
Nutrition to Support Healthy Weaned Pigs

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Nursery nutrition for the healthy weaned pig vs. challenged pig

Traditional thinking with healthy pigs

- Lower cost diets
- Transition quicker
- Lower cost protein sources and byproducts
- Reduced feed additives
- Feed intake is already high

Estimated costs and calculations

- Decrease phase 1 diet by \$200/ton on a 3.5#/pig budget = \$0.35/pig reduction in cost
- 0.75#/pig of phase 1 budget with an expensive prestarter (\$500/ton more) = \$0.18/pig increase in cost
- Reduce mortality 1% wean to market
\$1/pig

Can you actually measure differences between nursery programs? Need around 7000 pigs/trt

Similarities and must do's

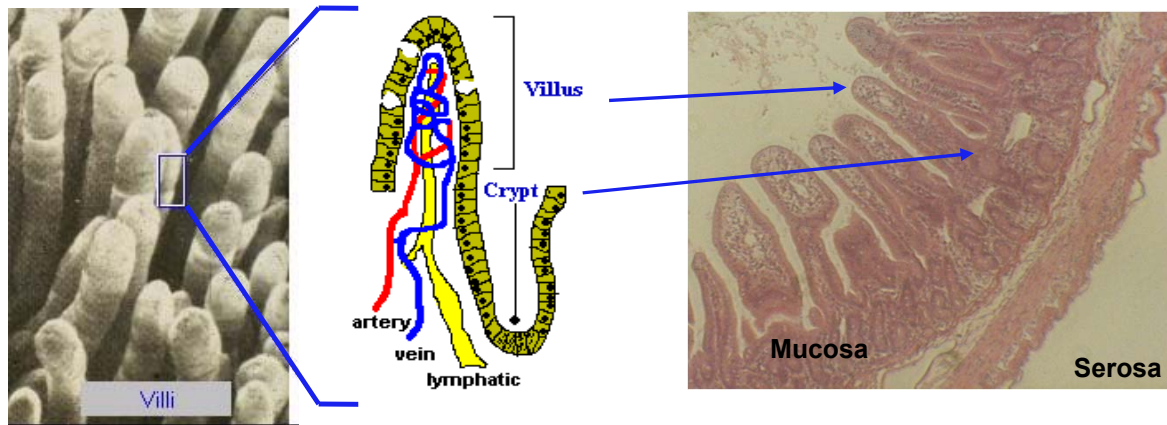
- **Get high intake immediately**
- **Stop interruptions in feed intake**
- **Quality control on ingredients used in diet formulation**
- **Accurate formulation**
- **Transitioning of phases – Move on**
- **Pull/treat/graduate fall behind pigs out of the general population**
- **Use appropriate technologies that reduce opportunistic secondary pathogens and improve growth rate**

Goals of presentation

- 1. Discuss practical “nutritional” examples of when healthy pigs haven’t reached their potential in the field**
- 2. Discuss foundational concepts that are critical for successful nursery nutrition program – regardless of healthy or sick.**
- 3. Some additive examples; not designed to give detailed lists of commercial products**
- 4. Open discussion today, and in the field.**

Intestinal Health: What is it?

- **Intestinal growth and development.**
- **Improve intestinal function.**
 - **Nutrient absorption**
 - **Immune response**
 - **Barrier function**
- **Balance and promote beneficial microbial populations**



Summary: Rapid feed intake at weaning is mission critical.

- Reduced dry matter intake is the INITIAL intestinal insult that reduces intestinal integrity. (McCracken et al., 1995)
- Prolonged period of no intake – more intestinal damage.
 - Gut becomes leaky to pathogens
 - Gut generates an immune response to diet components.

Common statement:

You can't put that much SBM in the phase 1 diet of the pig. They will have an allergic reaction!

Reality:

Yes you can. If the pig is eating well and the gut isn't compromised, the pig can handle a lot of SBM.

Things to consider for high initial intake at weaning

- **Genetic lines, age, environment**
- **Antibiotics**
- **Water and feed restrictions**
- **Vaccines**
- **Mycotoxins**
- **Quality control of ingredients**
- **Creep feeding and exposure to sow additives**
- **Gruel**
- **Water additives to stimulate dry feed intake**



Things to consider for high weaning intake

- Genetic lines, age, environment
- Antibiotics
- Water and feed restriction
- Vaccines
- Mycotoxins
- Quality control of ingredients
- Creep feeding and exposure to sow additives
- Growth promoters
- Water additives to stimulate dry feed intake

**Critical to sort bottom end at weaning.
Critical to pull, treat, and graduate
pigs falling behind in general population**

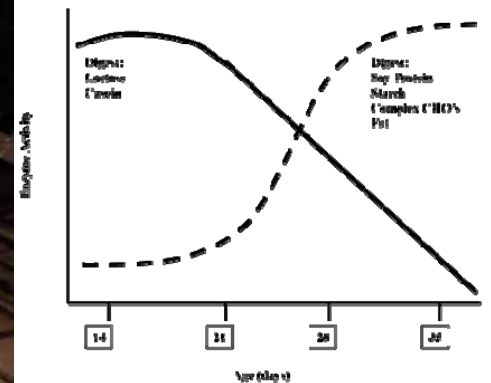
Gruel feeding – start up for small pigs

Grueling Steps:

- Mix 70% water & 30% feed together to soup-like consistency in a temporary feeder designed for grueling or a black rubber pan. There should be ~ ¼ inch of liquid on top. (**Prestarter ration** or dense electrolyte and lactose product)
- Decrease water as pigs gain acceptance, should be 30% water & 70% feed by day 7 (oatmeal consistency)
- Have dry feed (*Phase 1 or 2 use what is being fed to the general population for diet transition*) available on mats and feeder to encourage transition to dry feed.
- Need to feed gruel a minimum of 3-4x per day with enough for 1 hour. Pans/feeders should be cleaned between feedings.
- Once pigs have recovered and have made the transition to dry feed then move back into graduation pens.

PIGS PULLED 1-2 weeks post weaning

Pull, get started, and get on appropriate diet quickly

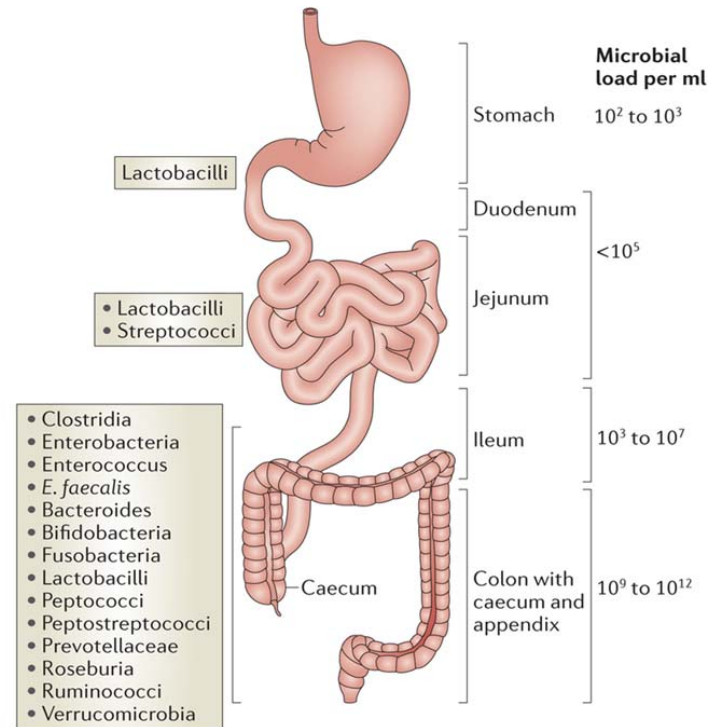


Intestinal Health –

Balance and promote beneficial microbial populations

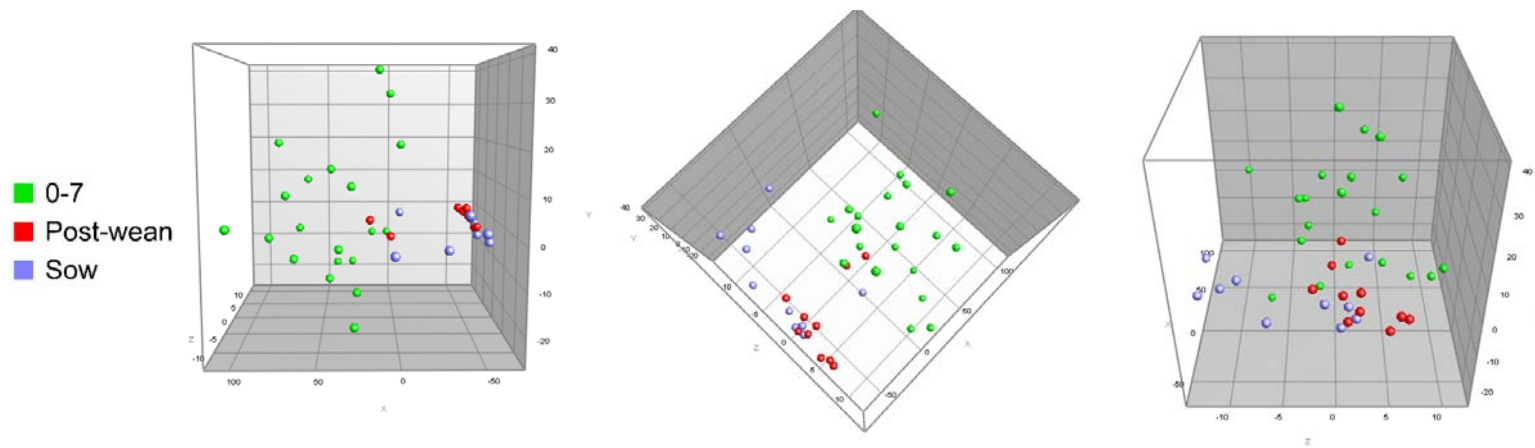
How do you alter the microbial populations in the GI tract of pigs?

Why is this important?



Nature Reviews | Immunology

Sows Inoculate Their Litter



- Pathogenic population of the piglet is drastically different than that of the sow early.
- Pathogen profiles begin to mimic that of the sow as the piglet matures

Opportunities :

- Reduce pathogen load coming from the sow
- Inoculate the piglets in the crate with beneficial microbes

*How do you alter the microbial populations in the GI tract of pigs?
– common methods found today*

- Feeding nutrients that enhance beneficial bacteria (**Pre**biotics)
- Feeding bacterial cultures (**Pro**biotics, direct fed microbial, DFM, live culture)
- Feeding of live yeast
- Acidification – Inorganic and organic acids
- Feeding components of yeast, or plants (botanicals), that bind or inhibit bacteria
- Nutrition – Fiber, lactose, protein level, Zn, Cu

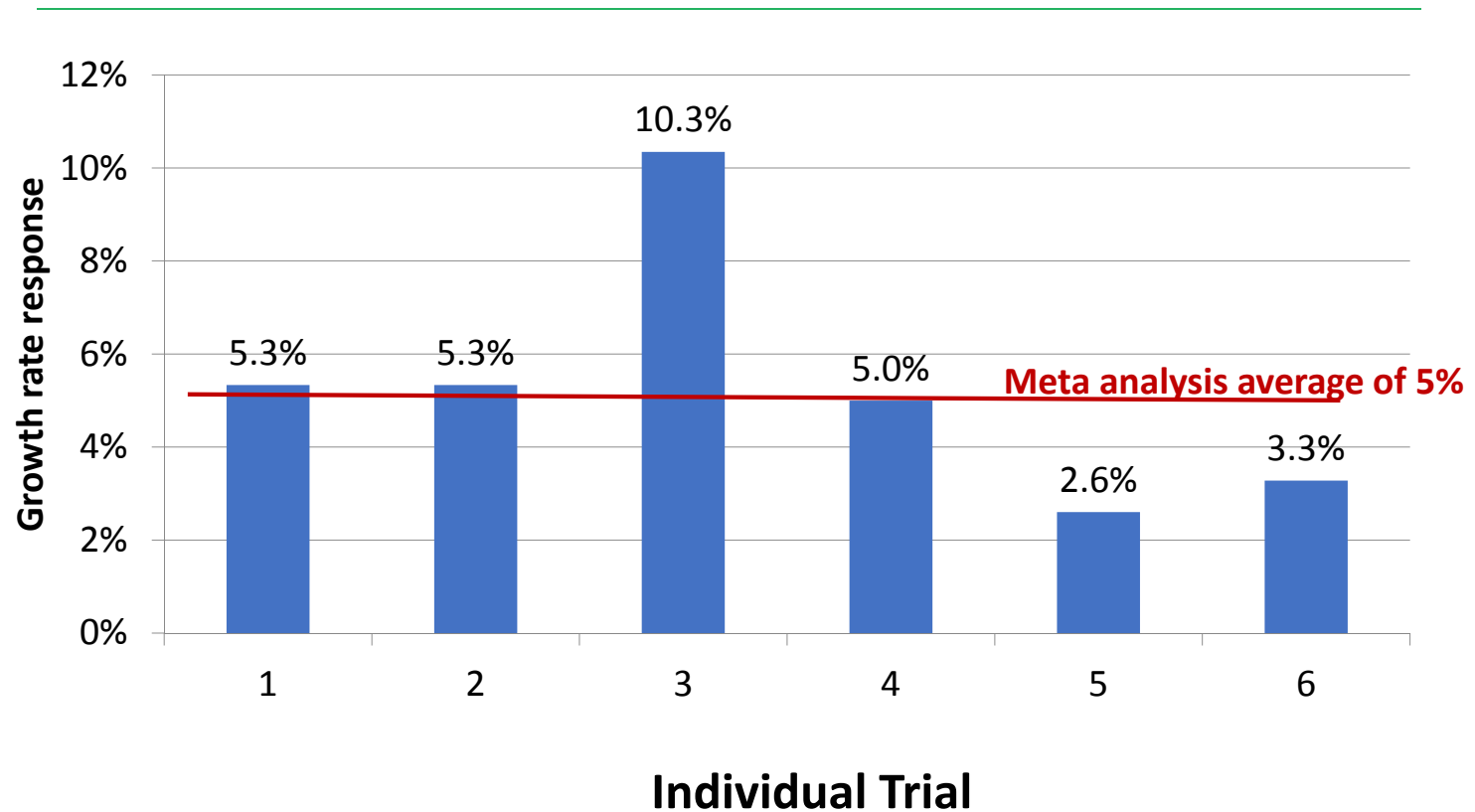
Probiotics/Direct Fed Microbials (DFM), Bacterial cultures, live inoculants for feed...

Do they work???

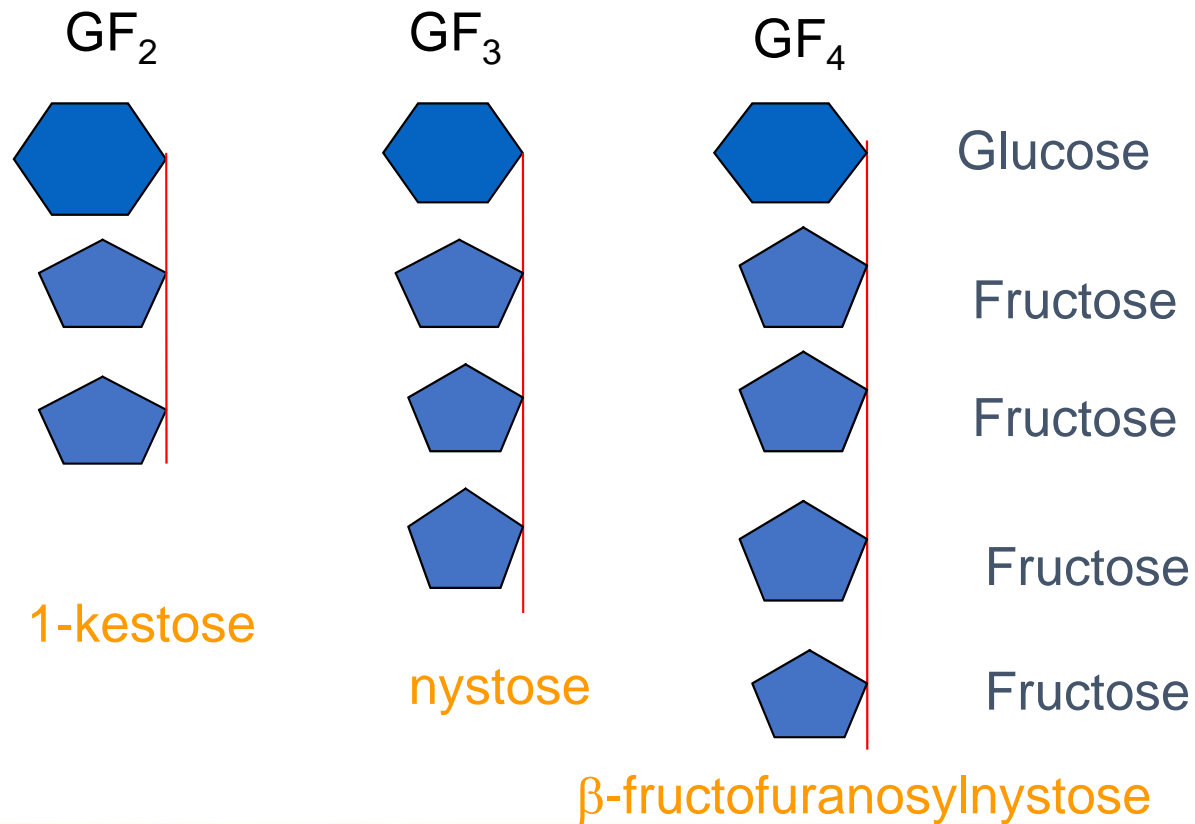
DeRouchey et al., 2017

- Review of 44 publications
- Over 70% showed numerical improvements in ADG
- But only 6.8% of the experiments showed an improvement in ADG that was statistically significant
- Why the inconsistency??

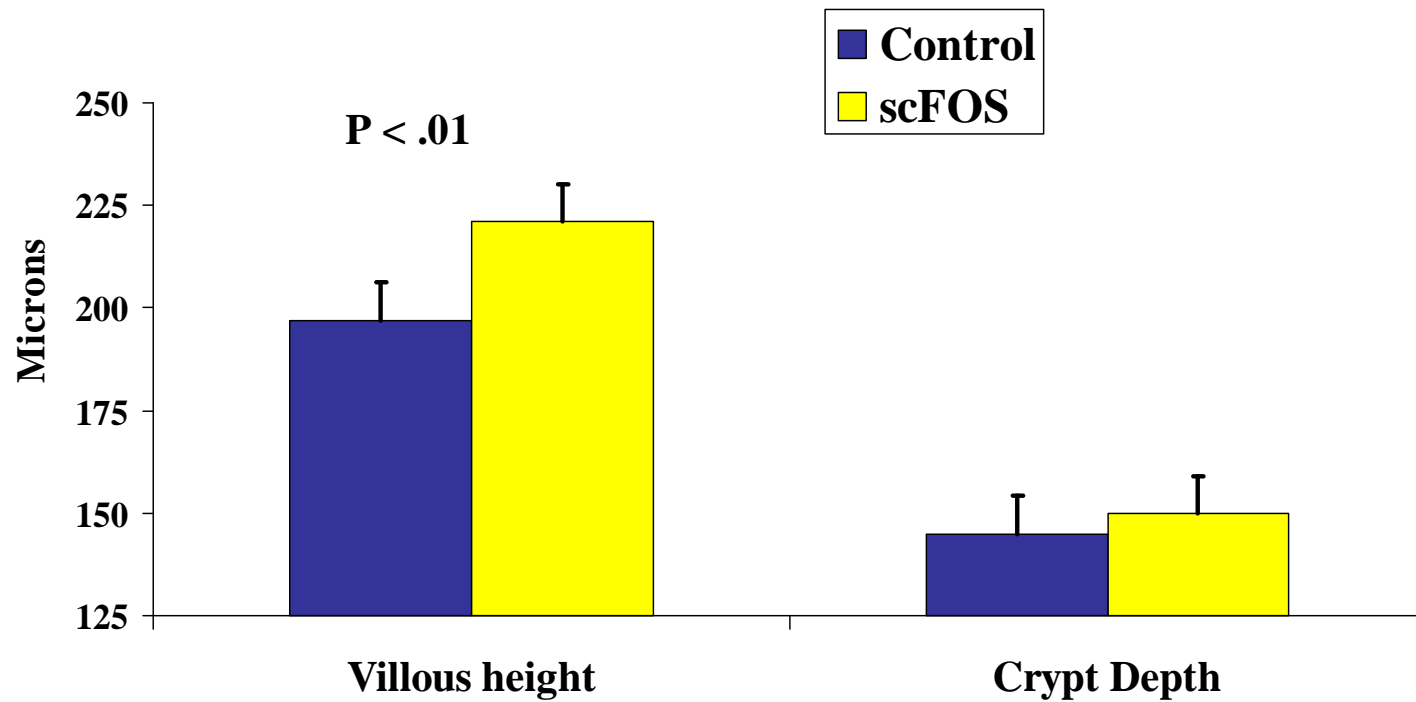
Nursery pig ADG improvement compared to control within each trial – Visano Nursery



Prebiotics - Fructooligosaccharides (FOS)



Impact of FOS on nursery pig intestinal morphology



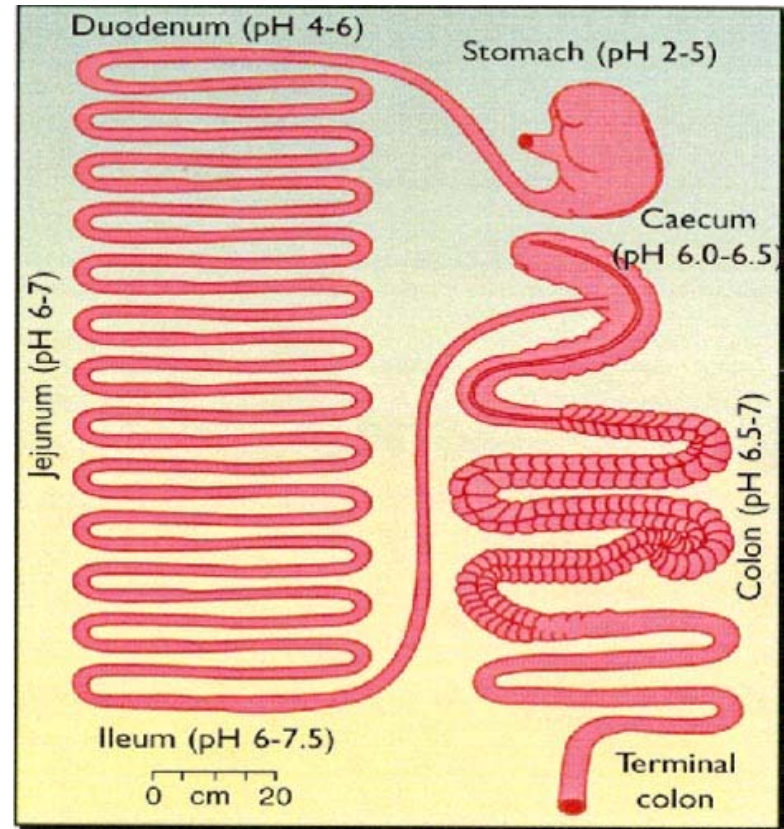
Pigs Challenged with *E. coli* K:88

	FOS -	FOS +
Survival rate, %	62.5	100
	(5/8)	(8/8)
Clinical		
Symptoms, %	75.0	12.5
	(6/8)	(1/8)

Russell et al. 1995

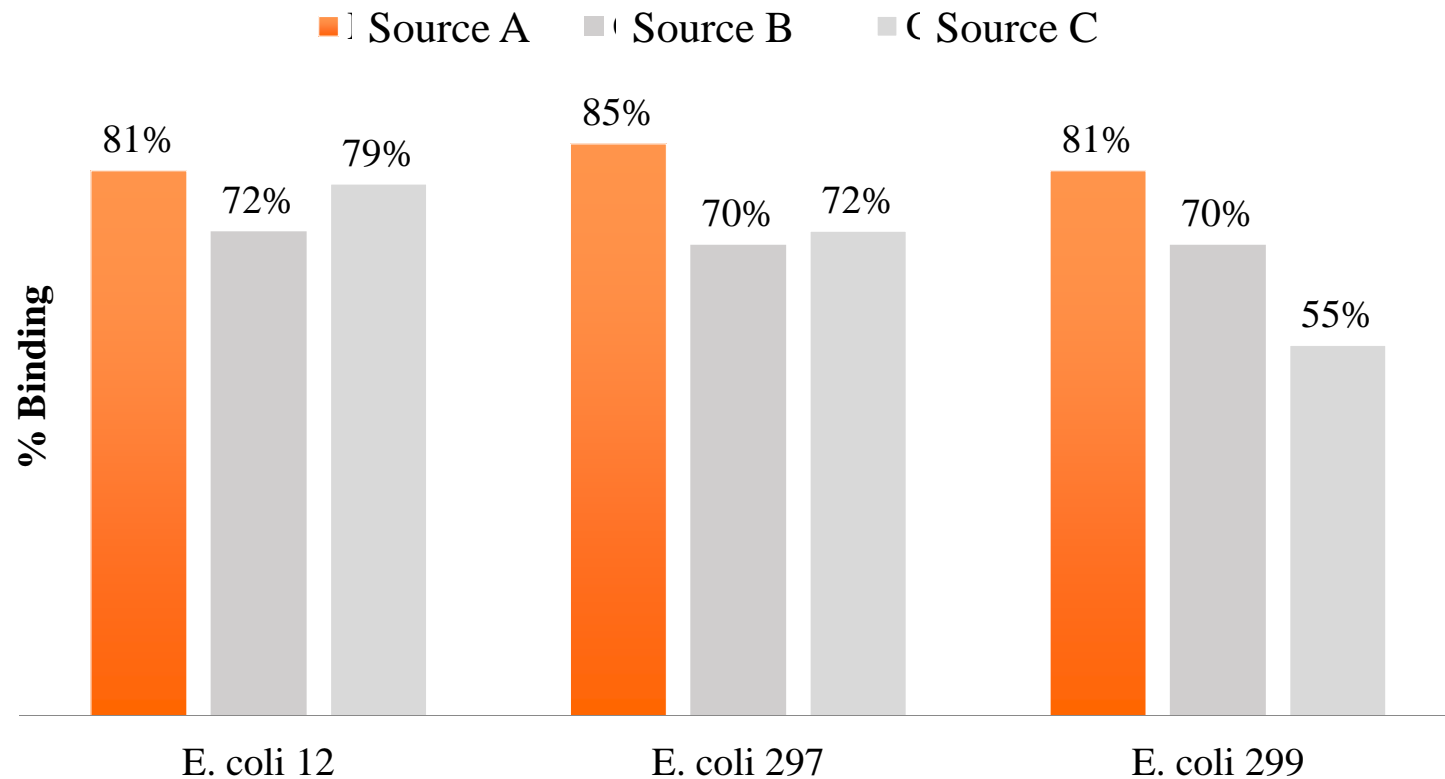
Why should diets be acidified??

- **Improved protein digestibility**
 - pH driven in the stomach
 - Inorganic acids
 - Phosphoric acid
- **Microflora modification**
 - Release in the intestine
 - Organic acids
 - Fumaric, Citric, Lactic
- **Fuel to grow intestinal mucosa**
 - Very short chain fatty acids
 - Butyric acid



Yeast Cell Wall Study with *E. coli*

*Source A showed superior binding with *E. coli**



Quality control – Mission Critical

- **Biosecurity**
- **Contamination**
- **Toxins**
- **Nutrient content accuracy for formulation**
- **Digestibility to the pig**
- **Oxidation and shelf life**

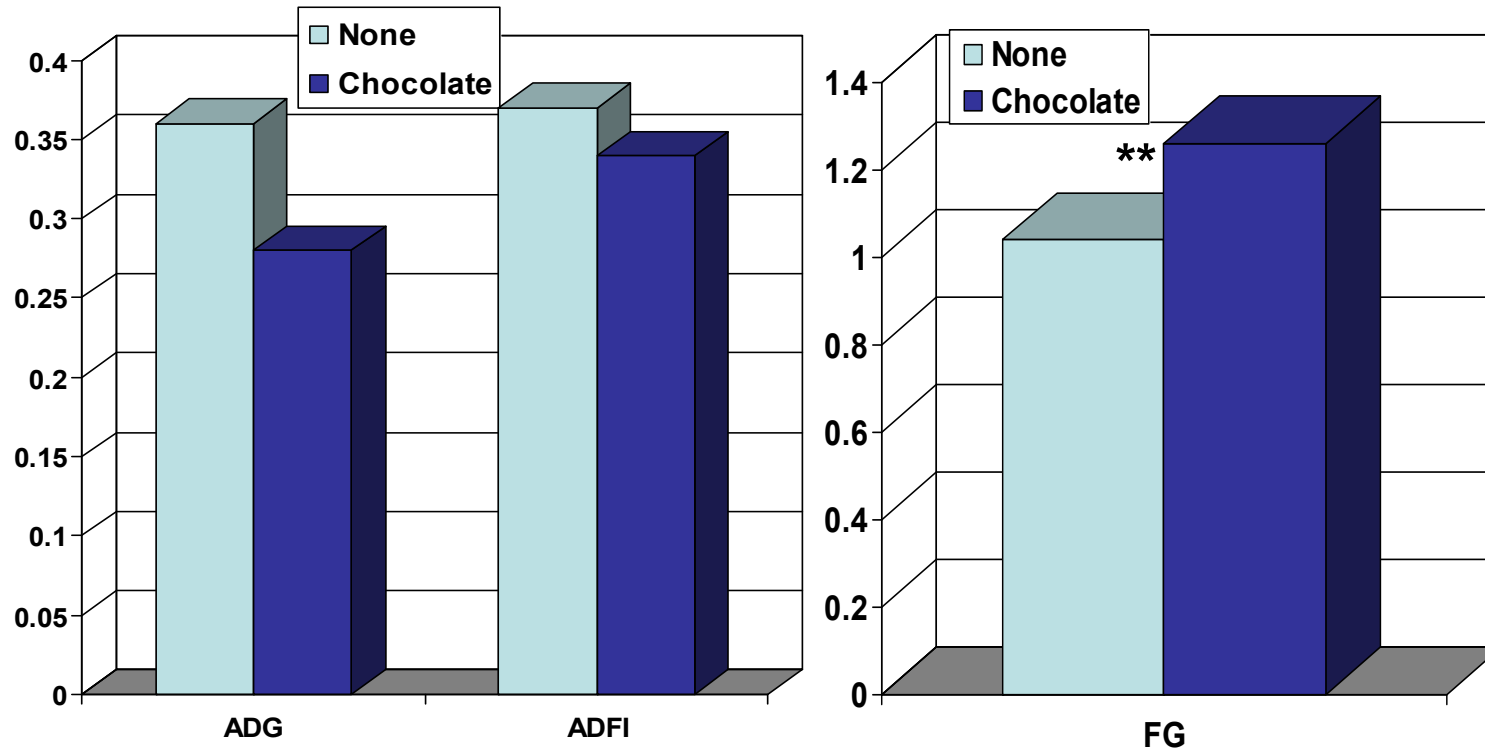
Effect of oral administration of FB1 on bacterial colonization of piglet intestines by E. coli strain 28CNa1

Bacterial colonization of sections (log ₁₀ [CFU/g]) of ^b			
	Ileum	Cecum	Colon
Exp. 1 ^a			
Control	1.66 ± 0.14	2.99 ± 0.32	3.32 ± 0.77
FB ₁ extract	4.26 ± 0.42	5.85 ± 0.40	6.03 ± 0.37
Exp. 2 ^a			
Control	2.74 ± 0.34	3.72 ± 0.42	3.73 ± 0.38
Purified FB ₁	3.67 ± 0.64	5.07 ± 0.58	5.62 ± 0.63
P value	< 0.001	< 0.001	< 0.001

^a Pigs were dosed for 7 days with 0.5 mg of FB1/kg of BW, administered as a crude extract (Exp. 1) or as a purified toxin (Exp. 2). (Estimated to be 5-8 ppm of a diet)

^b Values represent treatment mean bacterial counts + SEM for a group of 4 to 5 pigs.

Comparison of carbohydrate product with and without chocolate



16 pens of 27 pigs per treatment (approx. 430 pigs/trt)

Average start weight = 10.5 pounds BW

** = $P < 0.05$

Ingredients – Don't take anything for granted

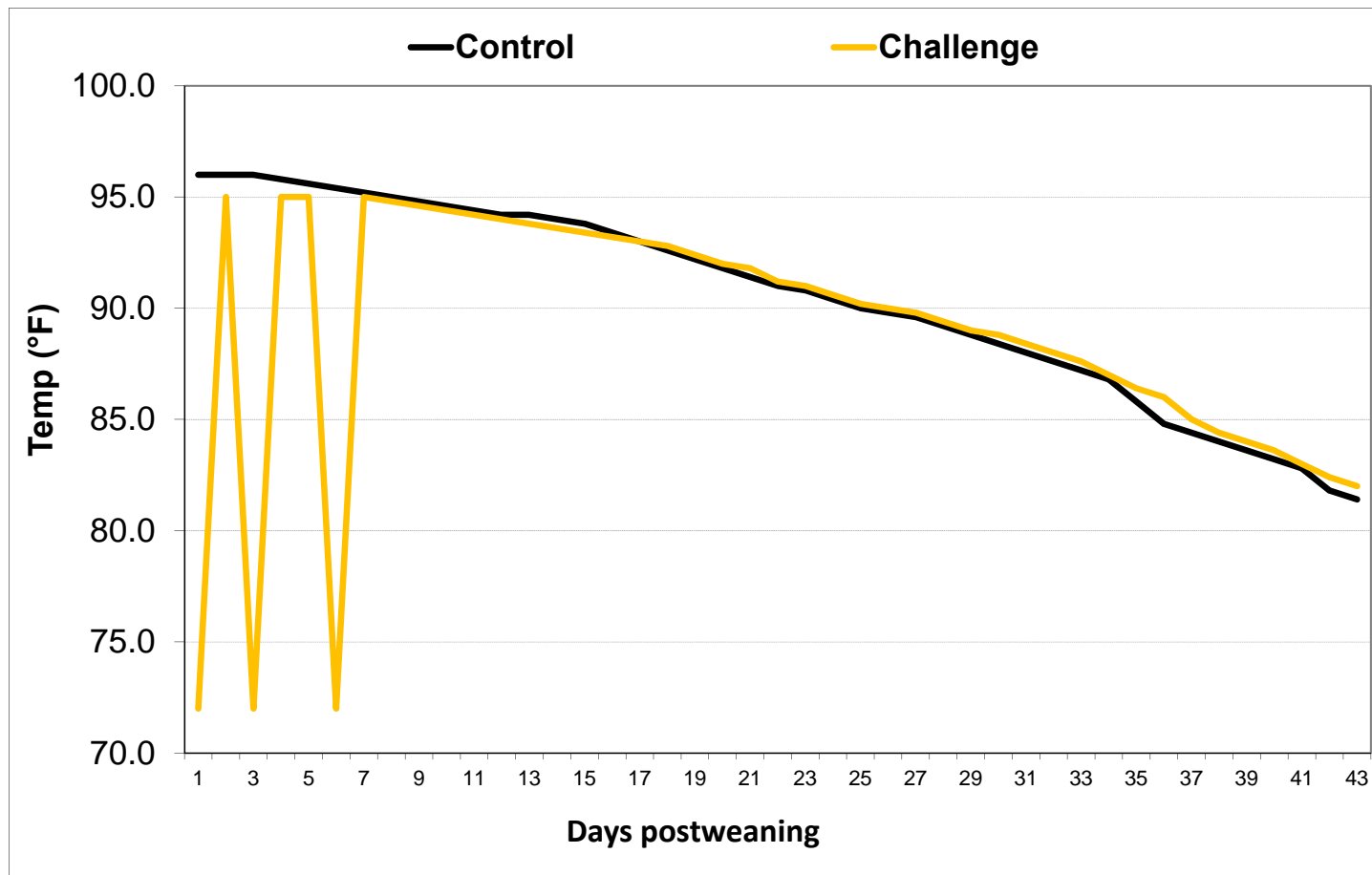
- **Check milk products for total coliform level**
 - **Suggest total values be less than 10 CFU/g**

- **Chocolate milk products can be susceptible to increased bacterial load**

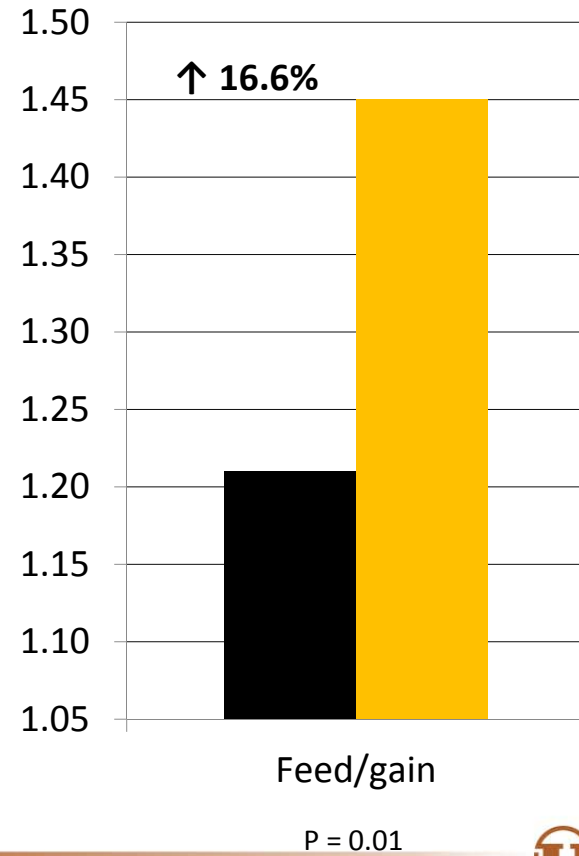
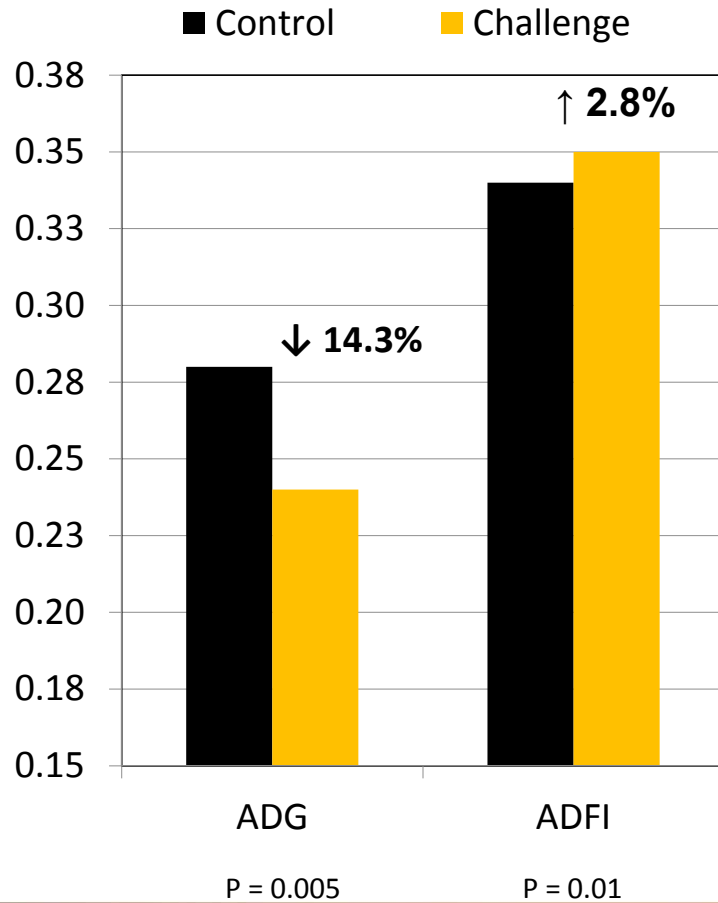
- **By-products – ask questions**
 - **How is the product dried down?**
 - **How is the product stored?**
 - **Age of the product?**
 - **Shelf life?**
 - **Maillard reactions reducing amino acid and CHO availability**



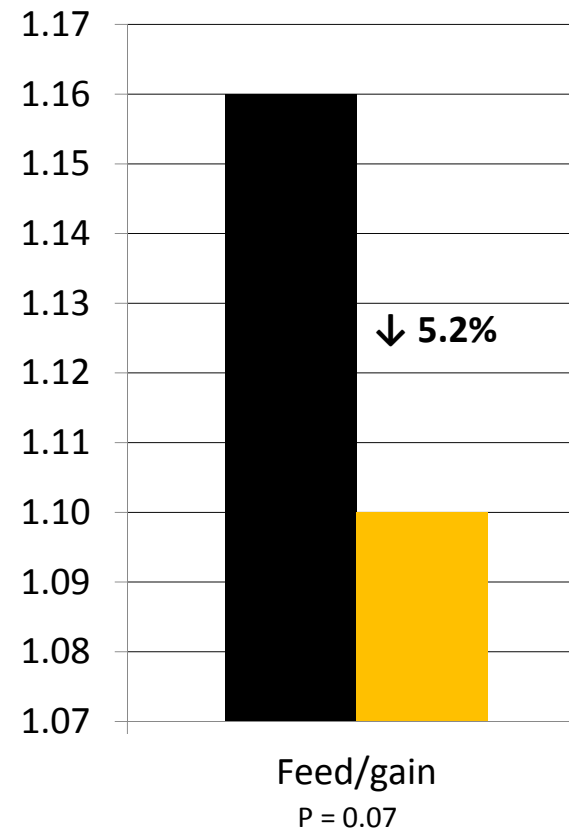
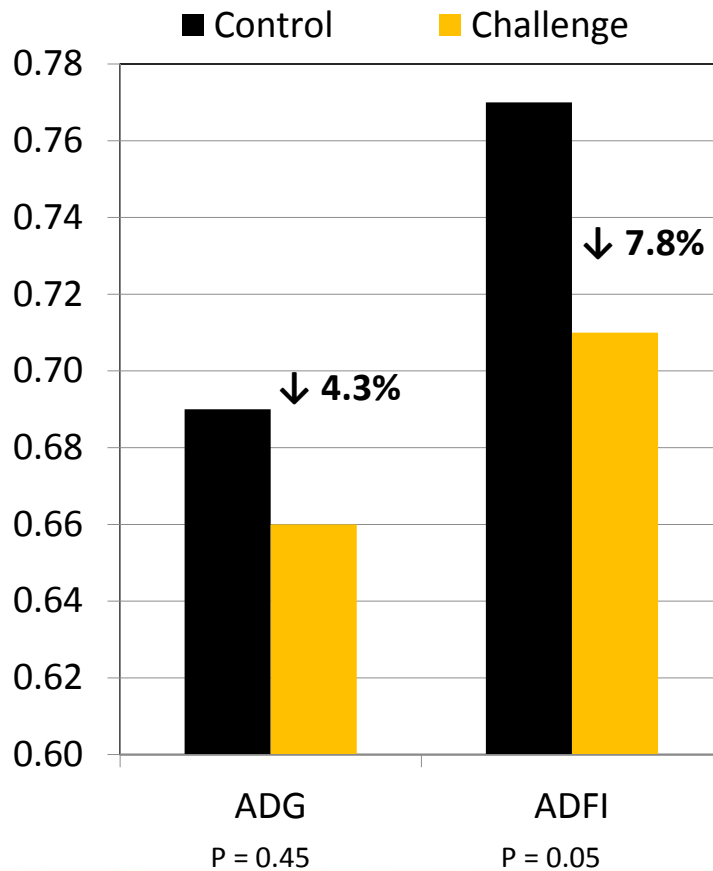
Trial Temperature Curve



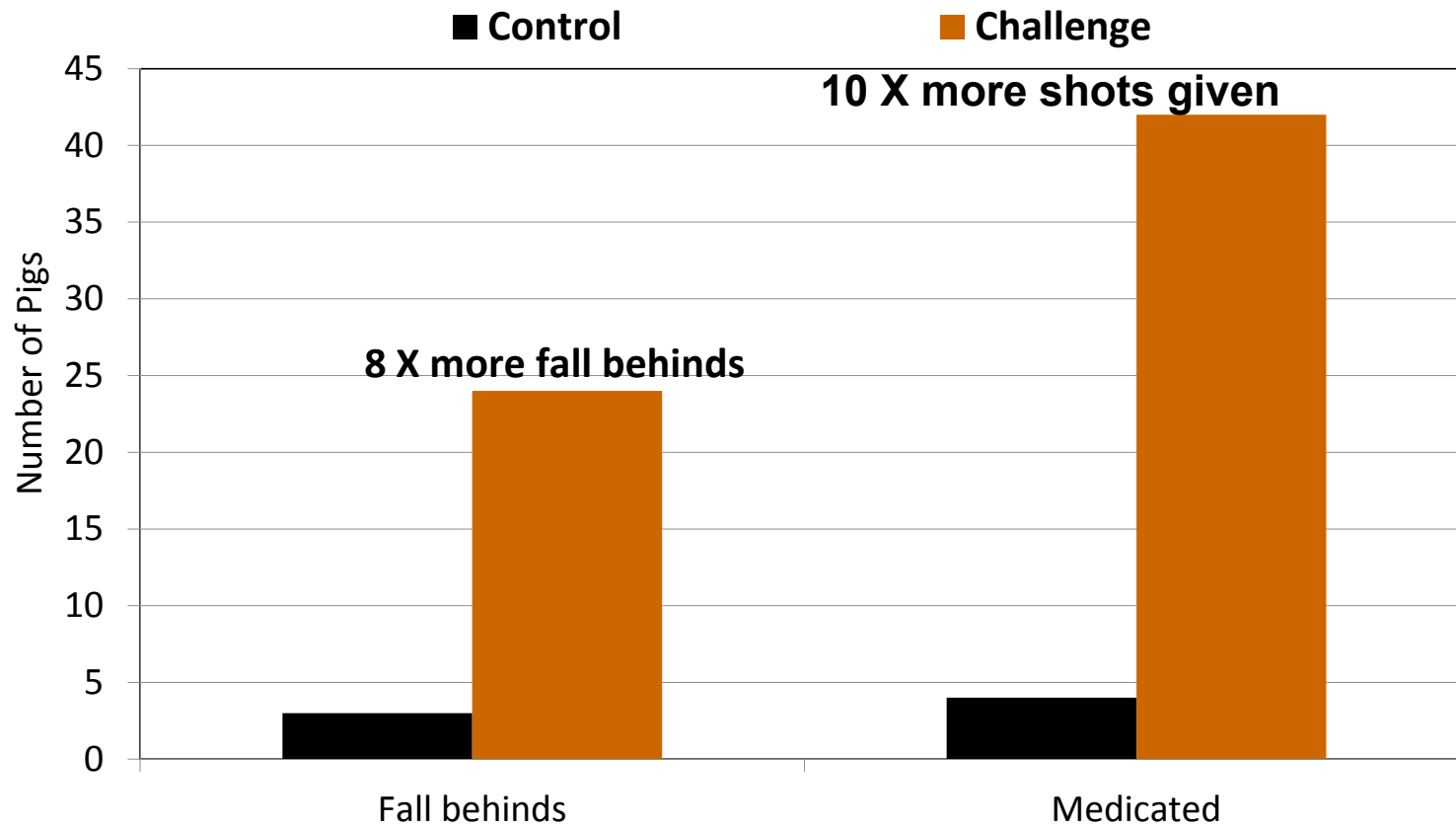
Performance from Week of Temperature Challenge (Day 0 to 8)



Performance for Week Following Challenge (Day 9 to 15) – Why is my phase 2 diet so bad?

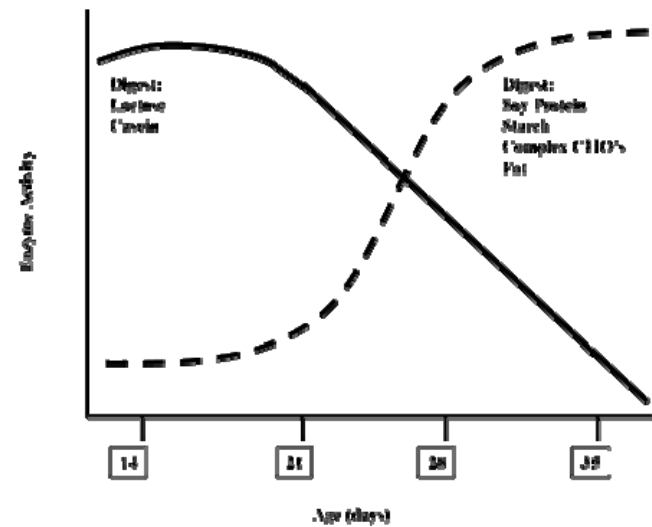


Effect of Temperature Challenge on Pig Viability



Take home message: When performance drops....

- Find the real problem
- Higher density nutrition could compound the problem



Additional comments on feeding healthy weaned pigs

- **Hit nutrient requirements. Get updated specifications.**
- **Double stocking impact.**
- **What drives value in your system? Goals?**
- **Collaboration and communication among teams**

Summary:

Drive initial feed intake

Transition the pig

Don't just throw a more complex diet at the problem

Use appropriate additives that fit goals

Communicate and work with teams

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