"New Generation" Distiller's Dried Grains with Solubles in Swine Diets

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Why is there so much interest in feeding DDGS to swine?

- "New Generation" DDGS is high in digestible nutrients
- Economical partial replacement for:
  - corn
  - soybean meal
  - dicalcium phosphate
- Increasing production and supply
- Unique properties
  - reduce P excretion in manure
  - increase litter size weaned/sow
  - gut health benefits?

Maximum Inclusion Rates of "New Generation" DDGS in Swine Diets

(Based Upon University of Minnesota Performance Trials)

- Nursery pigs (> 7 kg)
  - Up to 25 %
- Grow-finish pigs
  - Up to 20% (higher levels may reduce pork fat quality)
- Gestating sows
  - Up to 50%
- Lactating sows
  - Up to 20%

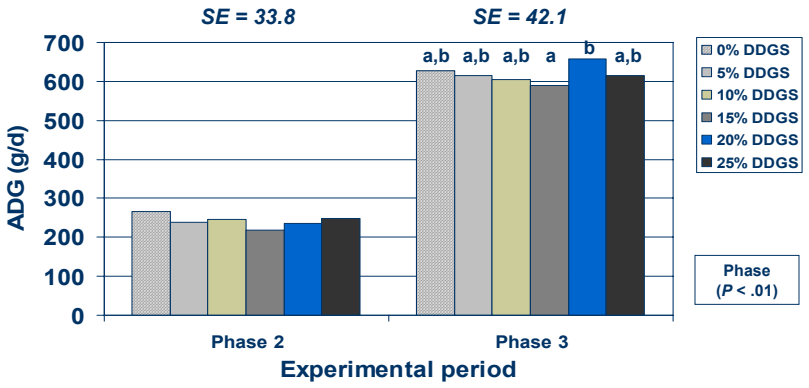
Assumptions: no mycotoxins
formulate on a digestible amino acid and available phosphorus basis

Feeding "New Generation" DDGS to Weaned Pigs

Materials and Methods – Nursery Experiments

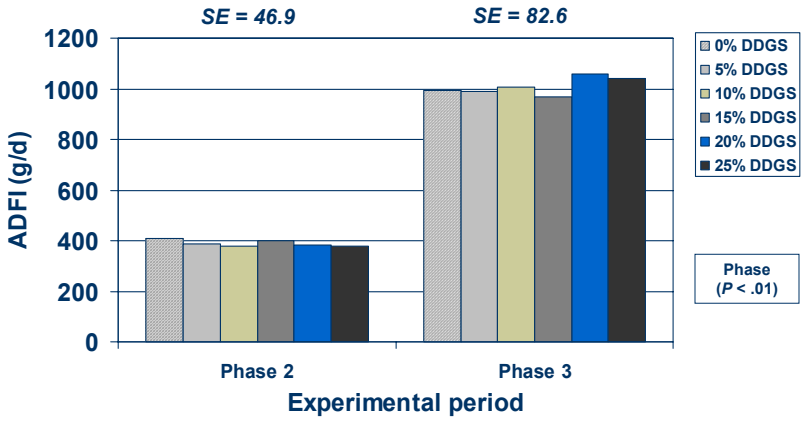
- Experiment 1
  - Pigs weaned at 19.0 ± 0.3 d of age
  - Weighed 7.10 ± 0.07 kg
- Experiment 2
  - Pigs weaned at 16.9 ± 0.4 d of age
  - Weighed 5.26 ± 0.07 kg
- Pigs were fed a commercial pelleted diet (d 0 to 3 postweaning)
- Phase II (d 4-17) and Phase III (d 18 – 35) diets were **formulated on a digestible amino acid basis.**
  - Diets contained 0, 5, 10, 15, 20, or 25% DDGS

Effect of DDGS Level on Growth Rate (Experiment 1)

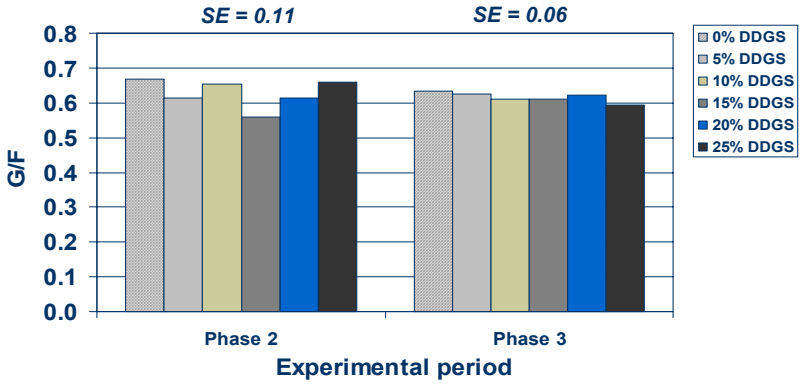


Means not sharing a common superscript letter are significantly different ($P < .05$)

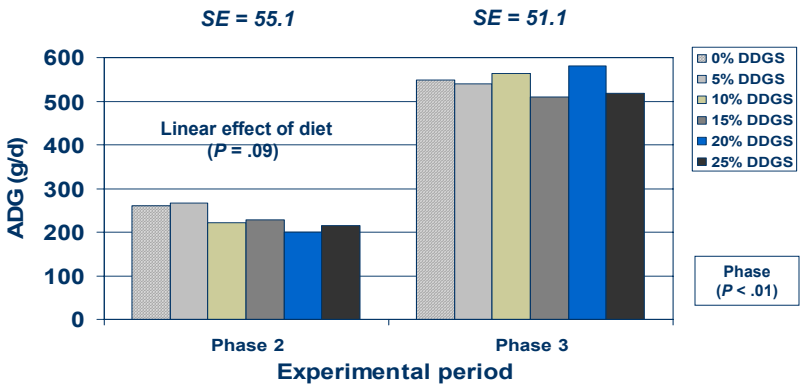
Effect of DDGS Level on ADFI (Experiment 1)



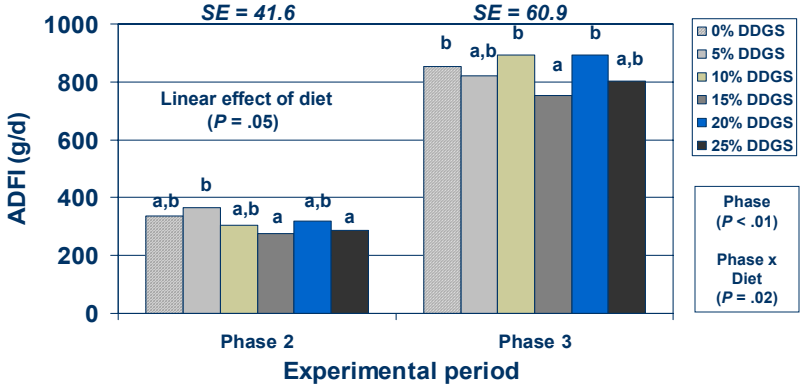
Effect of DDGS Level on Gain/Feed (Experiment 1)



Effect of DDGS Level on Growth Rate (Experiment 2)



Effect of DDGS Level on Feed Intake (Experiment 2)



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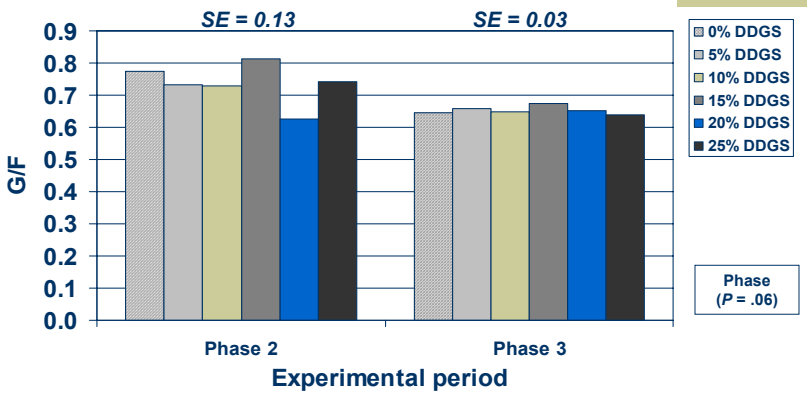
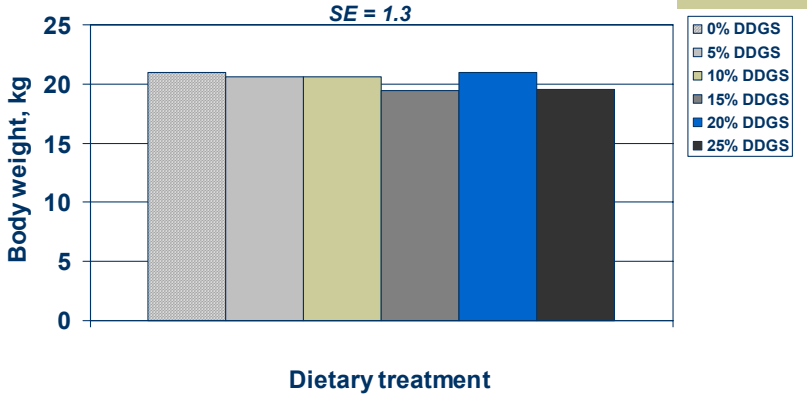
Effect of DDGS Level on Gain/Feed (Experiment 2)



Effect of DDGS Level on Final BW (Experiment 2)

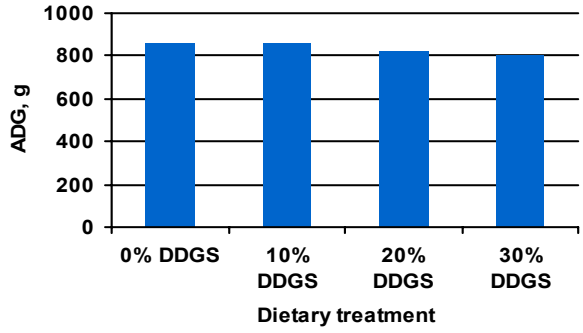


Feeding "New Generation" DDGS to Grow-Finish Pigs

Materials and Methods

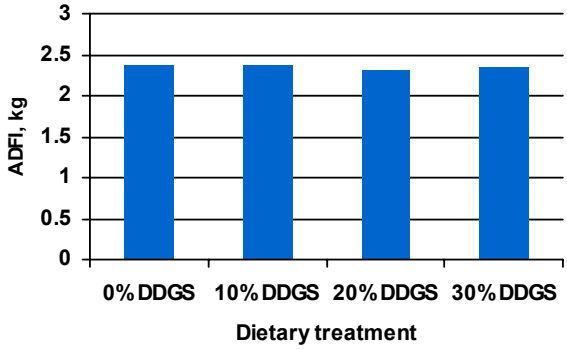
- 240 crossbred pigs (approx. 28.3 kg BW)
  - Grow-finish facilities at WCROC – Morris, MN
  - Blocked by weight, gender and litter
  - Blocks randomly assigned to 1 of 4 diet sequences
    - 5-phase feeding program
  - 0, 10, 20, or 30% DDGS diets **formulated on total lysine basis**
  - 24 pens, 10 pigs/pen, 6 replications/trt

Effect of Dietary DDGS Level on Overall ADG of Grow-finish Pigs



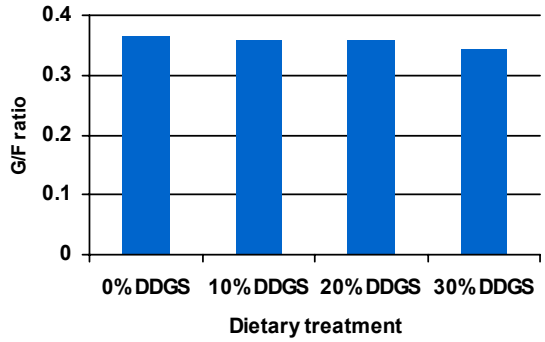
0 % and 10 % DDGS > 20% and 30% DDGS (P < .10)

Effect of Dietary DDGS Level on Overall ADFI of Grow-finish Pigs



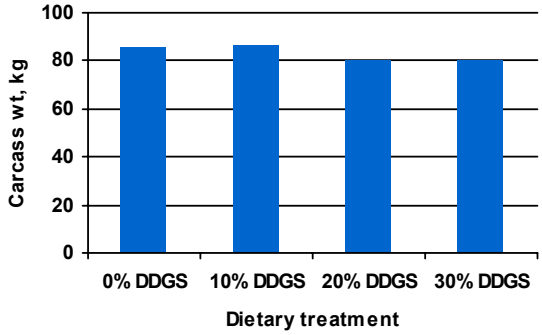
No significant differences among dietary treatments

Effect of Dietary DDGS Level on Overall G/F of Grow-finish Pigs



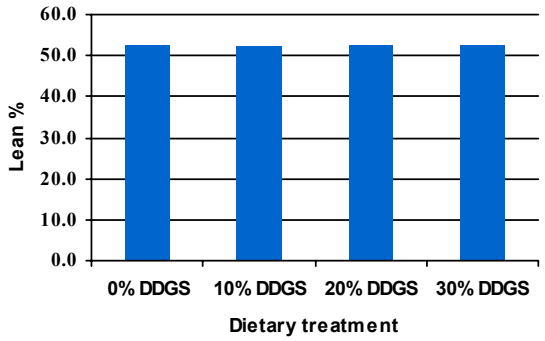
0 % and 10 % DDGS > 20% and 30% DDGS (P < .10)

Effect of Dietary DDGS Level on Carcass Weight



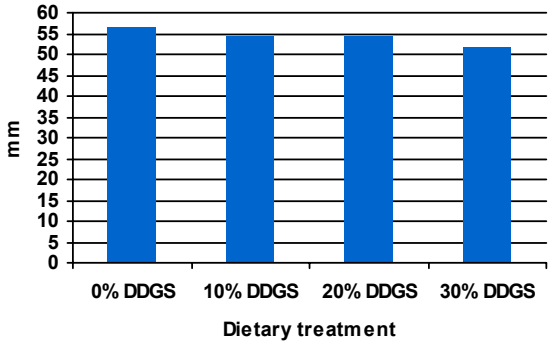
0 % and 10 % DDGS > 20% and 30% DDGS (P < .01)

Effect of Dietary DDGS Level on % Carcass Lean



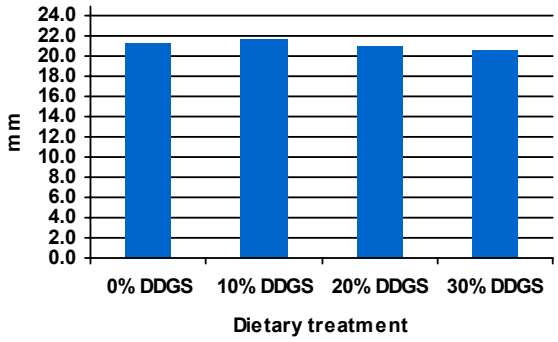
No significant differences among dietary treatments

Effect of Dietary DDGS Level on Carcass Loin Depth



Linear decrease with increasing dietary level of DDGS ($P < .02$)

Effect of Dietary DDGS Level on Carcass Backfat Depth



No significant differences among dietary treatments

Muscle Quality Characteristics from G-F Pigs Fed Diets Containing 0, 10, 20, and 30% DDGS

Trait	0 %	10 %	20 %	30 %	RMSE
L*[a]	54.3	55.1	55.8	55.5	2.9
Color score[b]	3.2	3.2	3.1	3.1	0.8
Firmness score[c]	2.2	2.0	2.1	2.1	0.5
Marbling score[d]	1.9	1.9	1.7	1.9	0.6
Ultimate pH	5.6	5.6	5.6	5.6	0.2
11-d purge loss, %	2.1[f]	2.4[fg]	2.8[g]	2.5[fg]	1.2
24-h drip loss	0.7	0.7	0.7	0.7	0.2
Cooking loss, %	18.7	18.5	18.3	18.8	2.6
Total moisture loss[e], %	21.4	21.5	21.8	22.1	3.1
Warner-Bratzler sheer force, kg	3.4	3.4	3.3	3.3	0.5

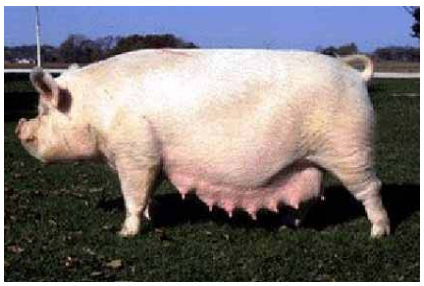
[a] 0 = black, 100 = white
[b] 1=pale pinkish gray/white; 2=grayish pink; 3=reddish pink; 4=dark reddish pink; 5=purplish red; 6=dark purplish red
[c] 1 = soft, 2 = firm, 3 = very firm
[d] Visual scale approximates % intramuscular fat content (NPPC, 1999)
[e] Total moisture loss = 11-d purge loss + 24-h drip loss + cooking loss

Fat Quality Characteristics of Market Pigs Fed Corn-Soy Diets Containing 0 to 30% DDGS

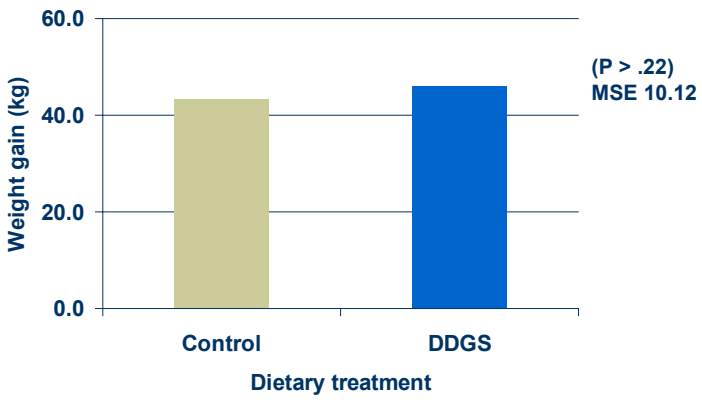
	0 %	10%	20%	30%
Belly thickness, cm	3.15[a]	3.00[a,b]	2.84[a,b]	2.71[b]
Belly firmness score, degrees	27.3[a]	24.4[a,b]	25.1[a,b]	21.3[b]
Adjusted belly firmness score, degrees	25.9[a]	23.8[a,b]	25.4[a,b]	22.4[b]
Iodine number	66.8[a]	68.6[b]	70.6[c]	72.0[c]

Means within a row lacking common superscripts differ (P < .05).

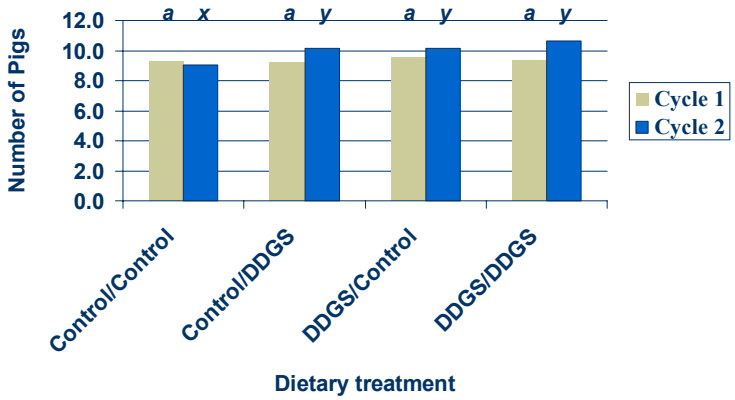
Feeding "New Generation DDGS to Sows"



Effect of Feeding a 50% DDGS Diet on Sow Weight Gain During Gestation (Reproductive Cycle 1)

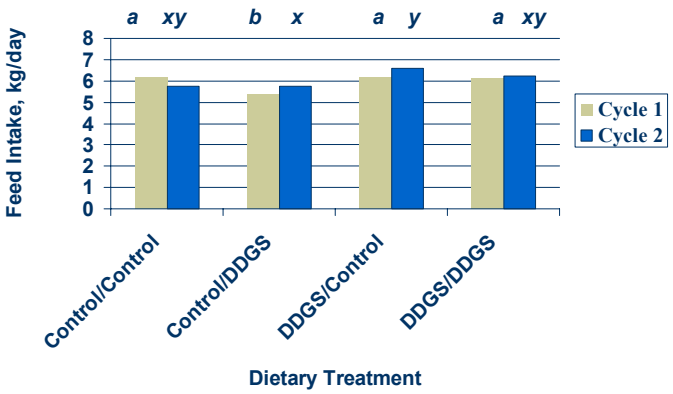


Effect of Feeding 0 or 50% DDGS Gestation Diets and 0 or 20% DDGS Lactation Diets on Pigs Weaned/Litter



[a,b,x,y] Different superscripts indicate significant difference (P < .10).

Effect of Dietary Treatment Combination on Sow Lactation ADFI



[a,b,x,y] Different superscripts indicate significant difference (P < .10).

Does Feeding DDGS Improve Gut Health?

What is Ileitis?

- Porcine Proliferative Enteropathy
- Caused by *Lawsonia intracellularis*
  - Present in 96% of U.S. swine herds (Bane et al., 1997)
    - 28% of pigs affected (NAHMS, 2000)
  - Can be shed in infected pigs for up to 10 weeks
- Animals are infected by oral contact with feces from animals shedding the bacteria
- 7-10 days after infection:
  - Lesions of the intestinal wall begin to form
  - Lesions maximized around 21 days post-infection

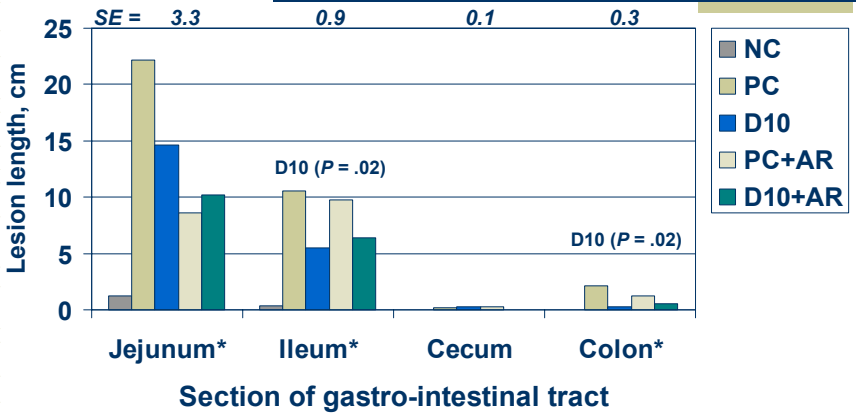
Clinical Forms of Ileitis

- Porcine Intestinal Adenomatosis (PIA)
  - Chronic form
  - Seen in growing pigs (6 - 20 weeks of age)
  - Decreased feed intake, lethargic
- Porcine Hemorrhagic Enteropathy (PHE)
  - Acute form, affects heavier pigs
    - Greatest frequency appears to be from 65 – 110 kg pigs
  - Massive intestinal hemorrhaging, bloody diarrhea, increase in mortality

Healthy

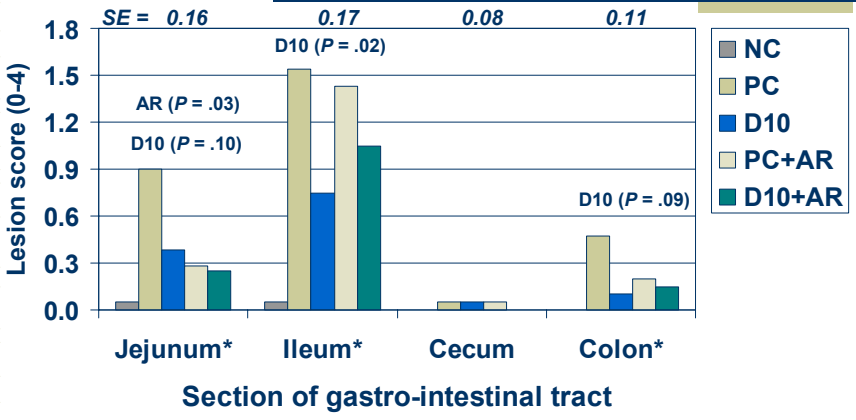
Ileitis

Effect of Dietary Treatment on Lesion Length (21 d Post-Challenge) Experiment 2



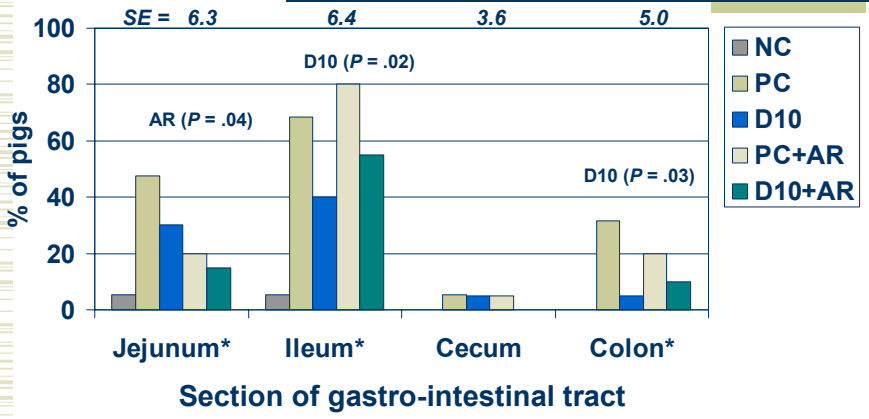
* Effect of disease challenge ($P < .01$).

Effect of Dietary Treatment on Lesion Severity (21 d Post-Challenge) Experiment 2



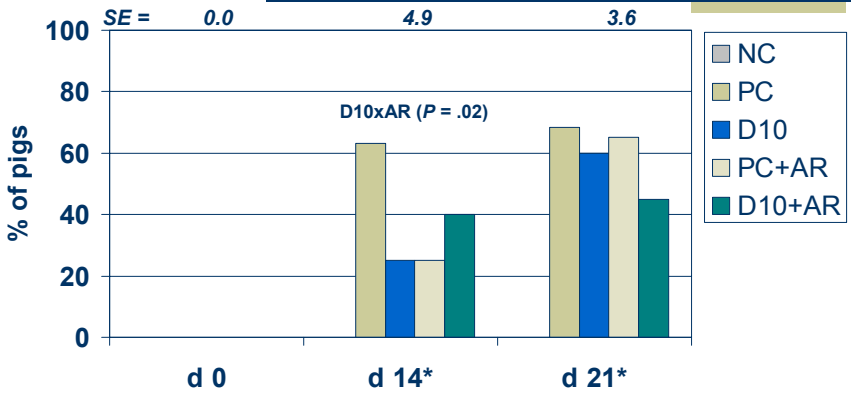
* Effect of disease challenge ($P < .01$).

Effect of Dietary Treatment on Lesion Prevalence (21 d Post-Challenge) Experiment 2



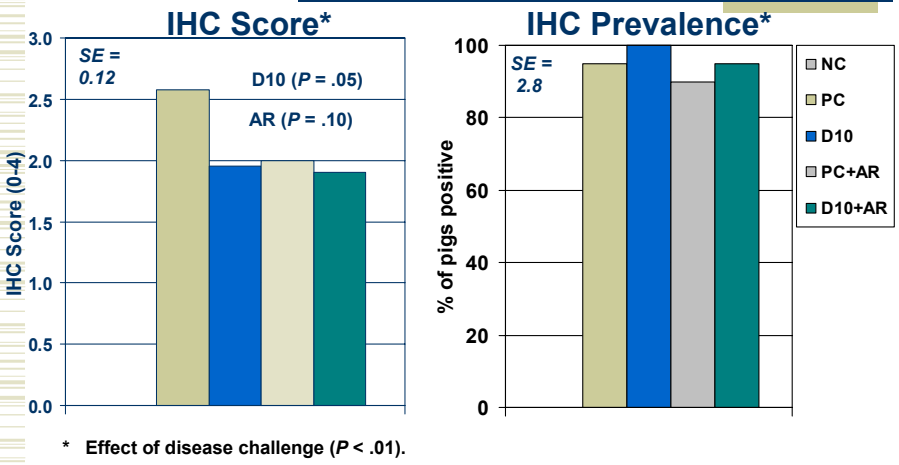
* Effect of disease challenge ($P < .01$).

Effect of Dietary Treatment on Fecal Shedding (PCR Analysis) Experiment 2



* Effect of disease challenge ($P < .01$).

Effect of Treatment on *L. intracellularis* Infection (IHC Analysis) Experiment 2



* Effect of disease challenge ($P < .01$).

Summary of Results, Experiment 2

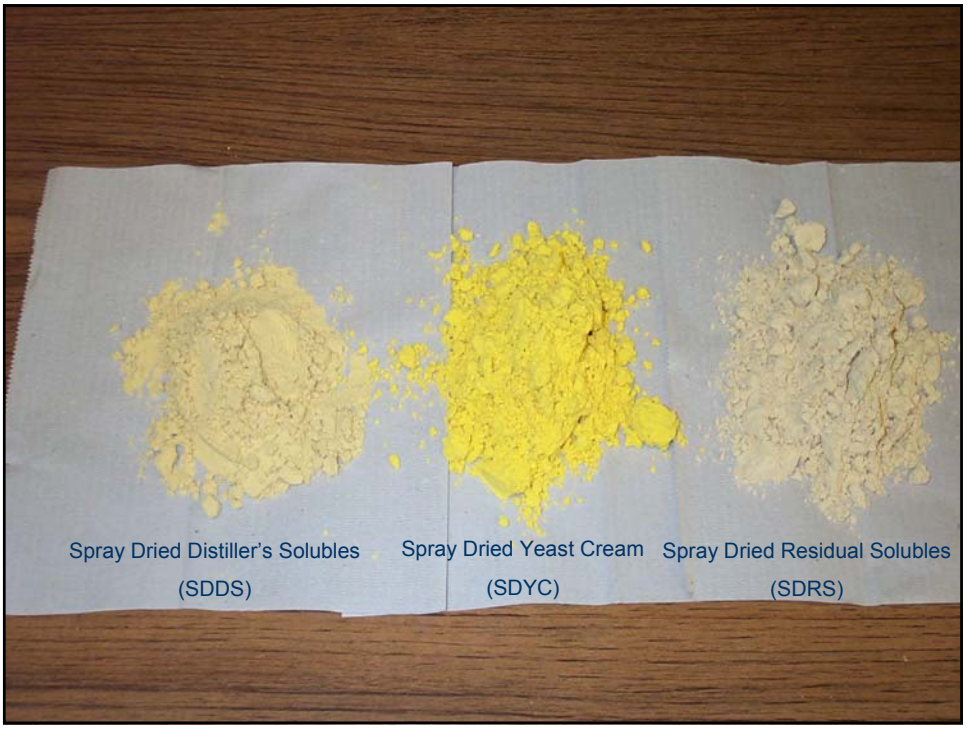
- Inoculation level was close to goal
- DDGS inclusion (10%) or antimicrobial regimen had a positive effect on the pig's ability to resist an ileitis challenge
- No beneficial additive effects of combining DDGS and BMD®/Aureomycin® regimen

DDGS and Phytase are a Key Part of Manure Phosphorus Management

- Adding 20% DDGS to a corn-soy diet and formulating on an available P basis
  - can reduce manure P by > 12%
- Adding phytase to a corn-soy diet
  - increases P bioavailability from 15% to > 45%
- Lowering dietary P, adding 20% DDGS & phytase
  - can reduce manure P excretion by 40 to 50%

Diet Composition When 18.8% DDGS and Phytase are Added to the Diet

Ingredient	Corn-SBM-1.5 kg Lysine	18.8% DDGS + Phytase
Corn, kg	798.3	636.3
Soybean meal 44%, kg	176.9	159.4
DDGS, kg	0.0	188
Dicalcium phosphate, kg	11.6	0.0
Limestone, kg	7.2	9.8
Salt, kg	3.0	3.0
L-lysine HCl, kg	1.5	1.5
VTM premix, kg	1.5	1.5
Phytase, 500 FTU/kg	0.0	0.5
TOTAL, kg	1000.0	1000.0



U of M DDGS Web Site
www.ddgs.umn.edu

We have developed a DDGS web site featuring:

* research summaries
  - swine, poultry, dairy, & beef
  - DDGS quality
* presentations given
* links to other DDGS related web sites
* international audiences