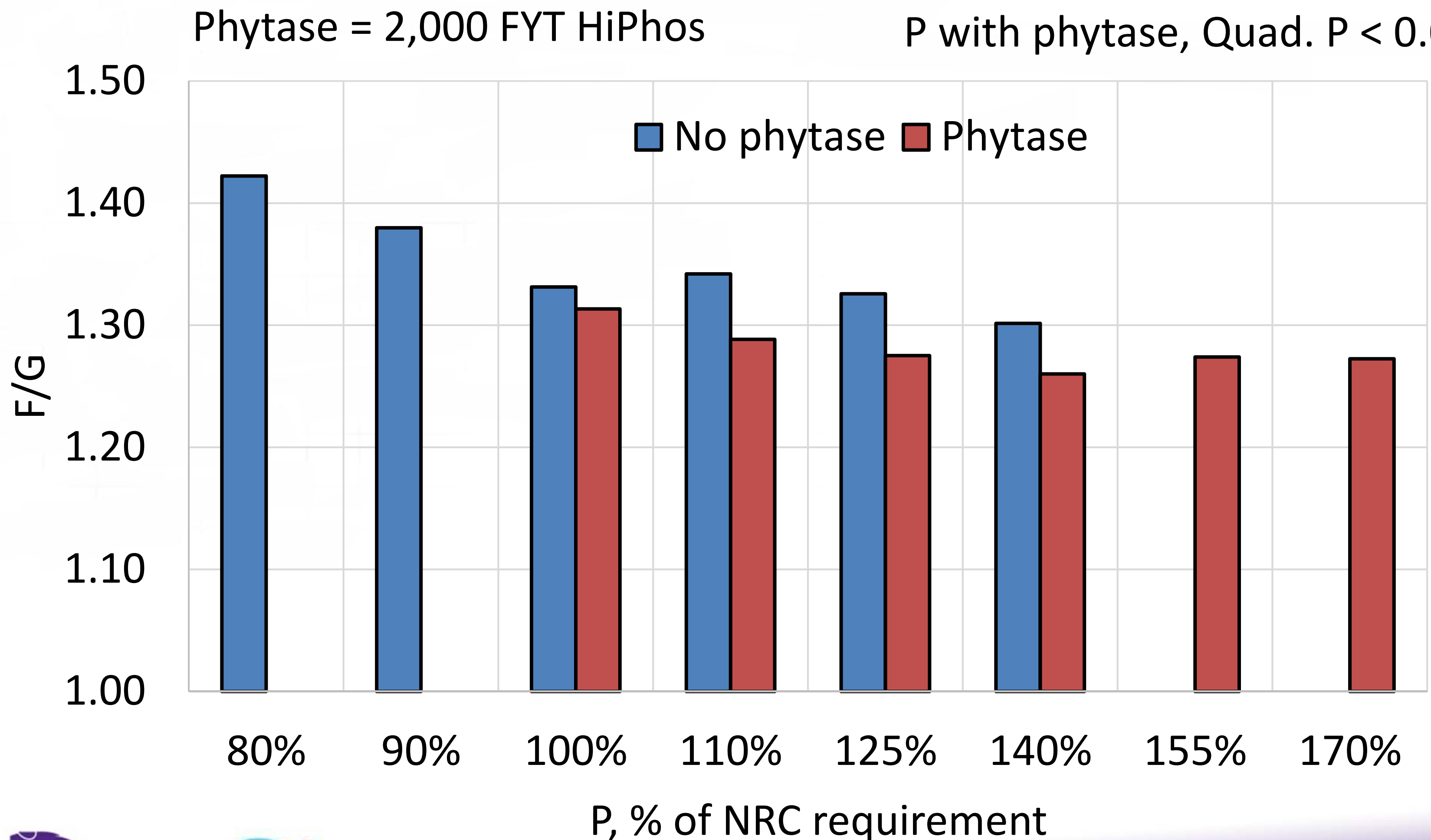
Wu et al., 2018

Knowledge for Life

Phosphorus and phytase on nursery pig F/G

Phytase, P < 0.001
P no phytase, Quad. P < 0.063
P with phytase, Quad. P < 0.065



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DSM

Wu et al., 2018

Knowledge for Life

Effects of standardized total tract digestible phosphorus on growth performance and carcass characteristics of growing-finishing pigs

PIC

NHF
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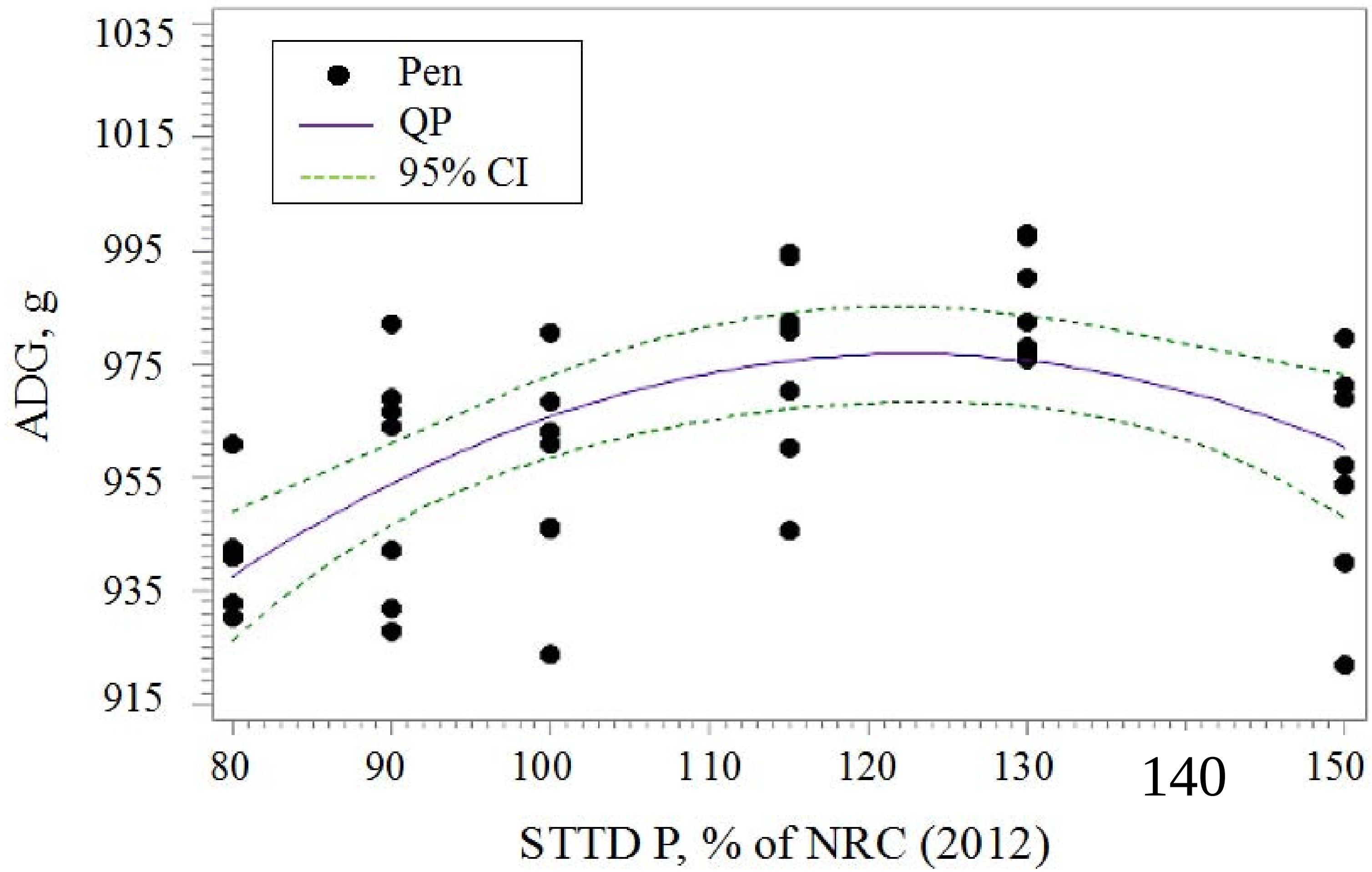
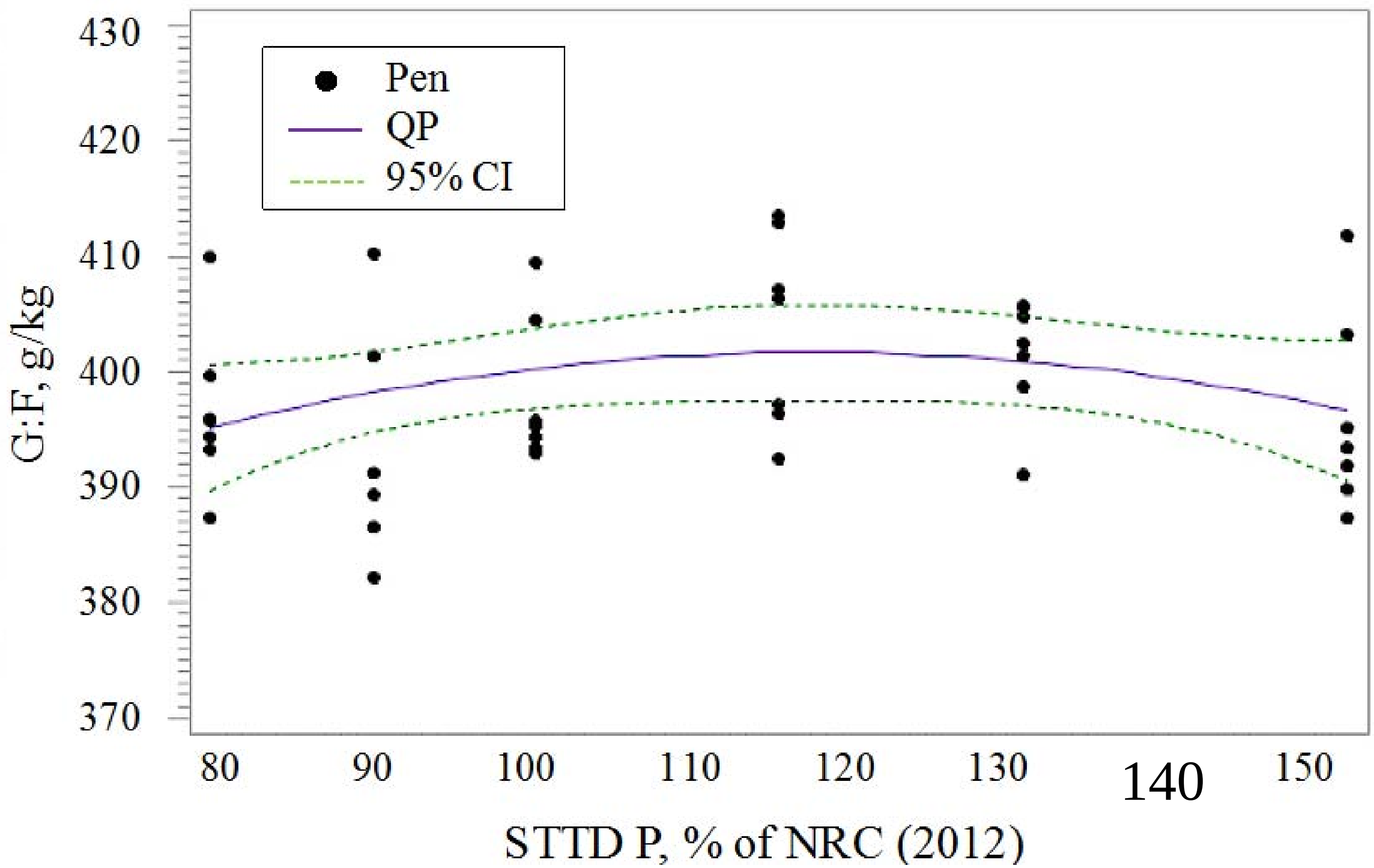
Knowledge for Life

Modeled ADG



QP model estimated the maximum mean ADG at 122% (95% CI: [104, 143%]) of the NRC (2012)

Modeled G:F



QP model estimated the maximum mean G:F at 116% (95% CI: [90, >150%]) of the NRC (2012)

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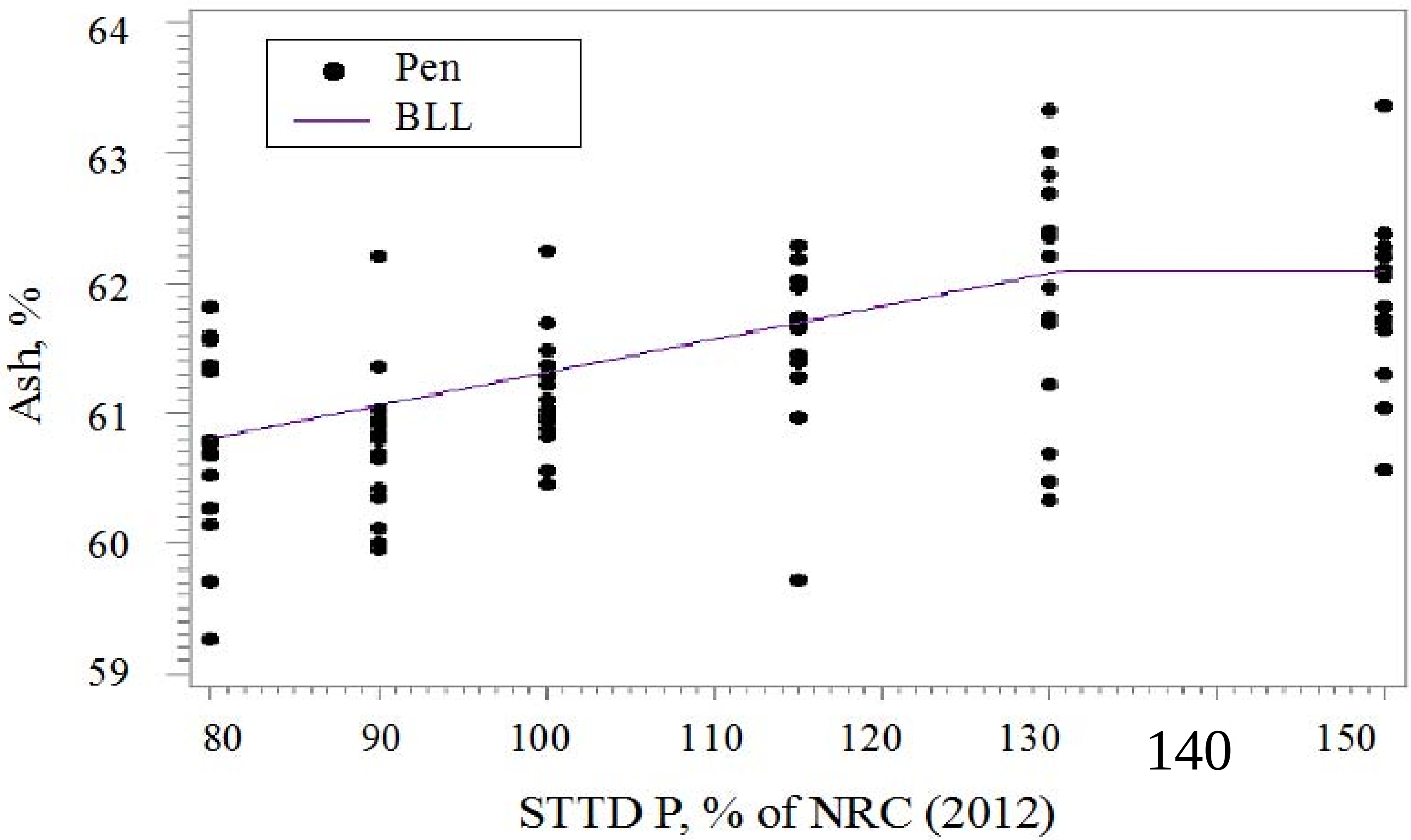
Knowledge for Life

Modeled bone ash%



The BLL model estimated the maximum mean ash % at 131% (95% CI: [113, 148%]) of the NRC (2012)

Change in average U.S. nursery and finishing performance over the last 25 years

	Nursery					Finishing			
	1990	2005	2015	%		1990	2005	2015	%
Start wt, lb	13.0	12.2	14.1	14%		50.0	50.0	53.6	7%
End wt, lb	50.0	50.0	53.6	7%		250.0	259.5	277.3	7%
ADG, lb	0.71	0.81	0.82	1%		1.47	1.61	1.85	15%
ADFI, lb	1.42	1.27	1.26	0%		5.10	4.54	4.98	10%
F/G	2.00	1.57	1.54	-2%		3.47	2.82	2.69	-5%

1990 PigChamp Summary;
U.S. Pork Industry Productivity Summary

The theory behind the economic model for optimum energy level for growing-finishing pigs

J. A. Soto[1*], M. D. Tokach[1], S. S. Dritz[1], M. A. D. Gonçalves[2], J. C. Woodworth[1], J. M. DeRouchey[1], R. D. Goodband[1], and U. Orlando[2]

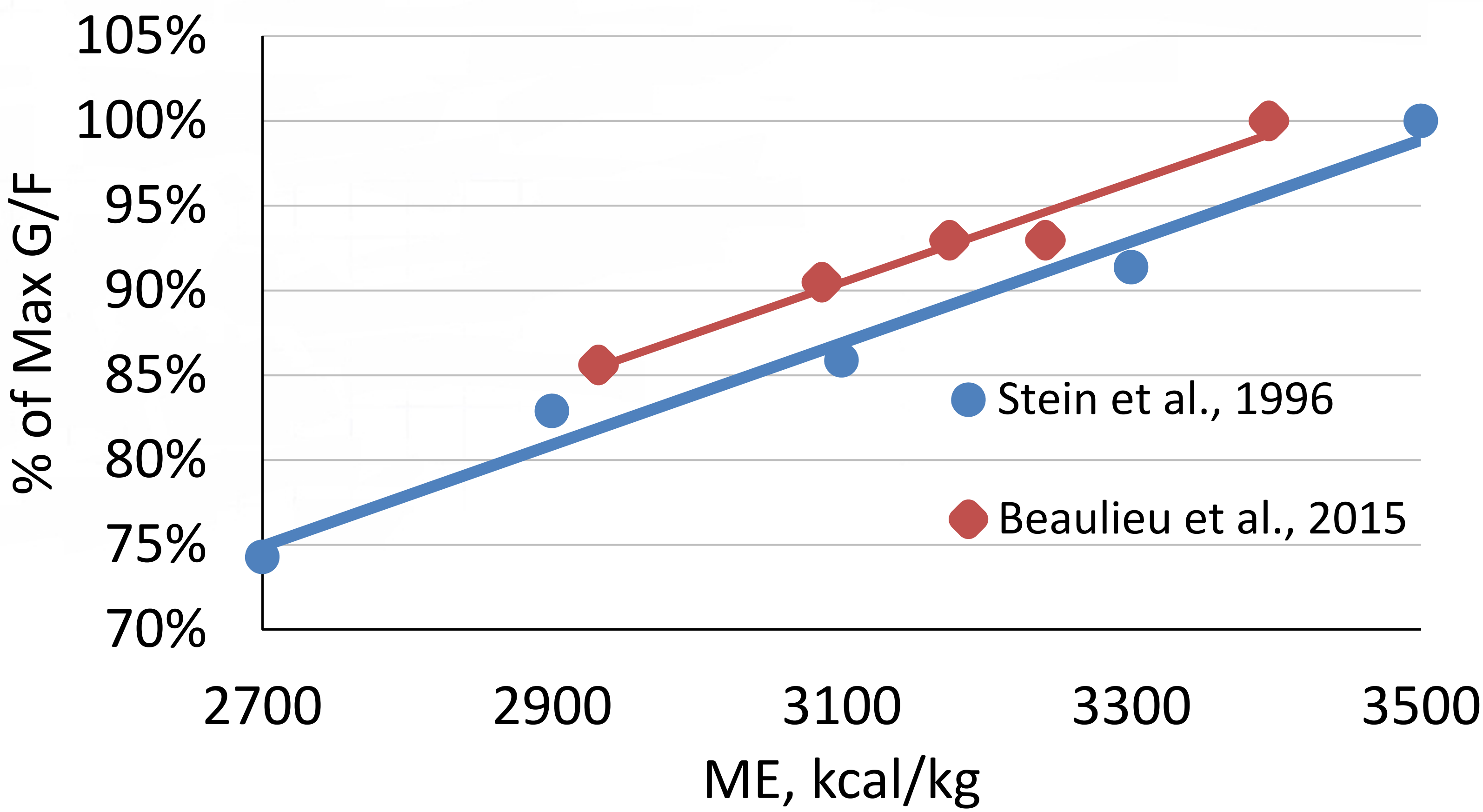
[1]Kansas State University, Manhattan, KS
[2]PIC-USA Hendersonville, TN

Knowledge *for* Life

Setting dietary energy level

- Must know how in incremental change in dietary energy influences:
  - Diet cost
  - Pig performance (ADG, F/G)
  - Carcass criteria (dressing %, lean %)
- Market price to determine value of changes in pig performance

Influence of energy intake on feed efficiency



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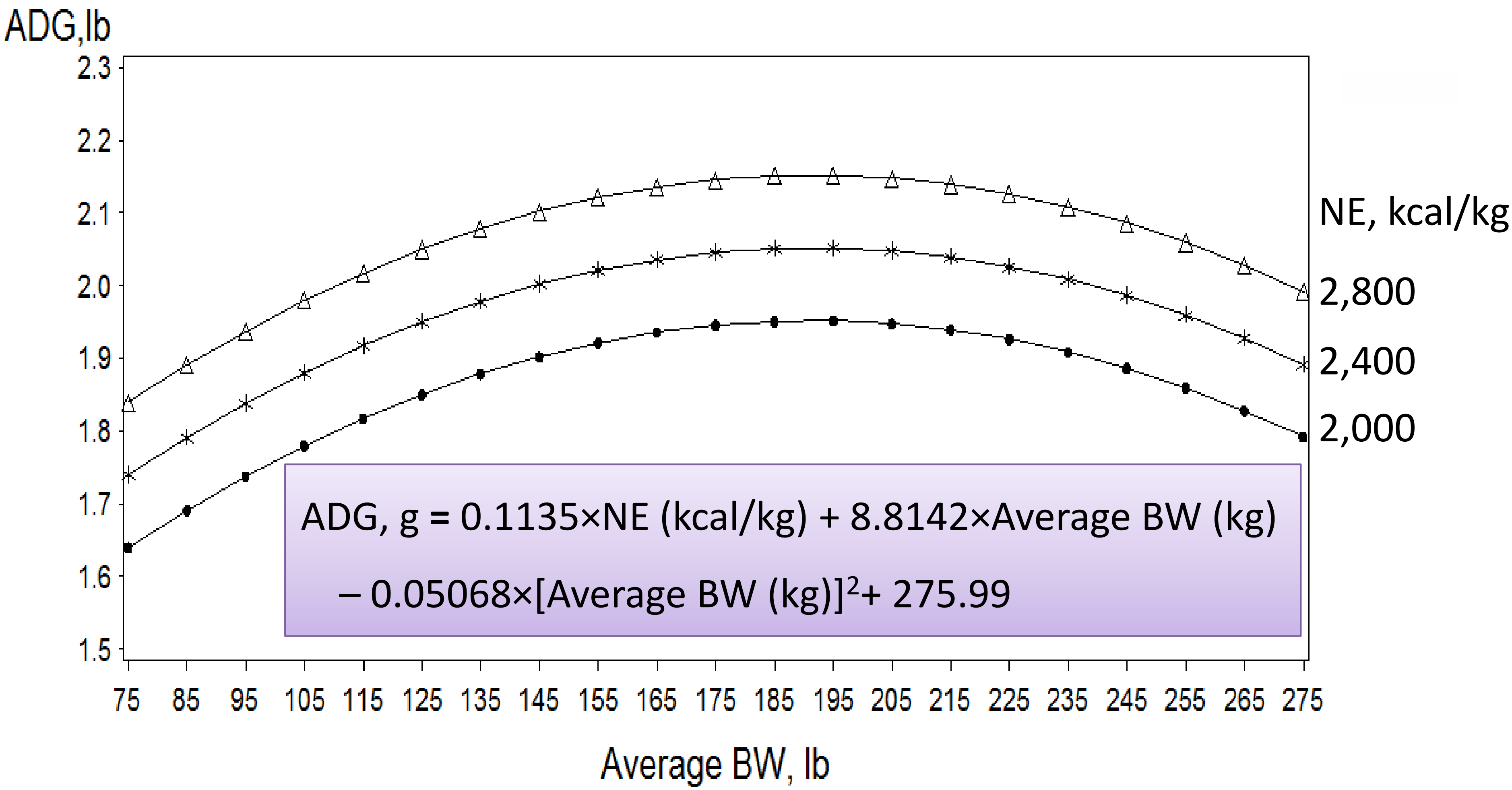
Knowledge for Life

Predicted ADG of pigs fed varying Dietary NE



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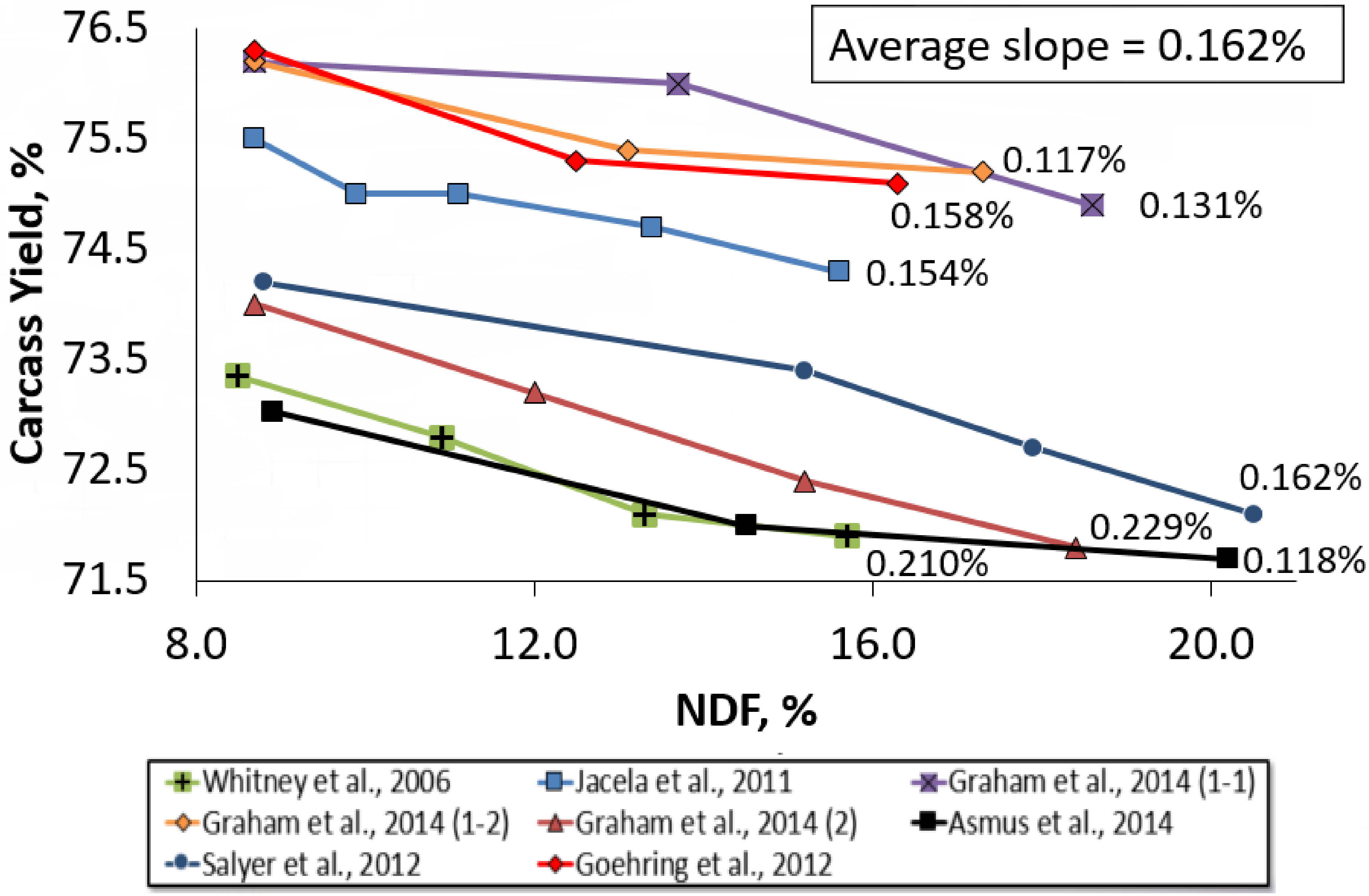
Nitikanchana et al. (2015). J. Anim. Sci. 93:2826-2839

Knowledge for Life

Impact of increasing NDF on Carcass Yield



Coble et al. (2015).

Carcass yield prediction equation

Summary of papers used in regression analysis

First author, year	Source[1]	NDF1[2], %	NDF2[3], %	WP[4], d	Initial BW, kg	Final BW, kg	Yield, %
Asmus, 2014	J	8.8 - 20.2	8.8 - 20.2	0-47	41.0	122.8	71.6 - 73.2
Coble, 2015 (exp. 1)	T	8.8 - 20.2	8.8 - 20.2	0-20	38.4	126.0	71.2 - 72.7
Coble, 2015 (exp. 2)	T	8.8 - 20.2	8.8 - 20.3	0-24	44.5	132.5	74.3 - 75.4
Gaines, 2007	J	8.7 - 15.3	8.8 - 15.3	0-42	66.1	128.5	75.9 - 77.1
Graham, 2014	J	8.8 - 20.2	8.8 - 20.2	0-24	55.8	126.8	72.8 - 74.2
Jacela, 2009	M	8.5 - 15.0	8.4 - 14.9	0-41	39.0	121.5	75.1 - 75.9
Nemecheck, 2013	J	8.8 - 20.2	8.8 - 20.2	0-17	49.6	129.0	74.7 - 75.1
Xu, 2010	J	8.8 - 15.3	8.8 - 15.3	0-63	30.0	125.0	75.8 - 77.0

[1] Source type: J=Journal, T=Thesis, M=Technical memo.
[2] Range of NDF concentration in dietary phase before the final phase.
[3] Range of NDF concentration in final dietary phase before marketing.
[4] Range of withdrawal period.

Soto et al. (2017)

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Carcass yield prediction equation

Database building

- Each dietary treatment was reformulated
- NRC ingredient library (Chapter 17, 2012).

Resulting equation:

$$\textbf{Yield, \%} = 0.03492 \times WP\ (d) - 0.05092 \times NDF1\ (\%) - 0.06897 \times NDF2\ (\%) - 0.00289 \times (NDF2\ (\%) \times WP\ (d)) + 76.0769$$

NDF1 (%) = NDF concentration in dietary phase before final dietary phase.

NDF2 (%) = NDF concentration in final dietary phase before marketing.

WP (d) = Withdrawal period.

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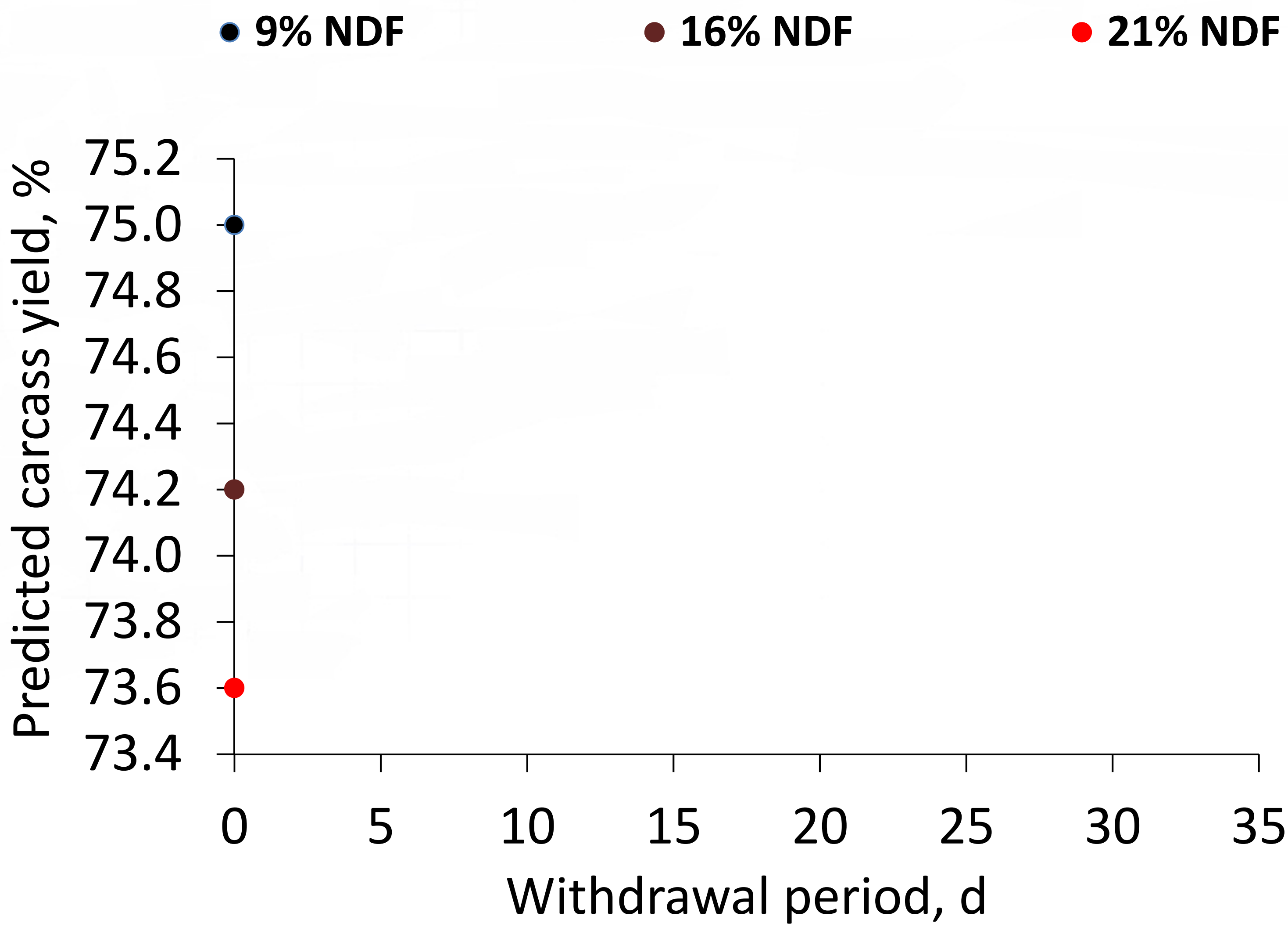
Soto et al. (2017)

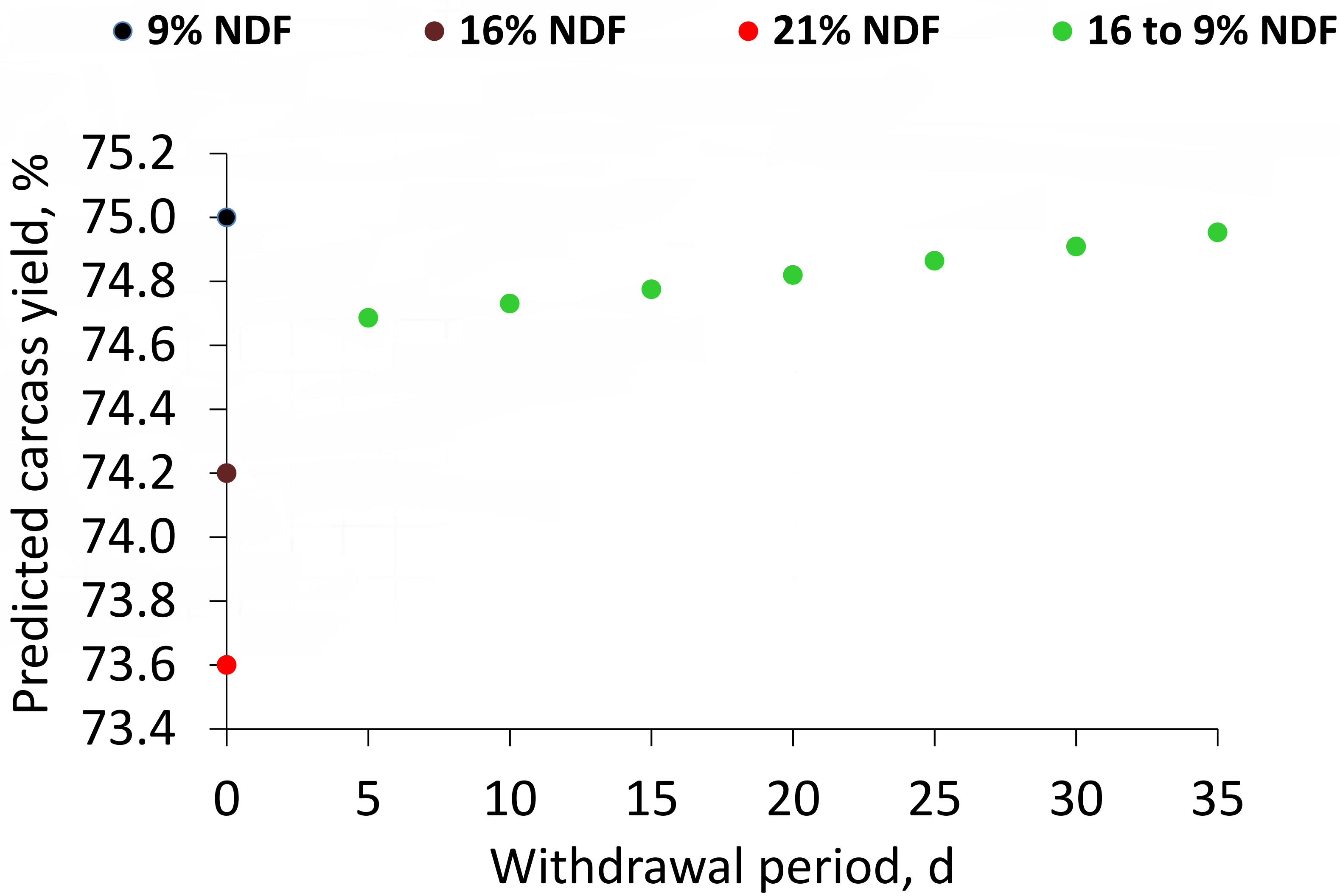
Knowledge for Life

Predicted carcass yield



Soto et al. (2017)

Predicted carcass yield



Soto et al. (2017)

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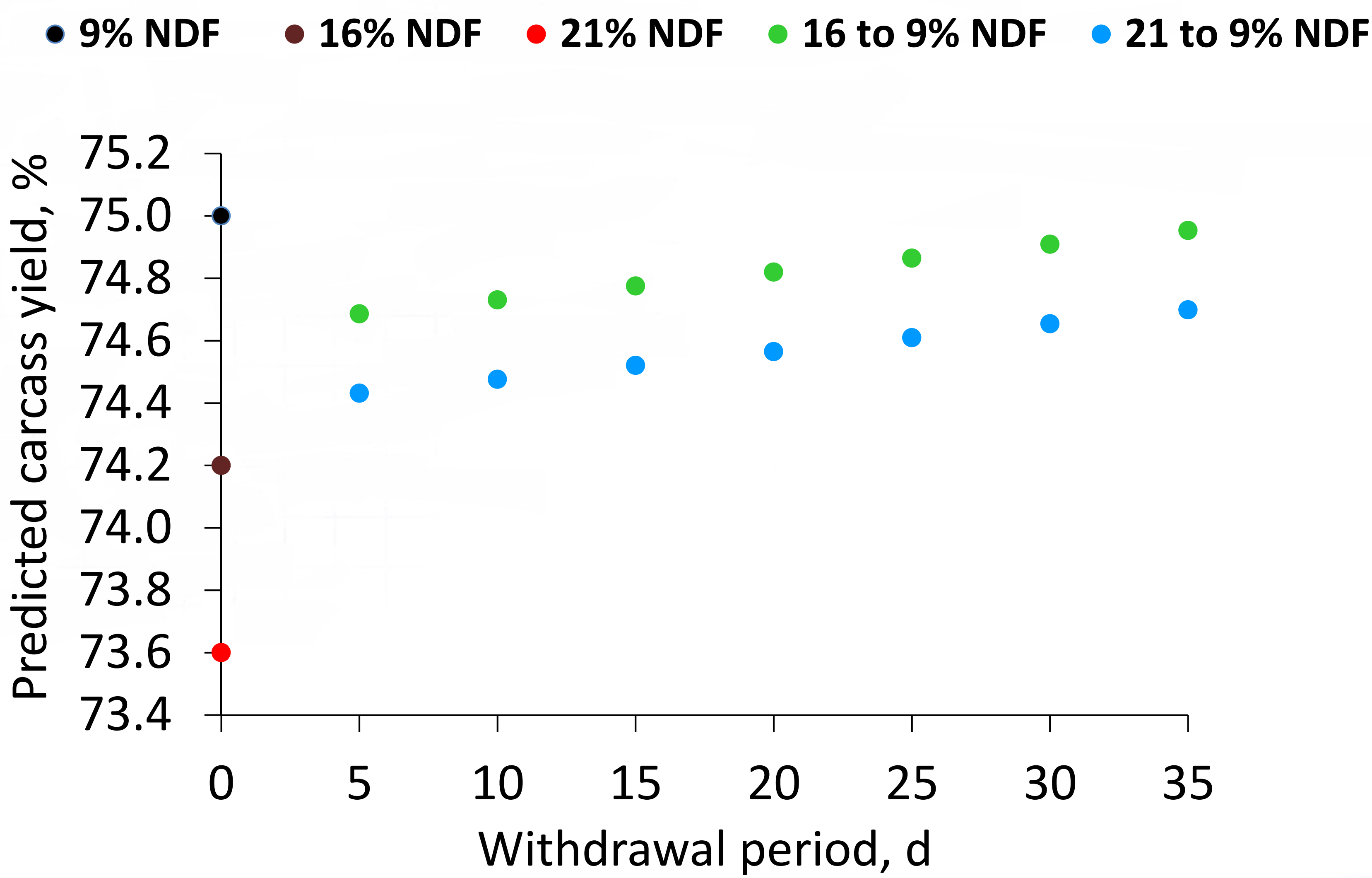
Knowledge for Life

Predicted carcass yield



Soto et al. (2017)

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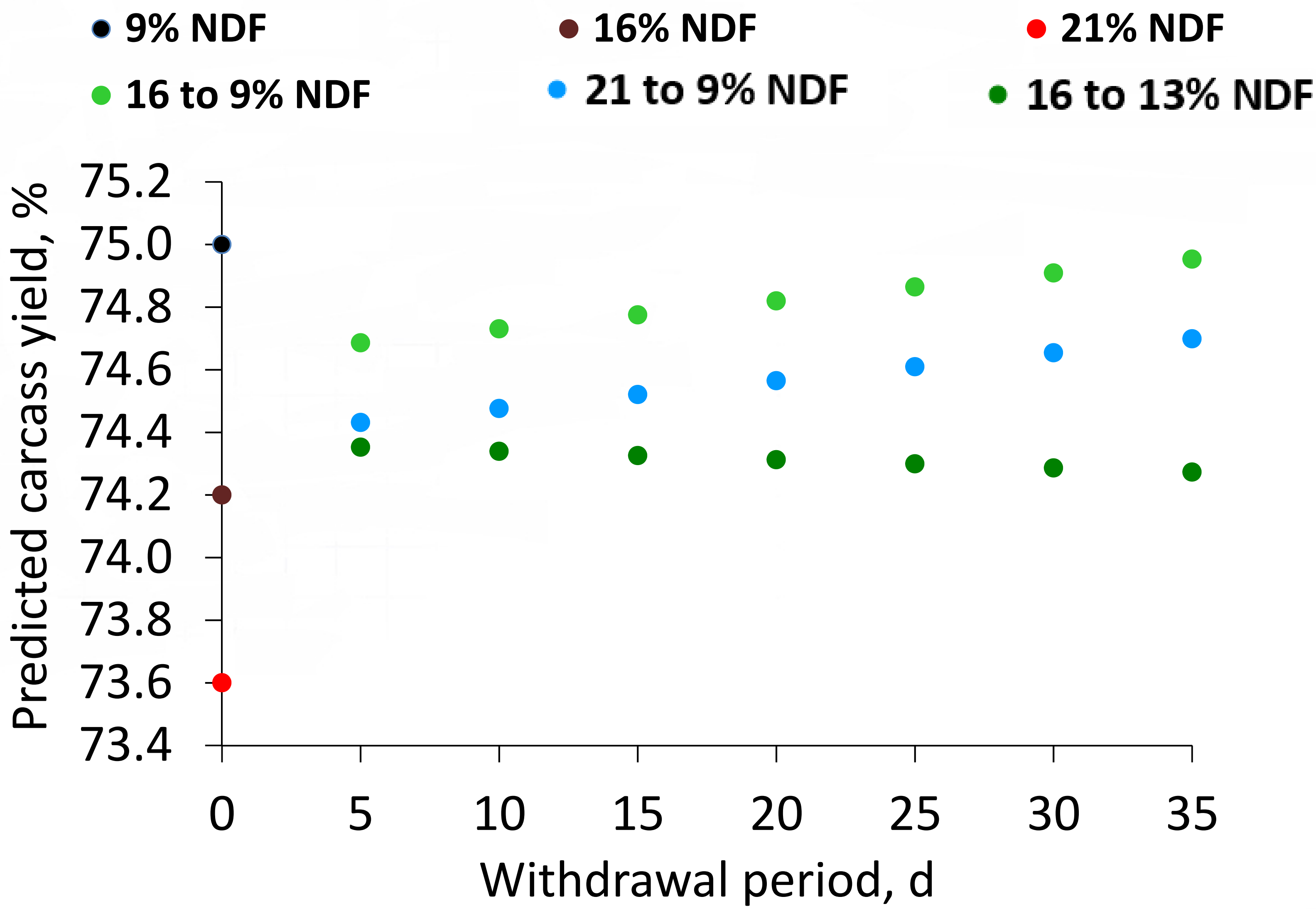
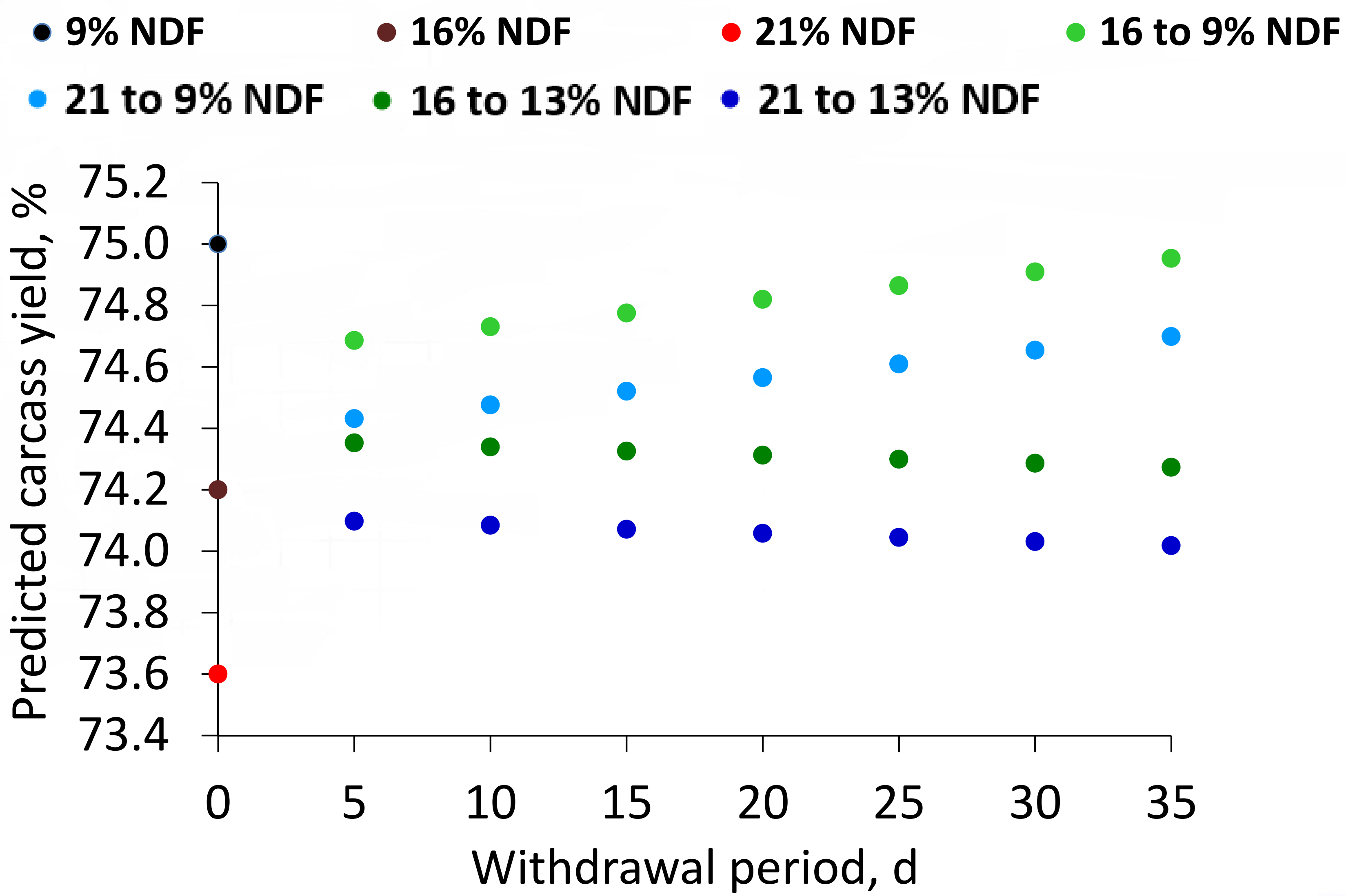
Knowledge for Life

Predicted carcass yield



Soto et al. (2017)

Predicted carcass yield



Soto et al. (2017)

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Knowledge for Life

Kansas State University | applied swine nutrition

Economic model for optimum dietary energy for growing-finishing pigs

PIC

Section 1. Economics and System performance

1	Live price, $/lb	0.62
2	Carcass price, $/lb	0.85
3	Feeder pig cost (50 lb), $/pig	55.00
4	Facility cost, $/pig/d	0.11
5	Current ADG, lb	2.10
6	Current Feed efficiency	2.90
7	Current carcass yield, %	73.00
8	Other cost[1], $/pig	8.00

[1] Veterinary supplies, field service personnel, truckin

Economic evaluation criteria (Live or Carcass)	Carcass
Marketing basis (Fixed weight or fixed time)	Fixed Time
Growth curve (enter own values or use default)	Default

Section 2. Weight by phase and current dietary energy levels

Select number of dietary phases: 6

Phase	Initial weight, lb	Final weight, lb	Current NE, Kcal/lb	Range NE (Kcal/lb) Min	Range NE (Kcal/lb) Max
1	50.0	75.0	1,104	1,083	1,122
2	75.0	125.0	1,122	1,097	1,137
3	125.0	170.0	1,130	1,110	1,153
4	170.0	210.0	1,145	1,119	1,164
5	210.0	250.0	1,150	1,126	1,170
6	250.0	285.0	1,140	1,117	1,159

Back to main menu | Summary of Calculations

Section 3. Dietary specifications

Are your diets adequate on SID Lys? Yes

Dietary Phase	Energy Level	NE, Kcal/lb	Cost, $/Ton	NDF, %
1	Min	1,083	159.71	-----
		1,093	168.08	-----
	Current	1,104	177.77	-----
		1,113	187.83	-----
	Max	1,122	204.55	-----

Model settings

Economics & System Performance

Nutritional program

KANSAS STATE UNIVERSITY

www.KSUswine.org

Animal Sciences and Industry

Calculators (Energy, Ingredient, F/G, and Pig Space Tools)

Optimal Net Energy Model for Finishing Pigs - lb. version (v2.6 - November, 2017) (metric version)

Feed Efficiency Evaluation Tool (v3 - November, 2015)

Floor Space Impact on Pig Performance (v7 - November, 2015)

Tryptophan:lysine economic model for nursery and finishing pigs (February, 2016)

Feed Efficiency Adjustment Calculator - lb. version (metric version)

Iodine Value Prediction Spreadsheet

KSU Fat Analysis calculator

DDGS Calculator (November, 2013)

AA Pricing Spreadsheet

Meat and Bone Meal Calculator

KSU Feed Budget Calculator

Phase feeding strategies and lysine specifications for grow-finish pigs

Phase	1	2	3	4
Weight, lb	60-110	110-160	160-220	220-280
Treatment		**SID Lys, %**		
MAX	1.13	0.96	0.82	0.77
STD	1.02	0.87	0.76	0.67
STD/MAX	1.02	0.87	0.82	0.77
2-PHASE (MAX)	←	0.96	→	0.77
Treatment		**SID Lys:ME, g/Mcal**		
MAX	3.42	2.89	2.46	2.29
STD	3.08	2.62	2.28	1.99
STD/MAX	3.08	2.62	2.46	2.29
2-PHASE (MAX)	←	2.89	→	2.29

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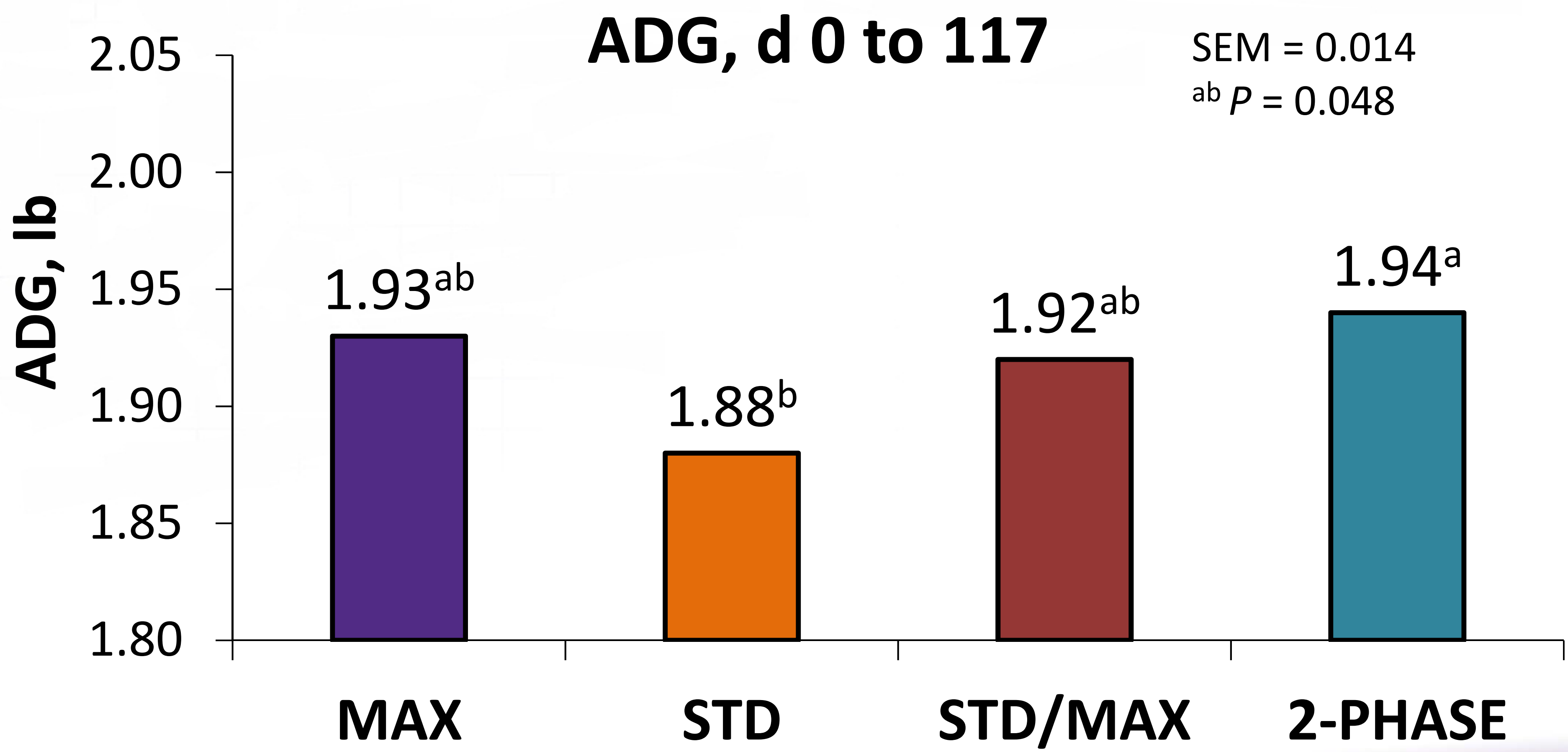
NEW HORIZON FARMS

Menegat et al., 2017

Knowledge for Life

Phase feeding strategies and lysine specifications for grow-finish pigs



Menegat et al., 2017

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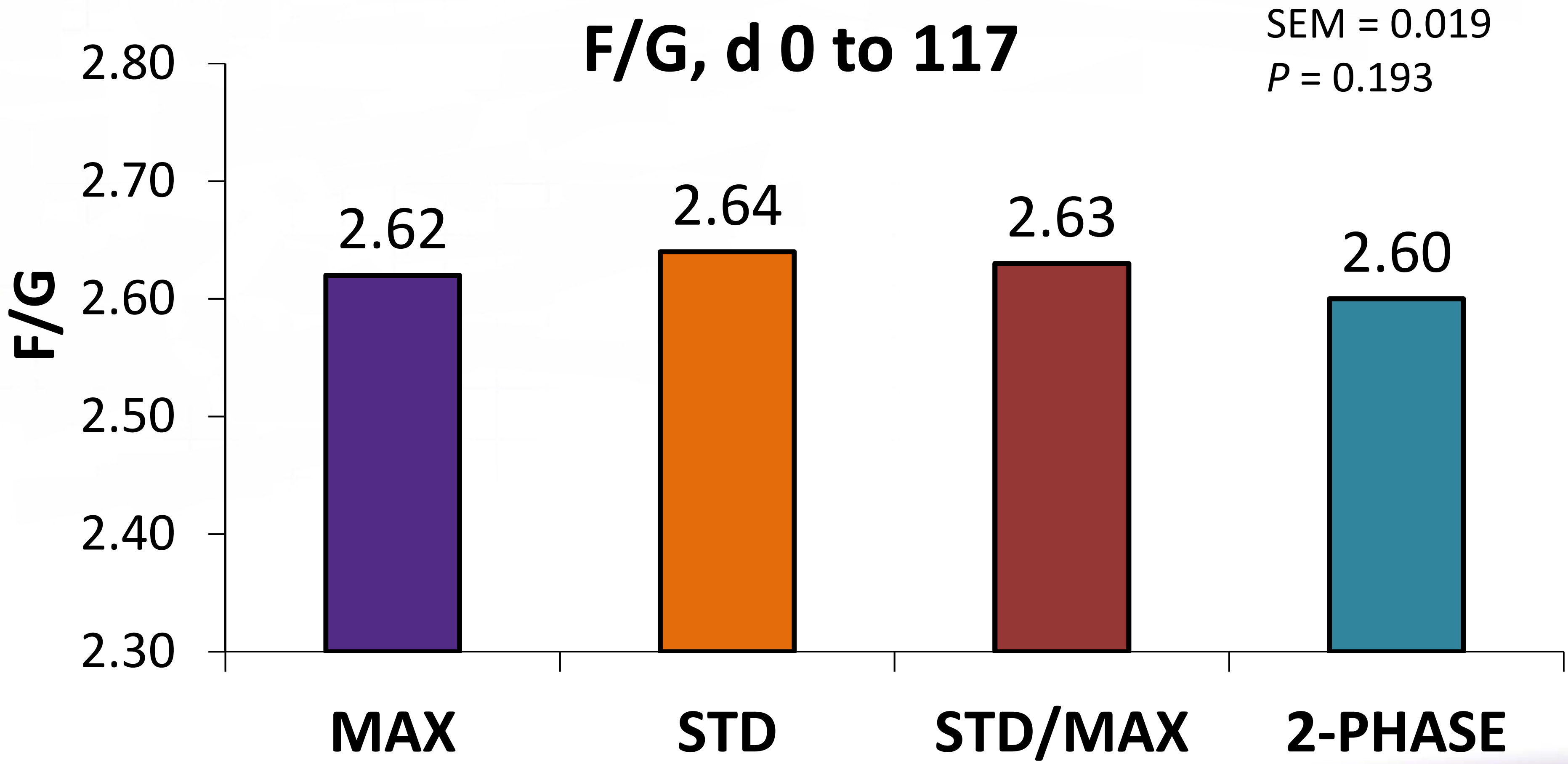
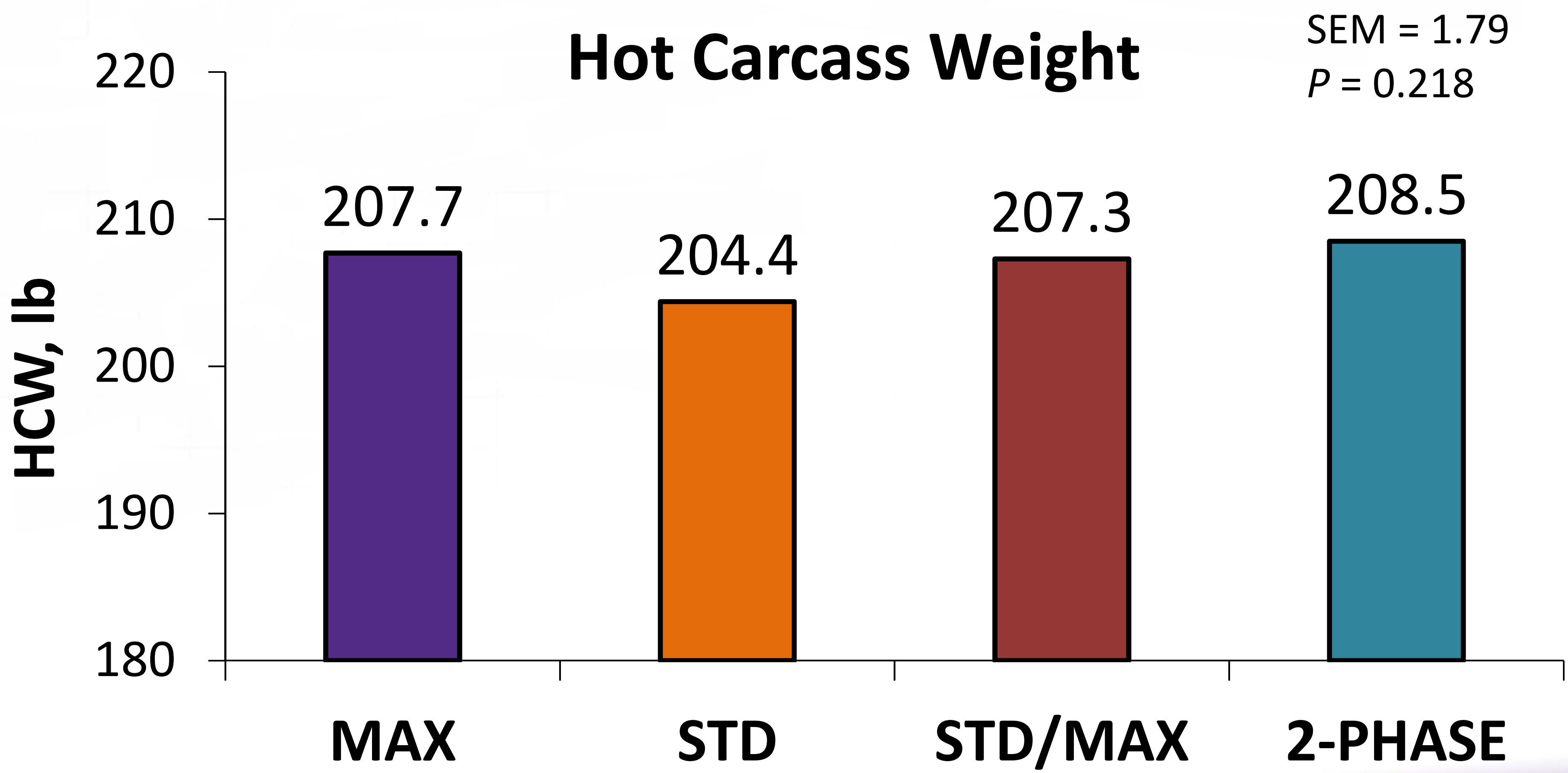
Phase feeding strategies and lysine specifications for grow-finish pigs



Menegat et al., 2017

Phase feeding strategies and lysine specifications for grow-finish pigs



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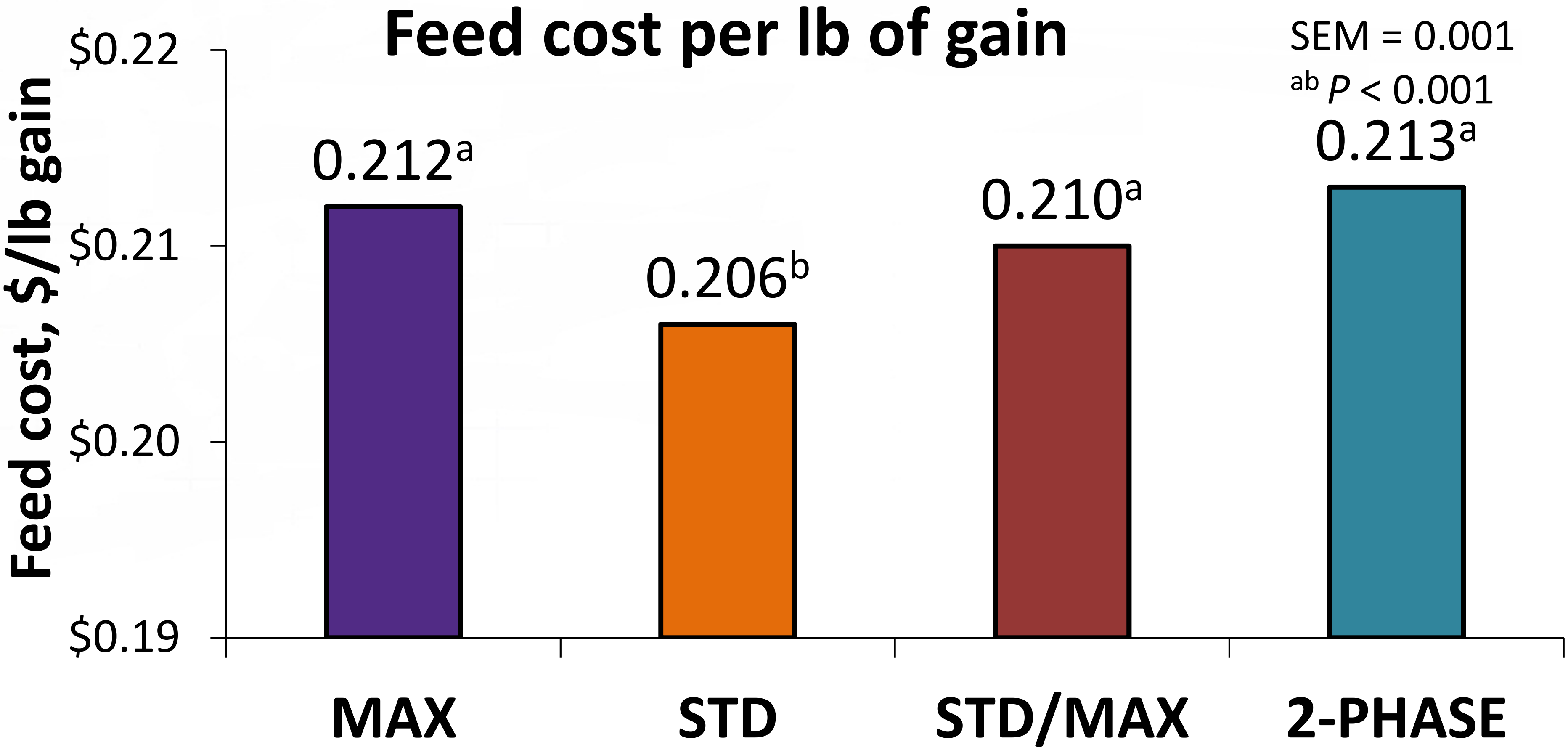
Menegat et al., 2017

Knowledge for Life

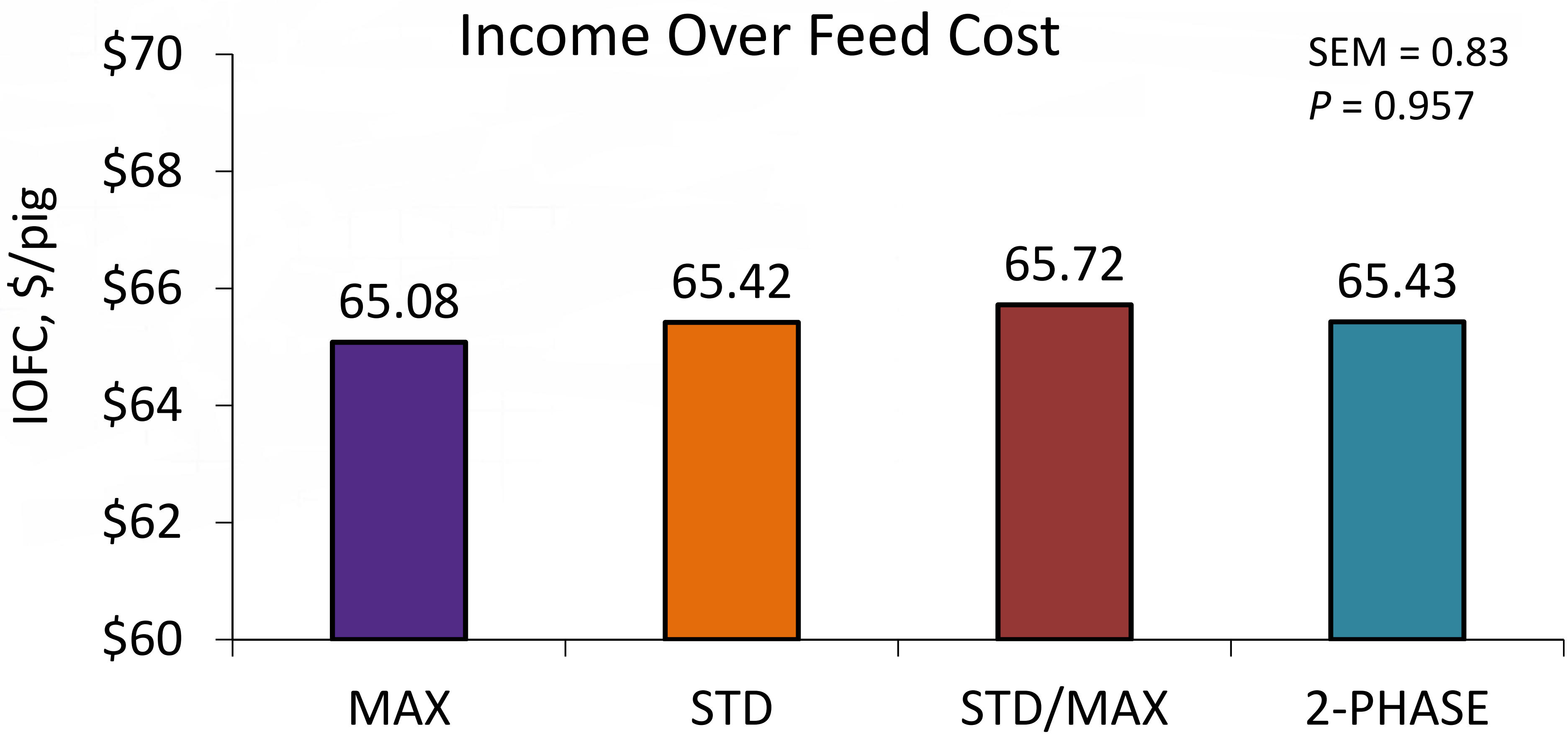
Phase feeding strategies and lysine specifications for grow-finish pigs



Corn $3.30/bu; soybean meal $290/ton; DDGS $94/ton; L-lys $0.75/lb

Menegat et al., 2017

Phase feeding strategies and lysine specifications for grow-finish pigs



Corn $3.30/bu; soybean meal $290/ton; DDGS $94/ton; L-lys $0.75/lb
Revenue = $70/cwt of carcass gain

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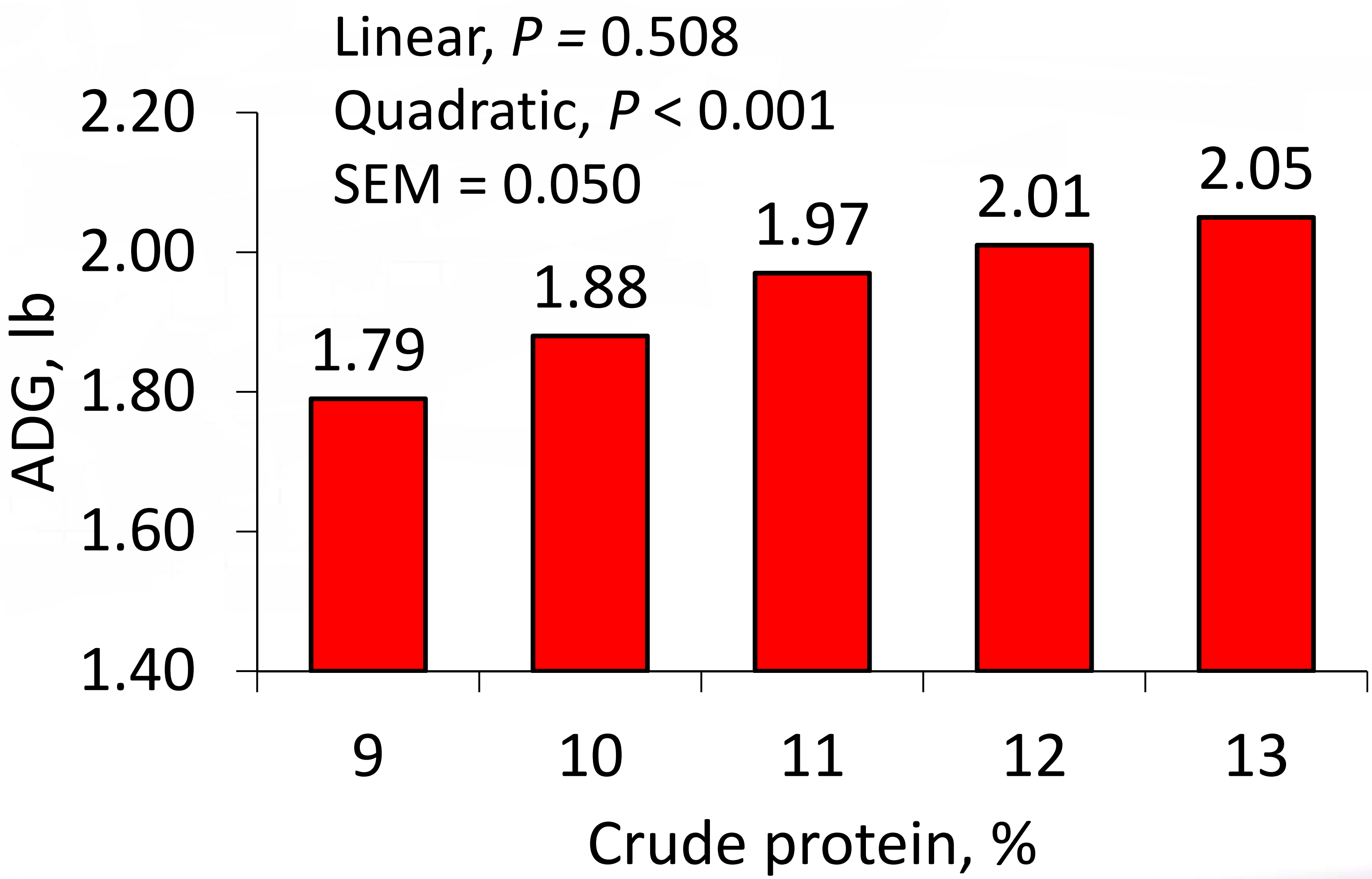
Menegat et al., 2017

Knowledge for Life

Late Finishing Dietary Crude Protein

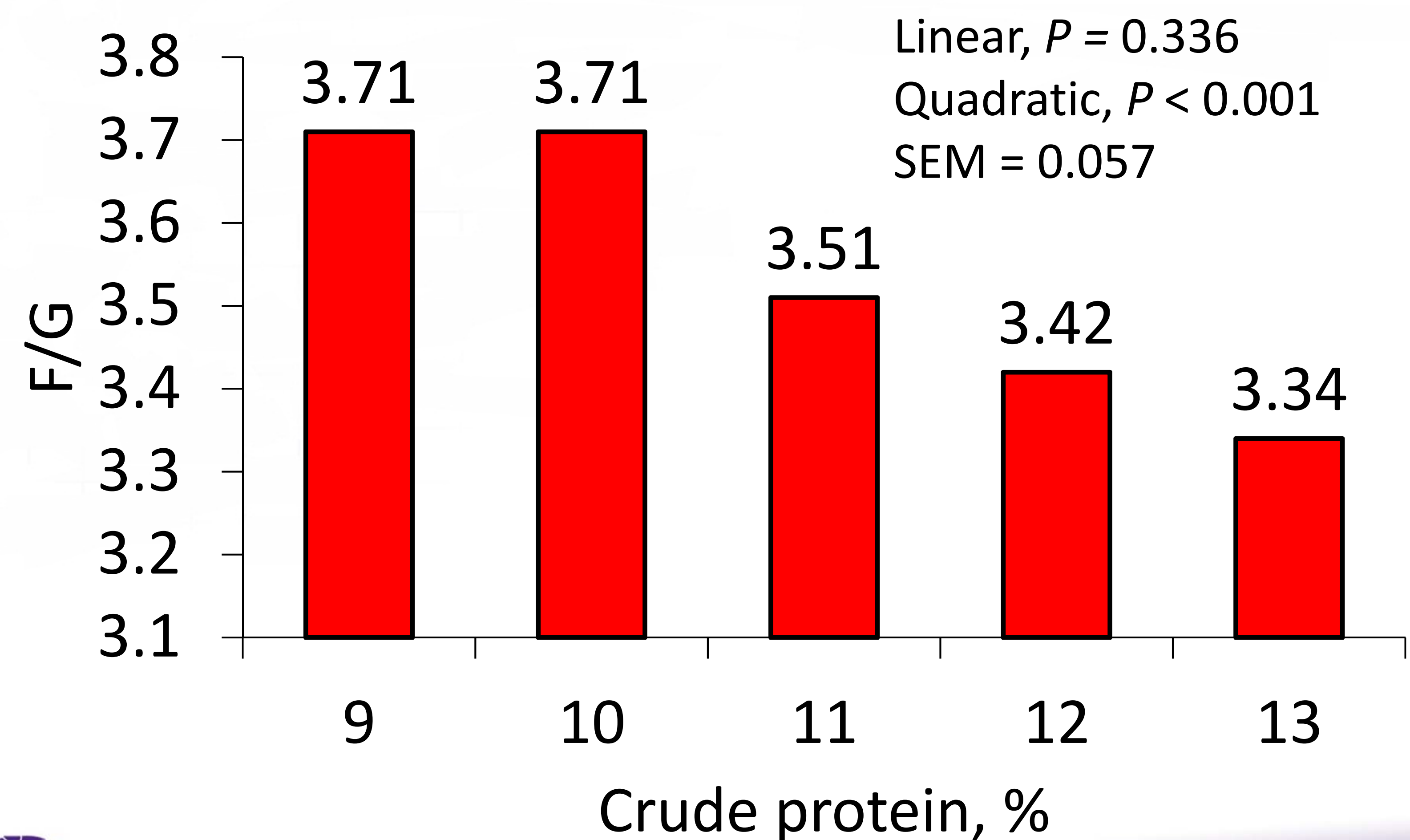
- Use of synthetic amino acids allow for diets that "on paper" are balanced for essential amino acids.
- However clear evidence exists that late finishing pigs will not perform as expected if crude protein is allowed to decrease.
  - Specific reason has yet to be identified

Determination of optimum levels of crude protein in finishing pigs from 245 to 300 lb



Soto et al., 2017

Determination of optimum levels of crude protein in finishing pigs from 245 to 300 lb



Soto et al., 2017

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Percent of maximum response at different CP levels for finishing pigs from 240 to 300 lb

	Crude protein, %				
	9	10	11	12	13
ADG, %					
PIC[1]	---	84.1	94.0	100.0	99.0
DNA[2]	87.3	91.7	96.1	98.0	100.0
ADFI, %					
PIC	---	90.9	95.7	100.0	97.3
DNA	95.2	100.0	99.9	99.1	98.8
G:F, %					
PIC	---	91.3	96.2	98.4	100.0
DNA	90.3	90.6	95.3	98.0	100.0

[1]A total of 224 pigs (PIC 1050 × 327; initially 241.1 lb) were used in a 20-d experiment. Diets contained 0.66 SID Lys and 1,194 Kcal NE/lb.

[2]A total of 238 pigs (DNA 600 × 241; initially 246.4 lb) were used in a 26-d experiment. Diets contained 0.55 SID Lys and 1,198 Kcal NE/lb.

Soto et al., 2017

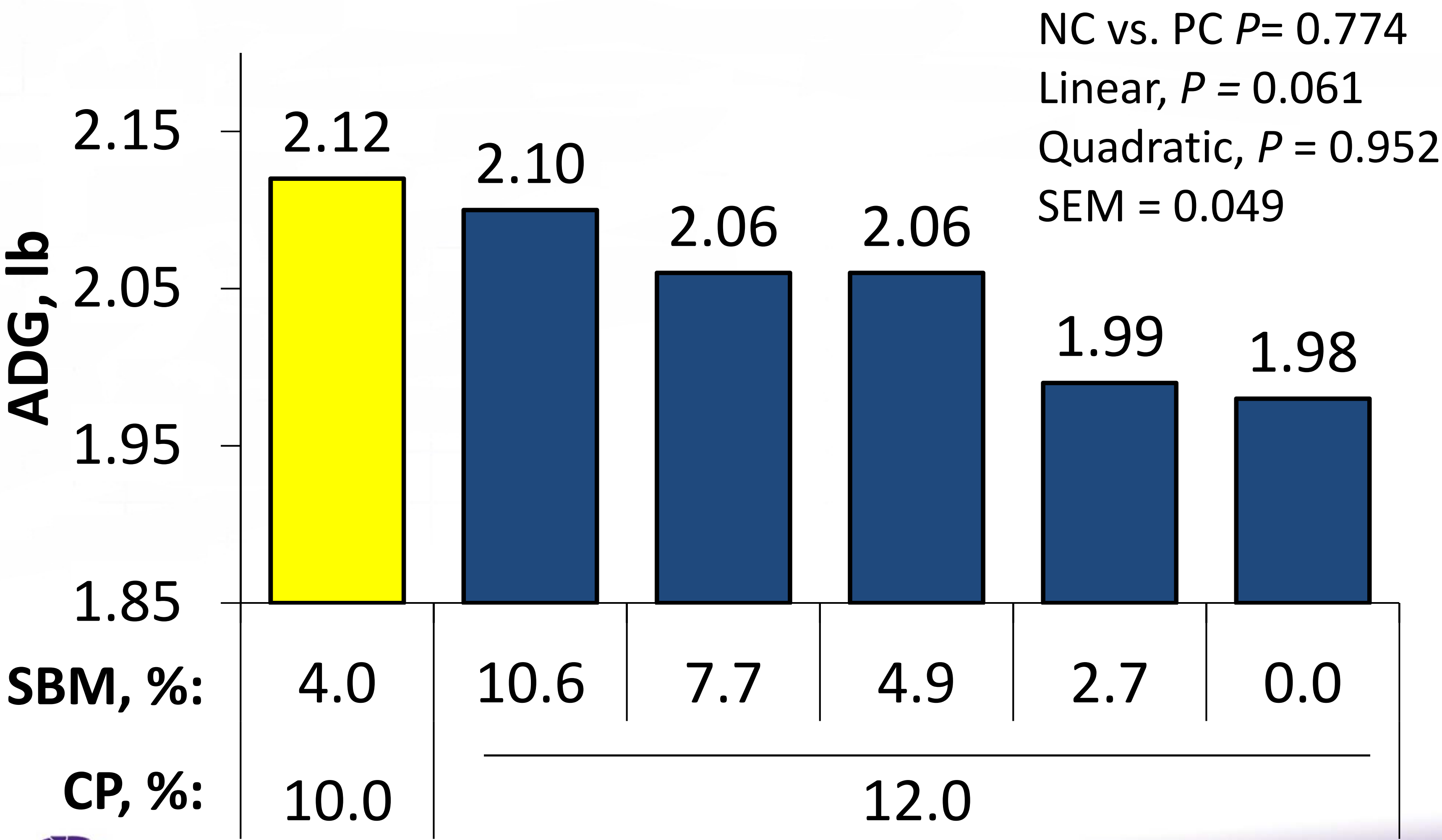
Effects of soybean meal level in 12% CP diets on performance of finishing pigs from 250 to 300 lb

- 280 finishing pigs (DNA 600 × 241, BW 251.9 lb) 26-d trial
- 6 pens per treatment with 7 or 8 pigs/pen
- Pen allotted by BW and assigned to 1 of 6 dietary treatments

Treatments	Soybean Meal, %	Crude Protein, %
1 (Neg. Control)	4.0	10.0
2 (Pos. Control)	10.6	12.0
3	7.7	12.0
4	4.9	12.0
5	2.7	12.0
6	0.0	12.0

Soto et al. 2017

Effect of soybean meal level on ADG of finishing pigs from 250 to 300 lb (d 0 to 26)



Soto et al. 2017

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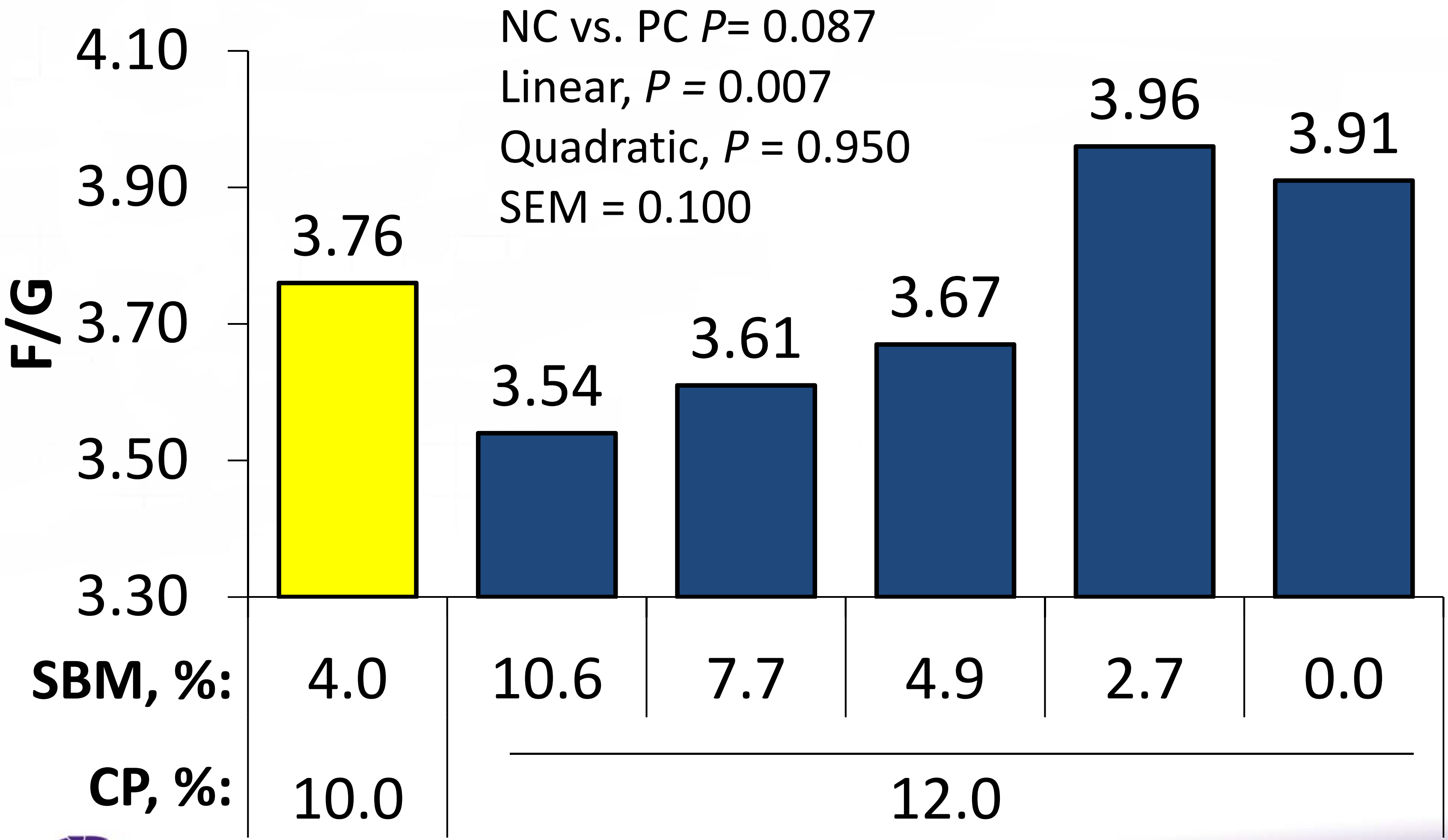
Effect of soybean meal level on F/G of finishing pigs from 250 to 300 lb (d 0 to 26)



Soto et al. 2017

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Knowledge for Life

Failed attempts to restore performance in low crude protein diets

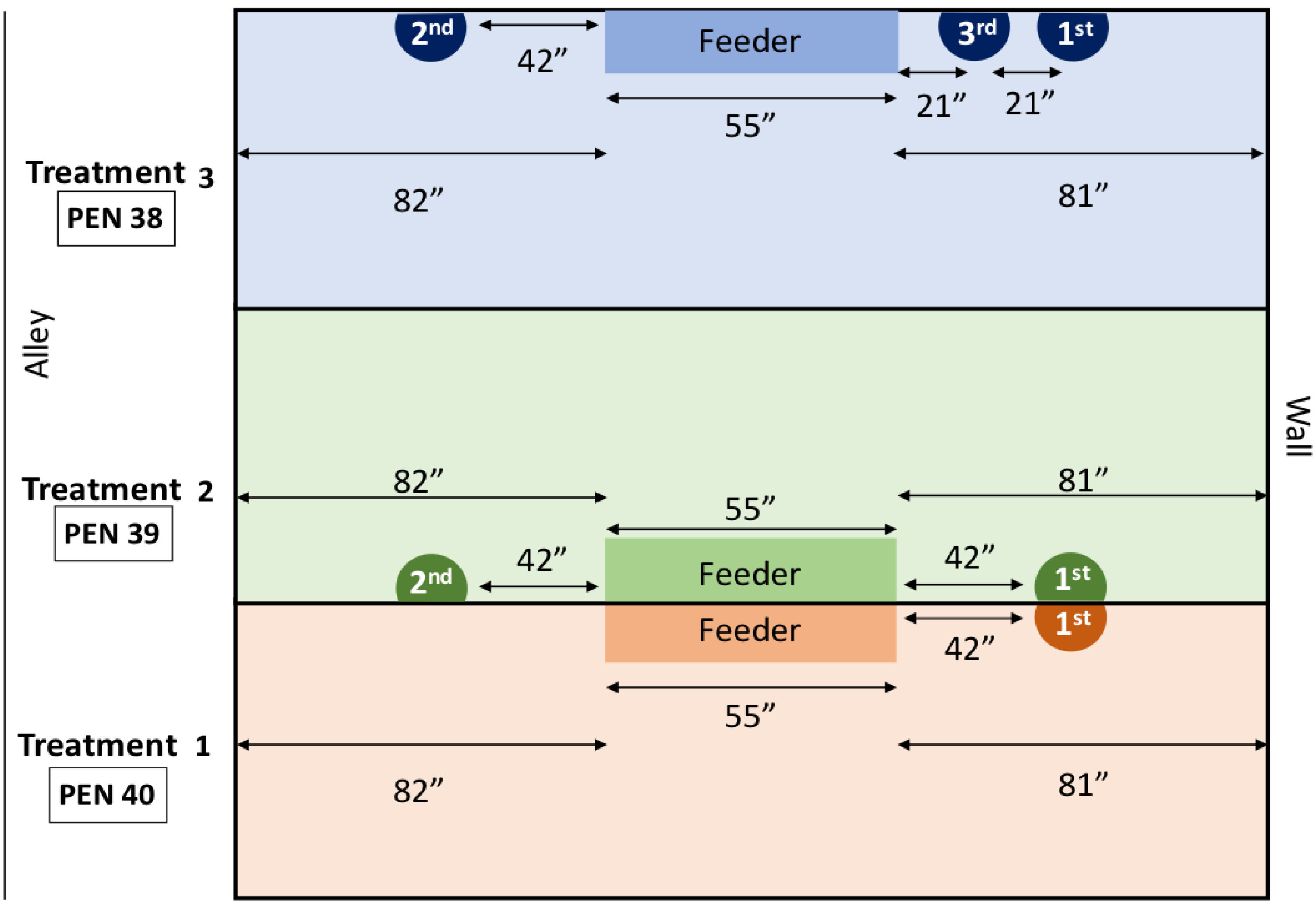
- Added choline chloride
- Added potassium chloride
- Dietary electrolyte balance
- Soy protein concentrate

Effect of number of cup waterers per pen on growing and finishing pig performance

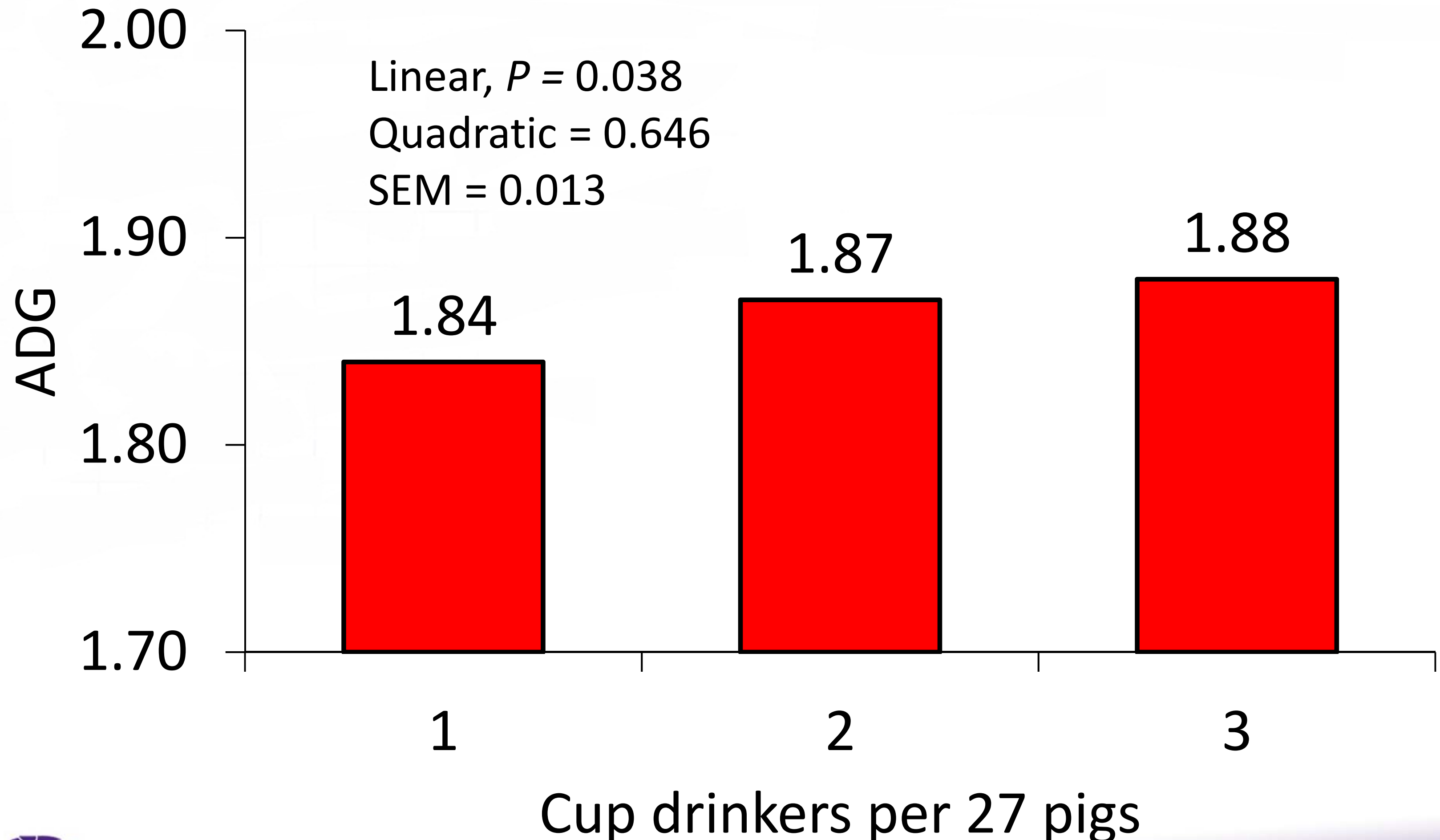
(27 pigs/pen; 36 to 250 lb)

Vier et al., 2018

Conducted May to September 2017



Effect of number of cup waterers per pen on growing and finishing pig performance
(27 pigs/pen; 36 to 250 lb)



Vier et al., 2018

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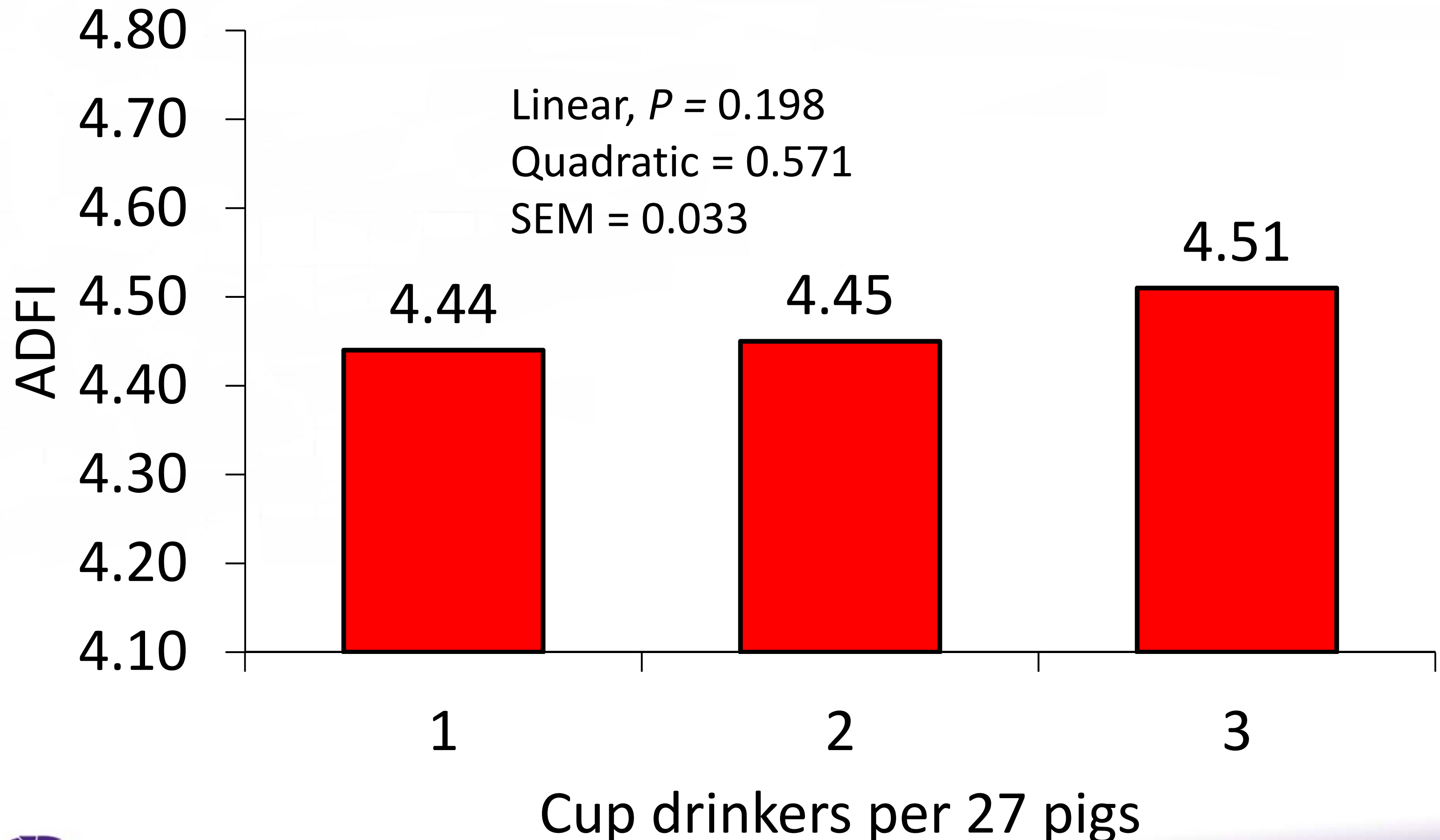
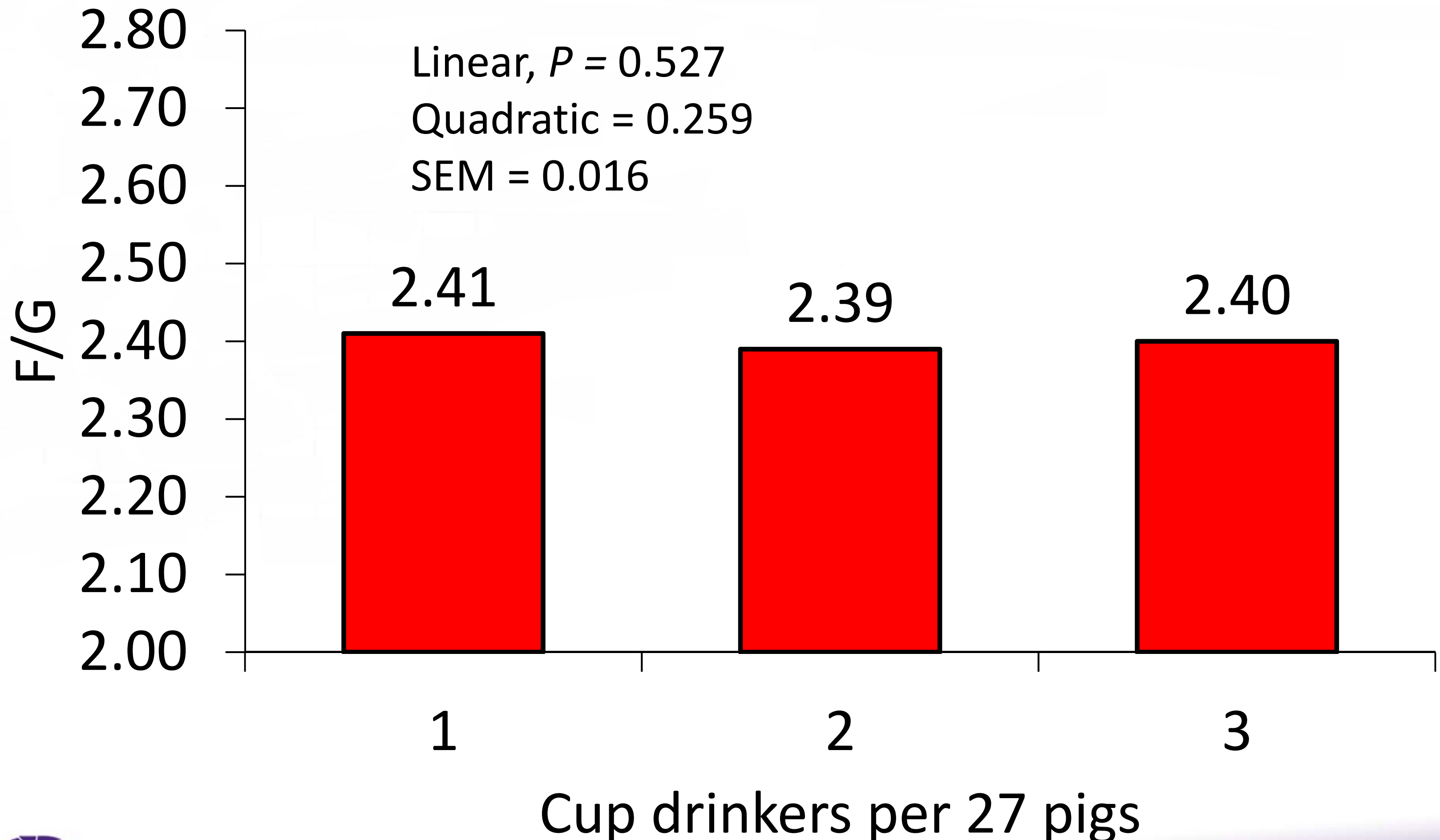
Effect of number of cup waterers per pen on growing and finishing pig performance
(27 pigs/pen; 36 to 250 lb)



Vier et al., 2018

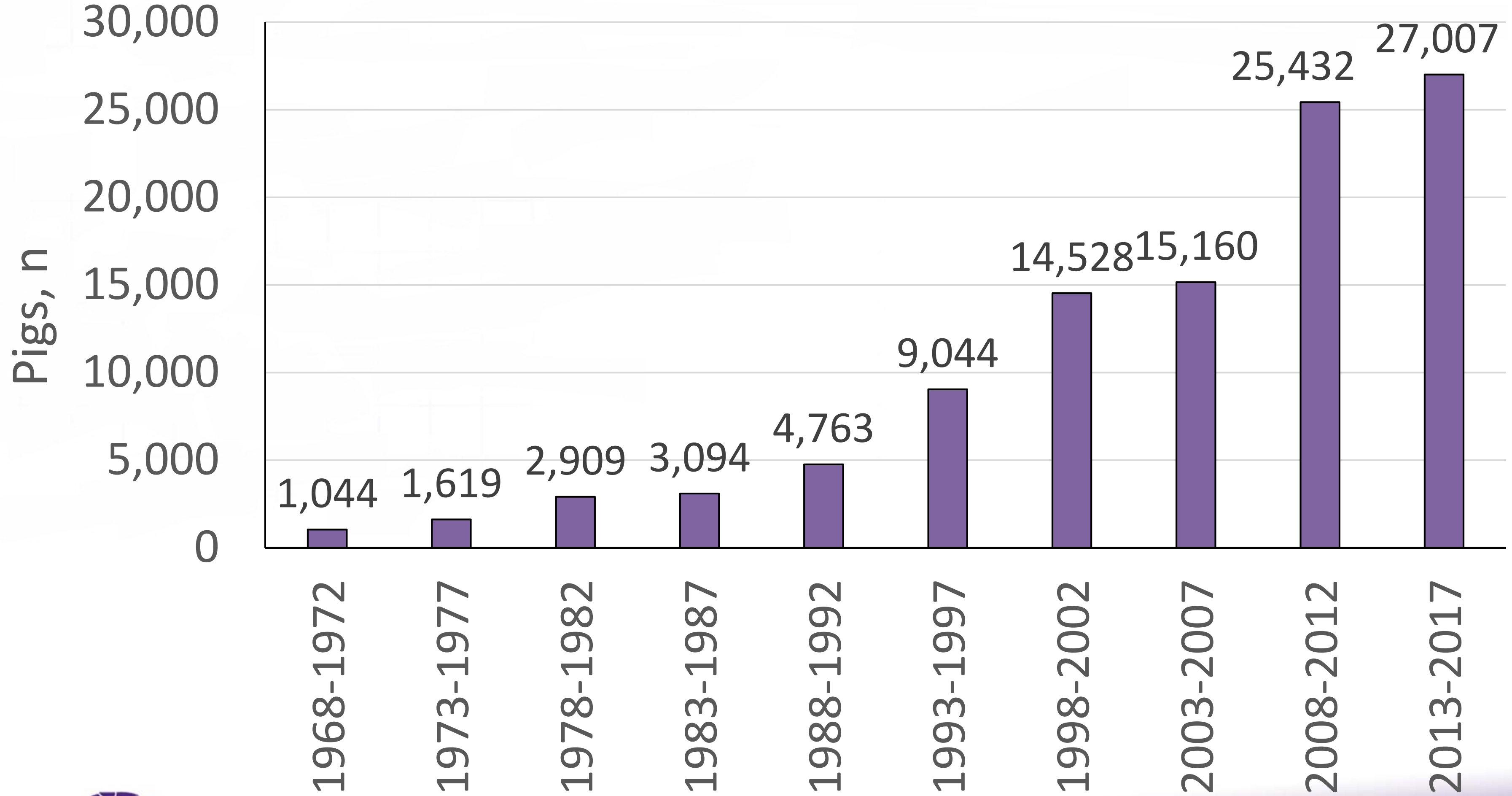
Effect of number of cup waterers per pen on growing and finishing pig performance

(27 pigs/pen; 36 to 250 lb)



Vier et al., 2018

Average number of pigs included in papers published in Swine Day



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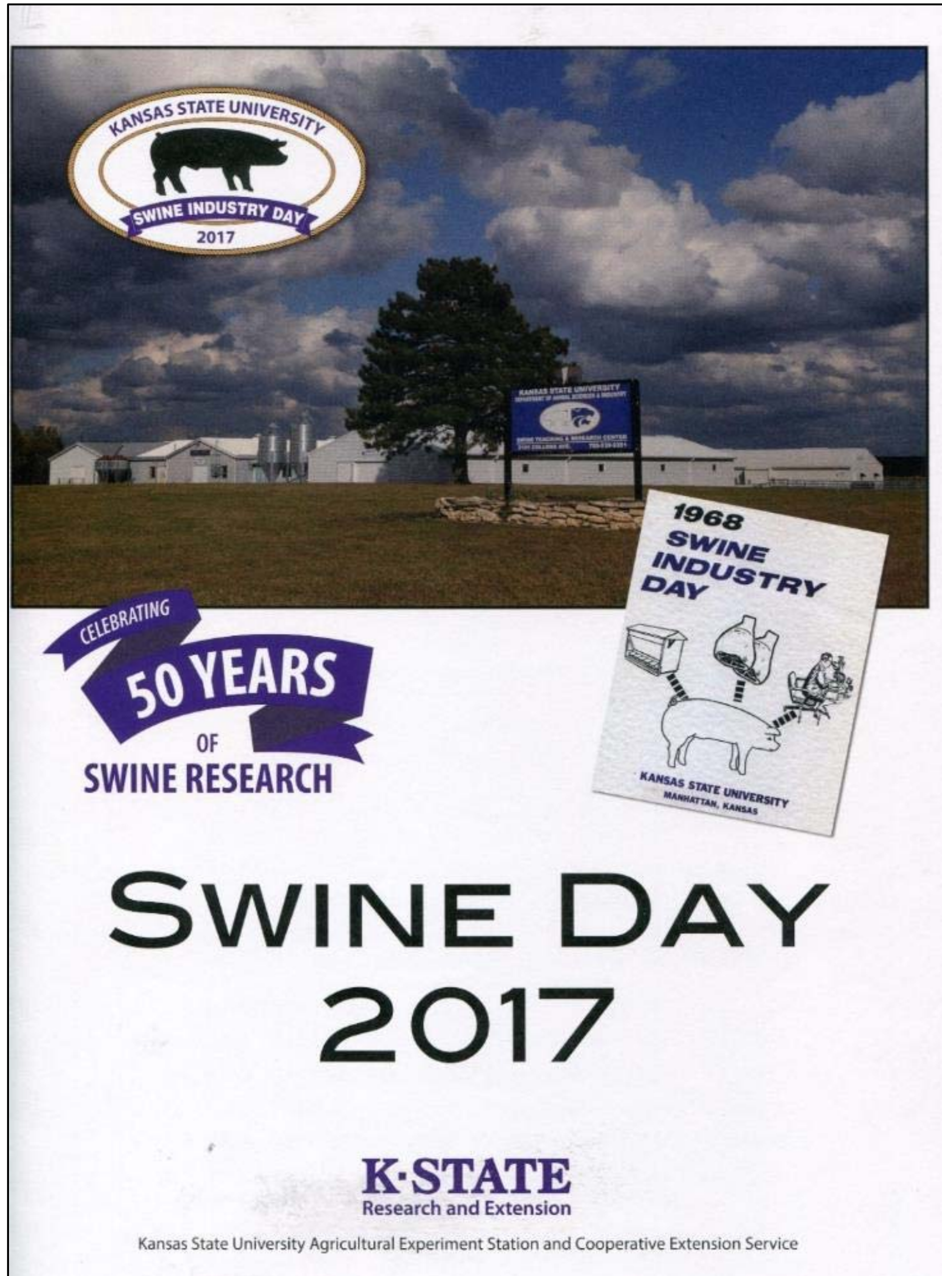
2017 Swine Day Report

available at:
www.KSUswine.org

- 54 papers
- 56 experiments
- > 39,000 pigs



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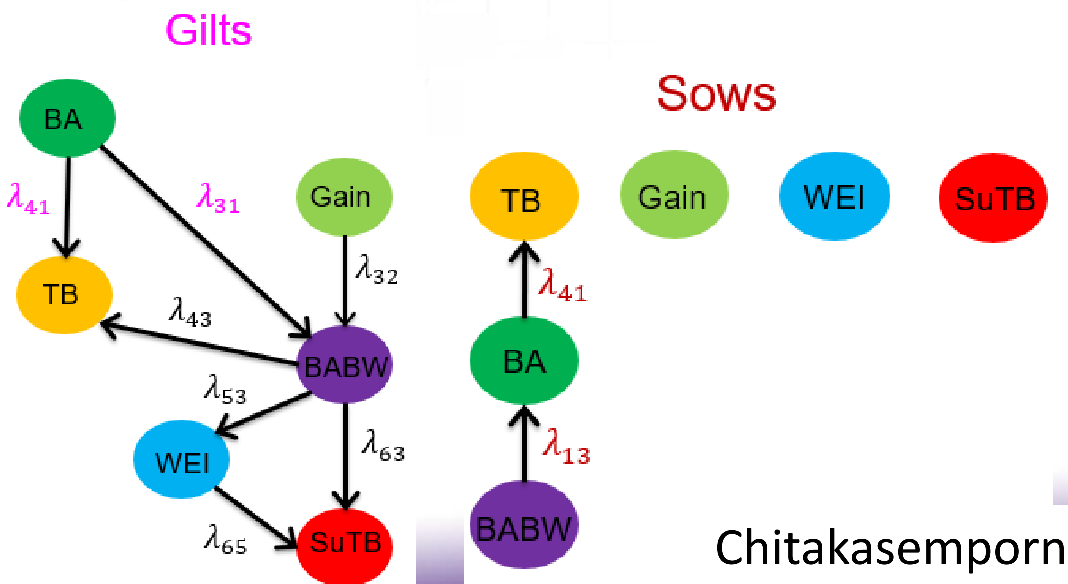
Swine Network Analysis

- Objective: Characterize causal biological relationships between reproductive traits in high-performing gilts and sows.
- Data: Goncalves et al., 2016 JAS
- Structural equation models combined with structure-learning algorithms adapted to a hierarchical Bayesian framework.

HERD LIVESTOCK CO. INC.



Chitakasempornkul et al., 2018

Electronic Sow Feeding

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ADM
Animal Nutrition

PIC

THOMAS LIVESTOCK CO.
T.L.C.
Creating Community Opportunities

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Objective

To determine the effects of increasing dietary lysine during gestation on sow performance and piglet birth weight

Graduate student: Lori Thomas
Undergraduate student: Lauren Herd

Procedures

- A total of 971 females (498 gilts and 473 parity 2+ sows)

- Pens equipped with 6 ESFs with approximately 275 females per pen

- Females had to walk over a scale after leaving the feeding stations for calculating daily weight changes

Electronic Sow Feeders

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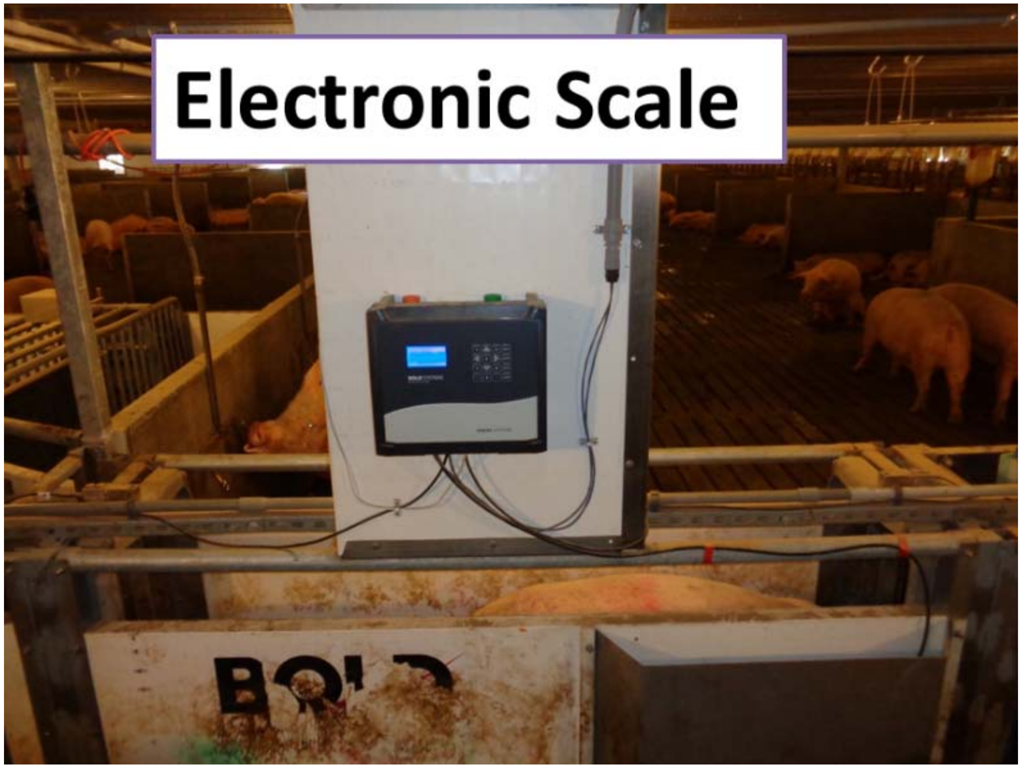
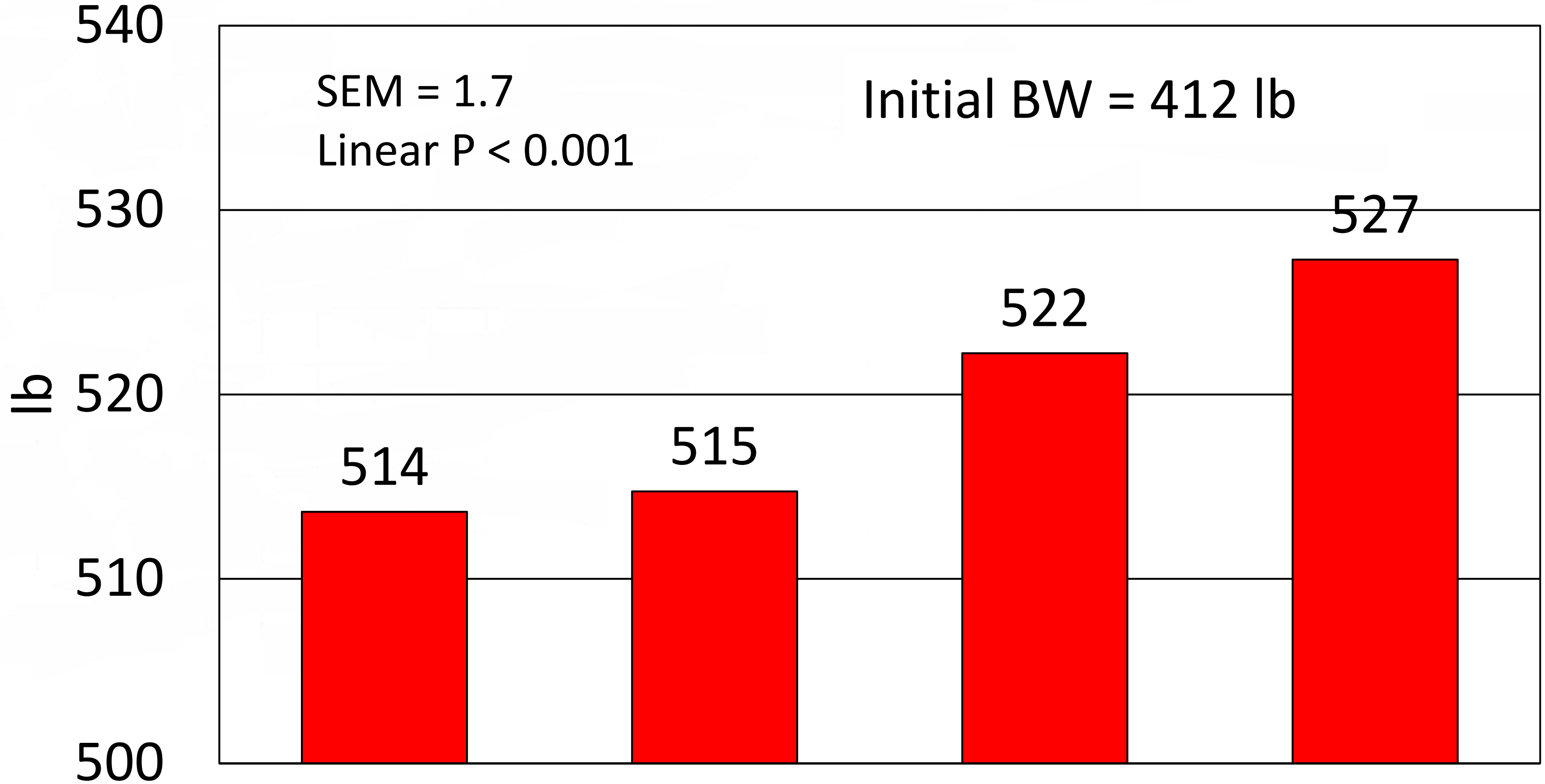
Scale System



Effect of increasing dietary lysine during gestation on final BW



SID Lysine g/d	11	13.5	16	18.5
SID Lysine %	.54	.66	.78	.91

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Thomas et al., 2018

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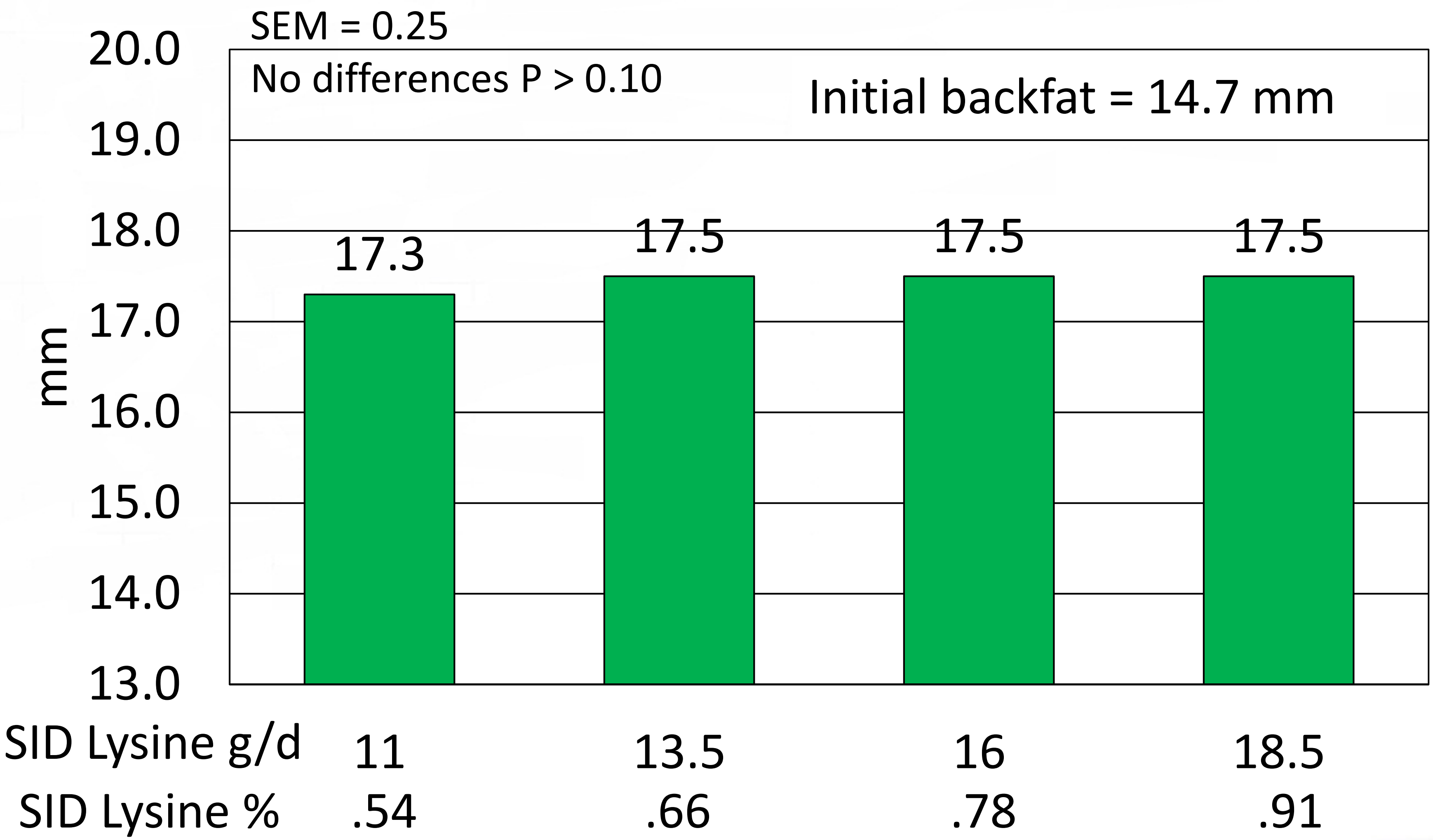
Effect of increasing dietary lysine during gestation on final backfat



Thomas et al., 2018

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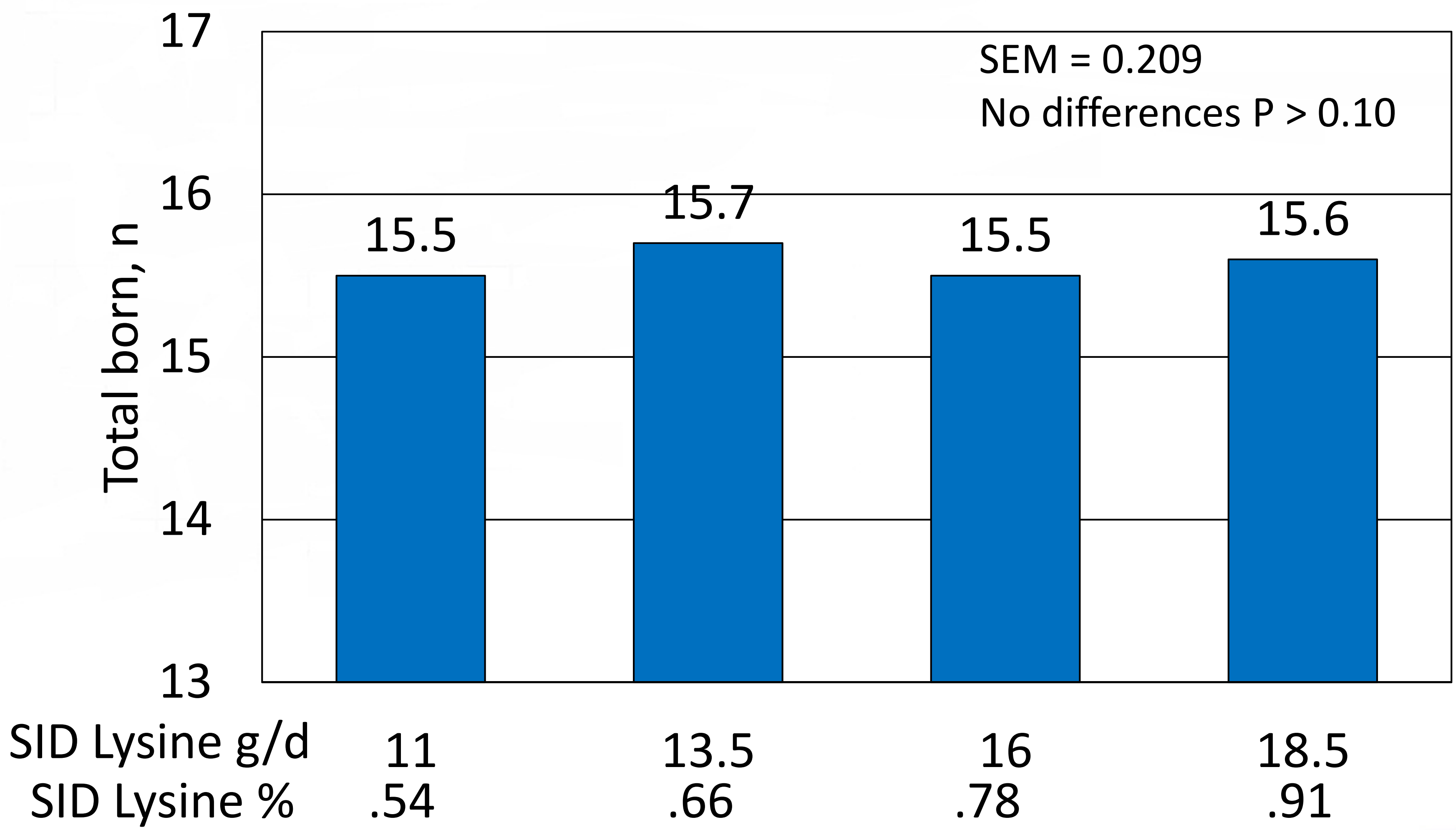
Effect of increasing dietary lysine during gestation on total born



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Thomas et al., 2018

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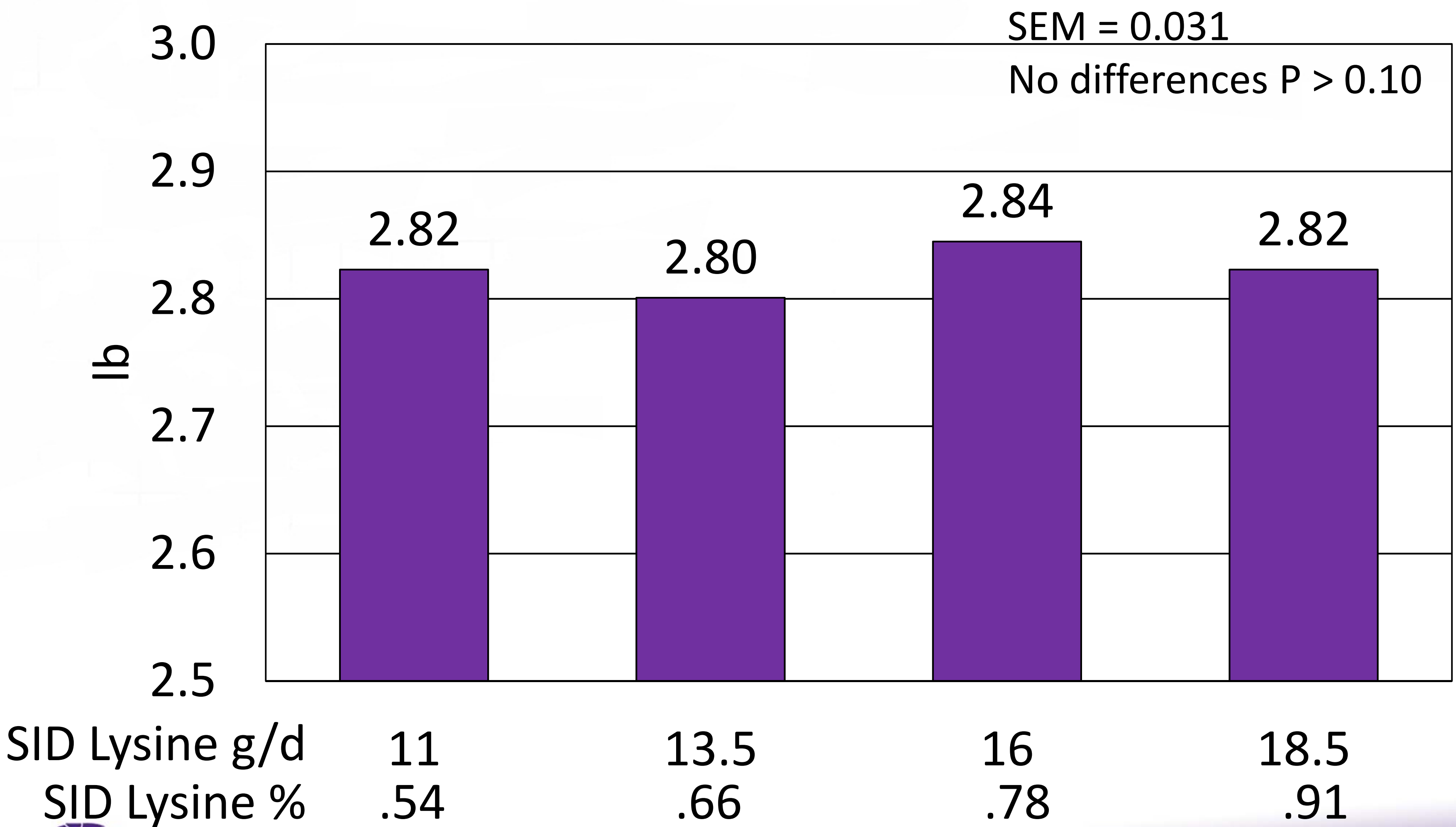
Effect of increasing dietary lysine during gestation on piglet BW



Thomas et al., 2018

Initial Analysis

- No treatment by parity interactions
- No effects on total born piglet birth weight

Future Analysis

- Effects on number of pigs born alive and weaned?
- Effects on subsequent reproductive performance?
- What effect does increased lean gain have on sow performance?

Stay Tuned!!!!

Objective

To determine the effects of increasing dietary lysine during lactation on sow and litter performance

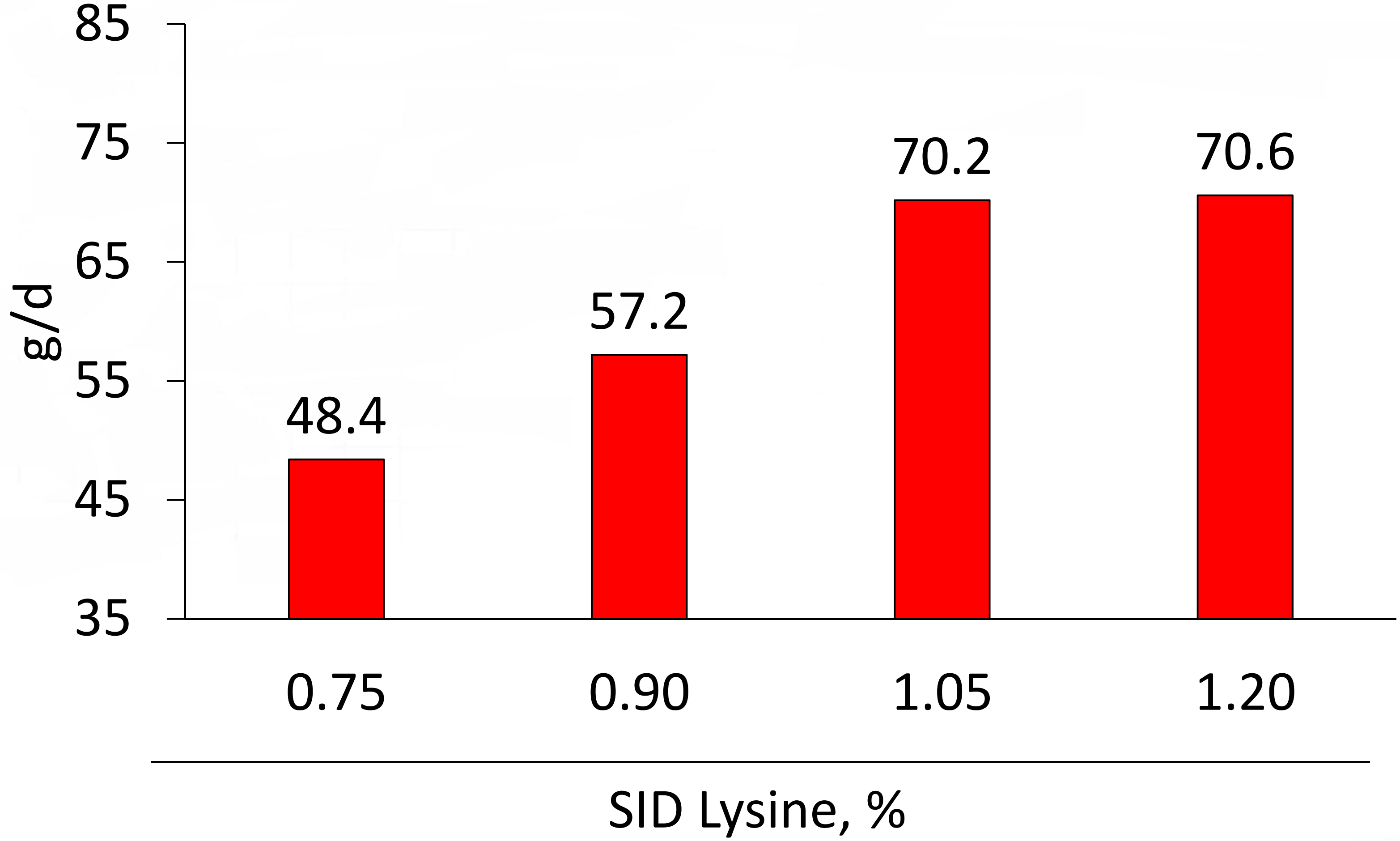
Graduate Student: Kiah Gourley

PILLEN FAMILY FARMS
FAMILY OWNED. FAMILY FOCUSED.

Materials and Methods

- 710 mixed parity sows (DNA Line 241)
- Pillen Family Farms (Columbus, NE)
- On d 112 of gestation, sows were allotted by BW to treatment diets:
  - **0.75, 0.90, 1.05, 1.20% SID Lys**
- Fed diets from d 114 of gestation to weaning

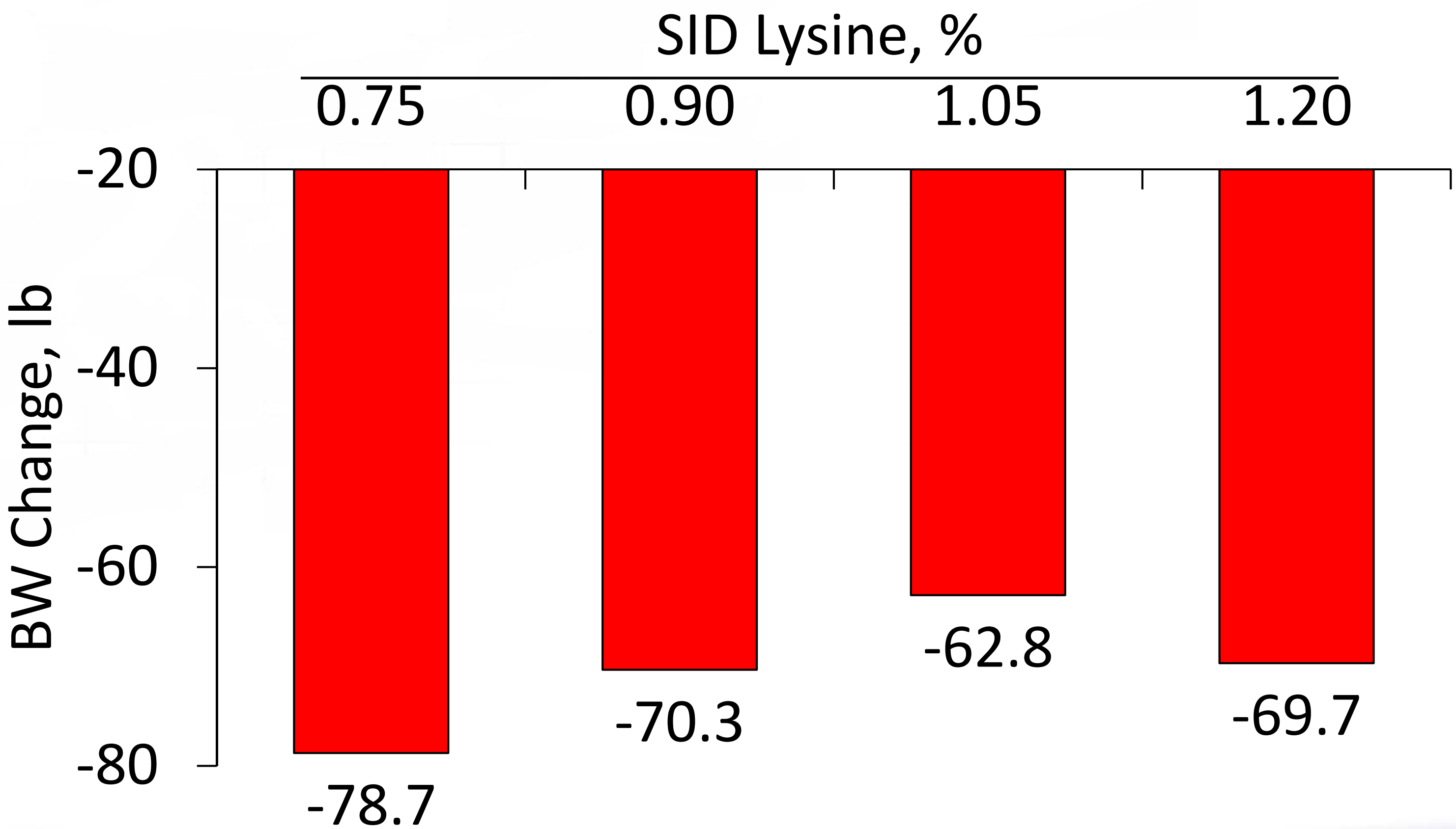
SID Lysine Intake, g/d



Gourley et al., 2017

Sow BW Change, d 112 to Wean

SEM = 1.50
linear, P = 0.003
quadratic, P = 0.004
Trt within Parity, P = 0.02



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Gourley et al., 2017

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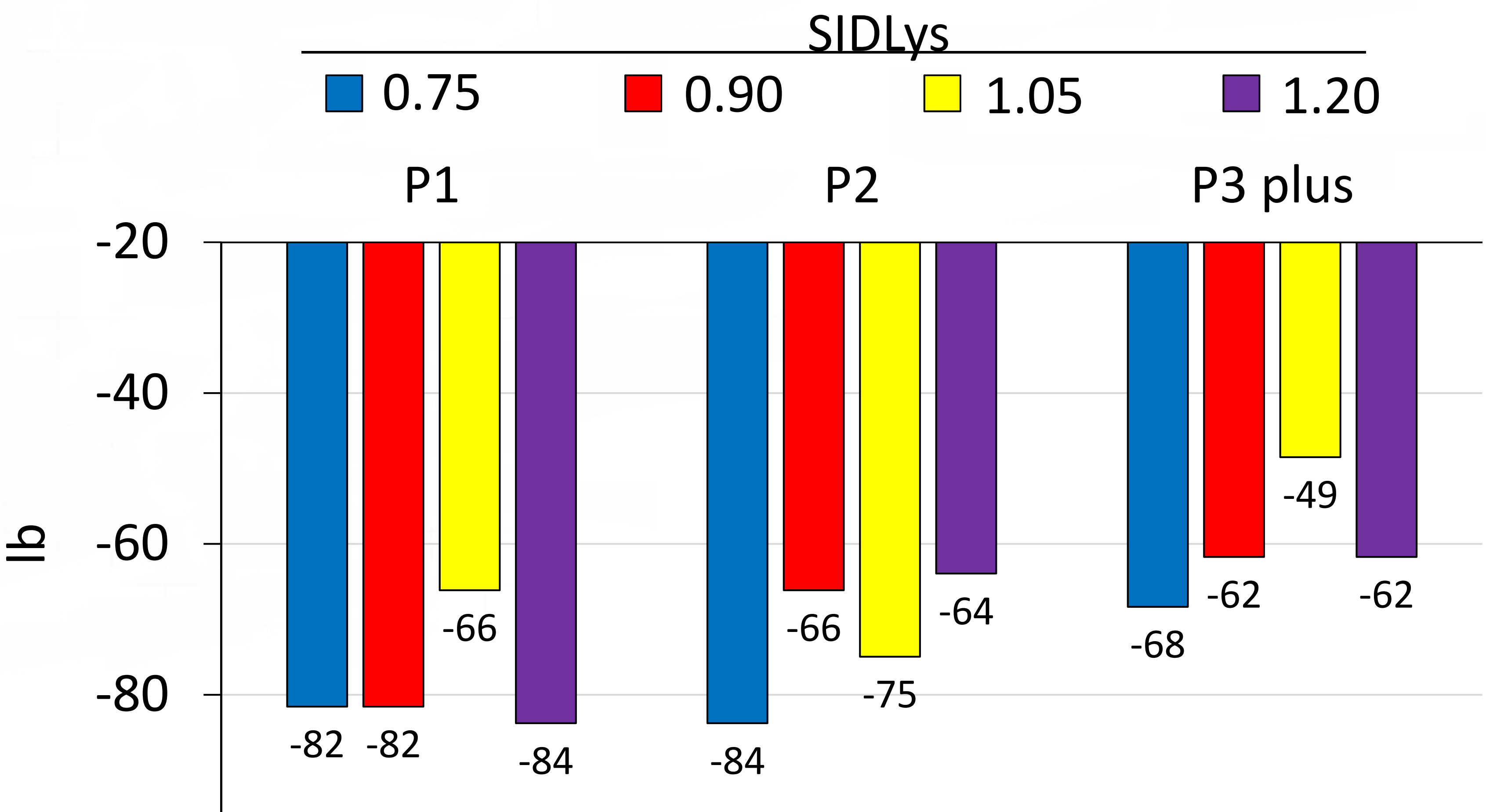
Sow BW Change, d 112 to Wean



P1	P2	P3 plus
SEM = 3.1	SEM = 2.8	SEM = 1.7
linear, P = 0.361	**linear, P = 0.035**	**linear, P = 0.011**
quadratic, P = 0.107	quadratic, P = 0.321	**quadratic, P = 0.003**

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Gourley et al., 2017

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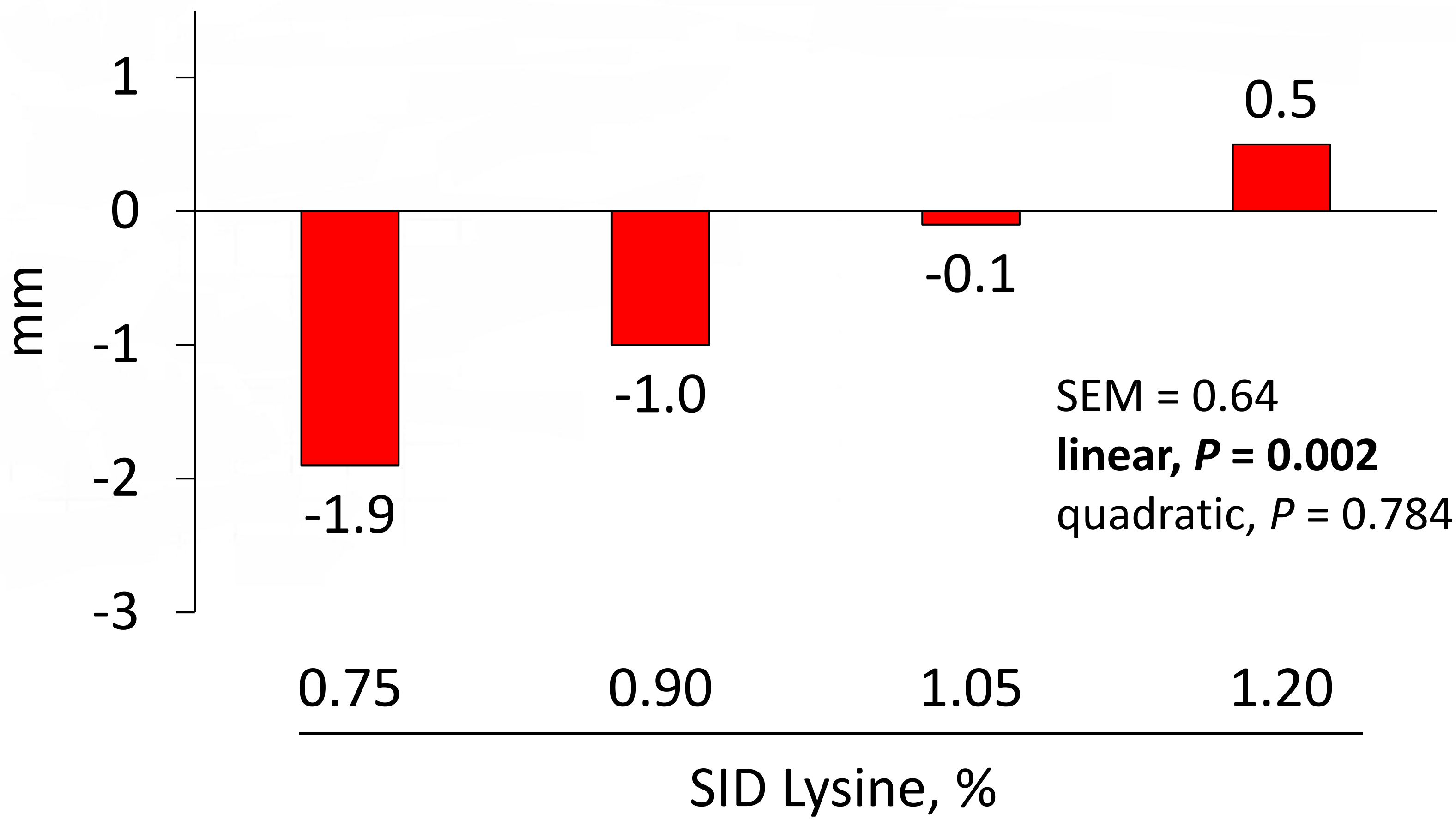
Loin Eye Depth Change, d 112 to Wean



Gourley et al., 2017

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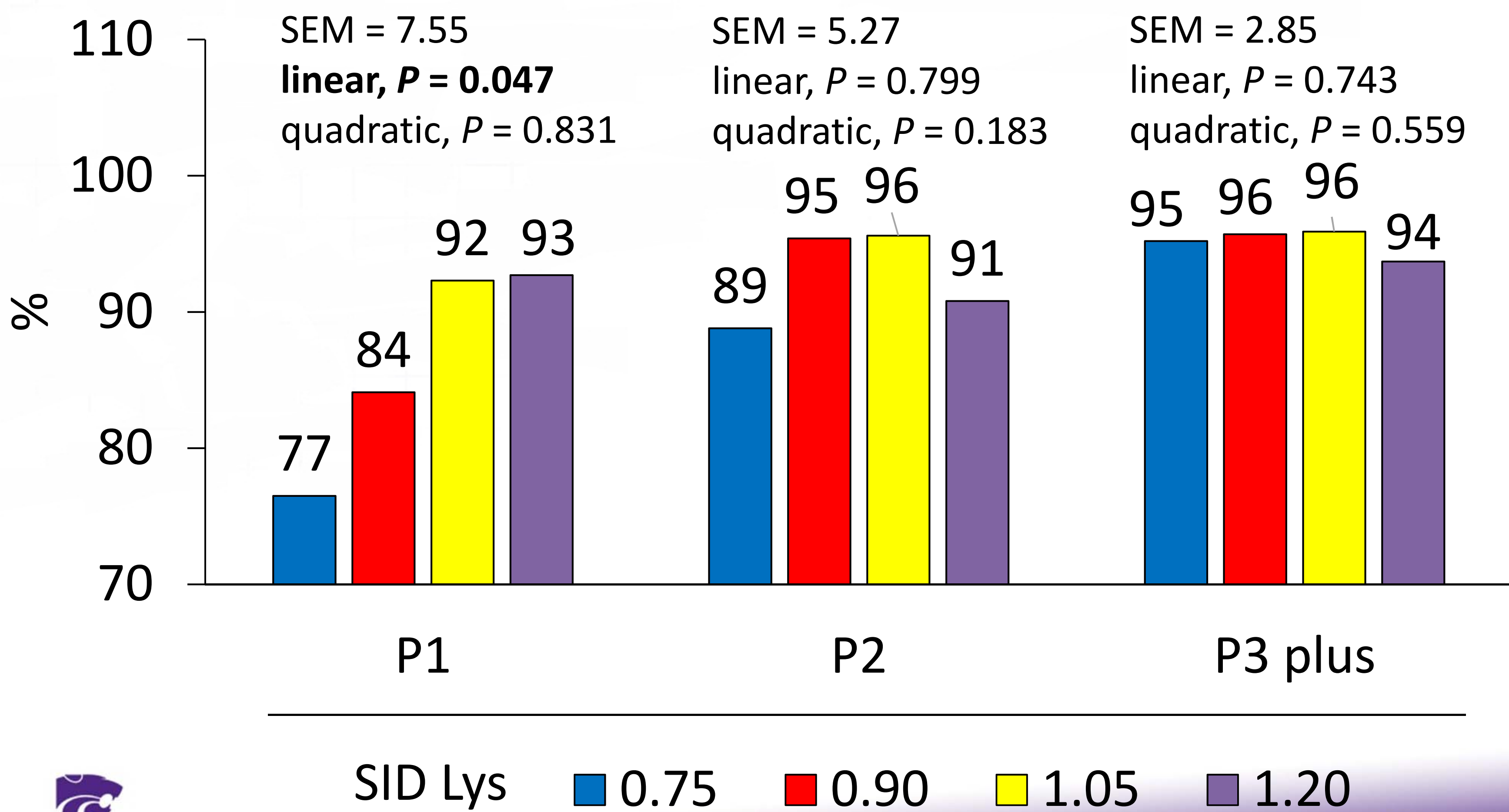
Females Bred by d 7 after Weaning



Gourley et al., 2017

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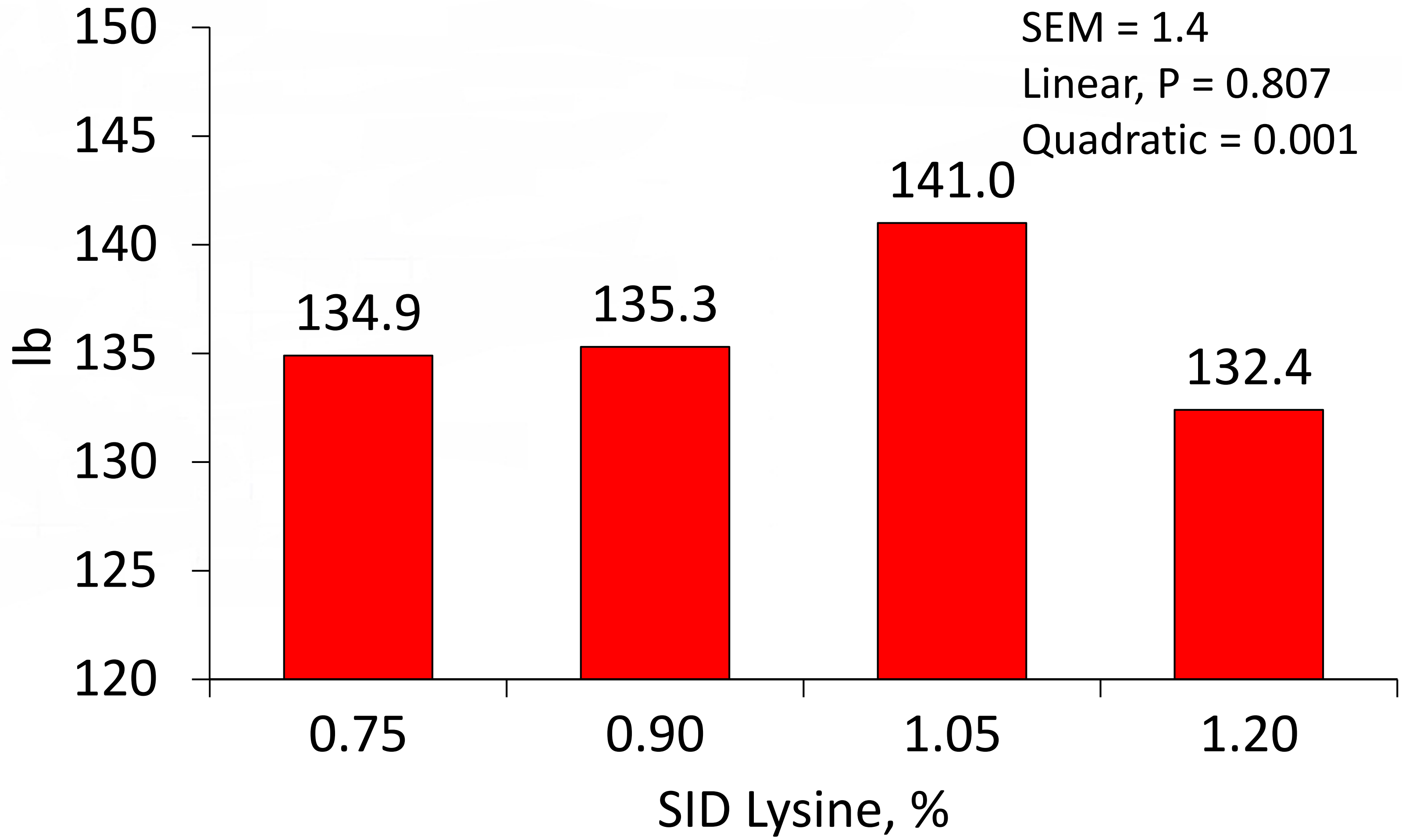
Litter Weaning Weight



Gourley et al., 2017

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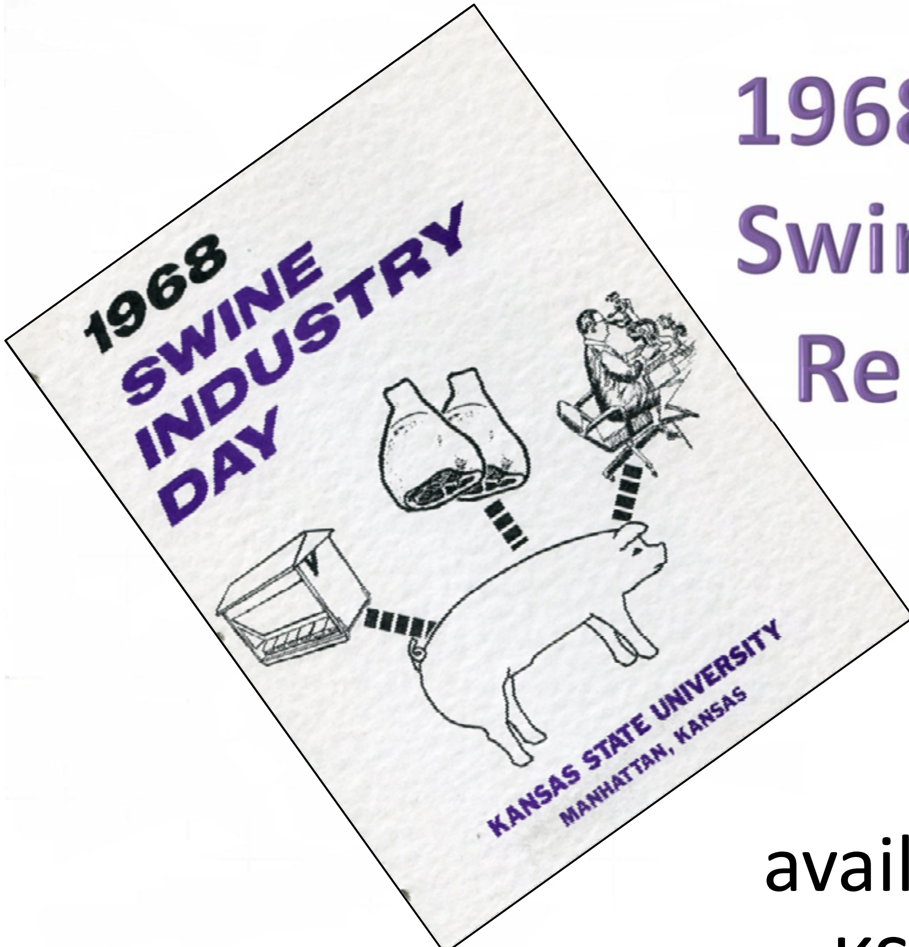
Thank You to Our
Research Partners
ENTRANCE



1968-2017 Swine Day Reports

available at:
www.KSUswine.org

- 1,222 experiments
- 472,053 pigs