The Value of Distillers Dried Grains With Solubles (DDGS) in Pig Diets

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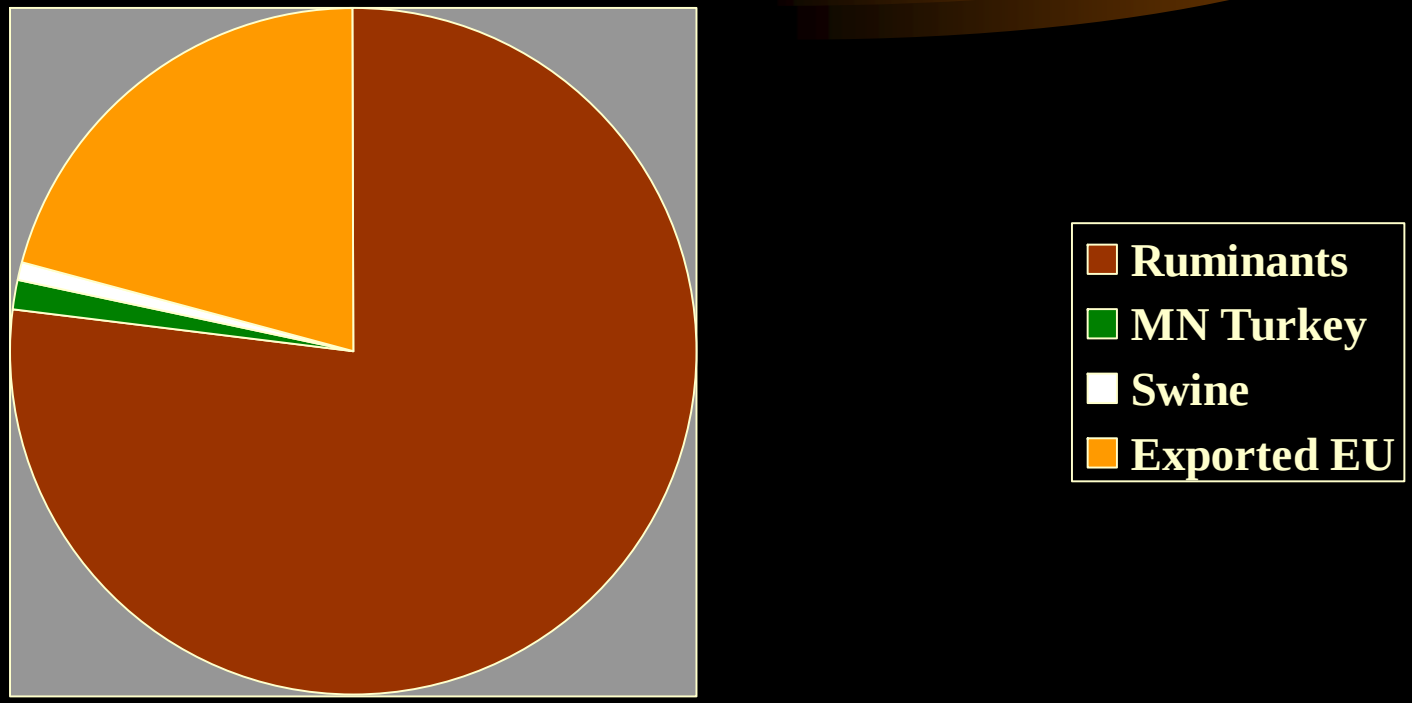
DDGS Production and Use

- 3.2 to 3.5 million MT of DDGS is produced annually in North America
  - ~ 900,000 MT are produced in MN-Dakota region
  - ~ 700,000 MT are exported to the EU
  - ~ 2.65 million MT are fed in U.S. and Canada
    - ~ 2.58 million MT (80%) fed to ruminants
    - ~ 45,000 MT fed in MN turkey industry
    - < 27,000 MT used in swine diets

Distribution of Use of DDGS Produced in North America



Why Hasn't DDGS Been Used in Swine Diets?

- Variability of nutrient levels
  - type of grain used
  - variability of corn quality
  - amount of solubles added
- Low amino acid digestibility
  - variable heating and color
- High crude fiber
  - Low and variable DE and ME estimates

Why Hasn't DDGS Been Used in Swine Diets?

- Amino Acid Profile
  - amino acid balance is not well suited to the pig (low lysine)
  - amino acid imbalance is amplified 3x in DDGS compared to corn
- Limited recent information on use of DDGS in swine diets
- Cost competitiveness relative to commonly used energy and amino acid ingredients

Why is There Renewed Interest in Feeding DDGS to Swine?

- Increasing quantities
  - increased ethanol production to meet oxygenated fuel demand
- New ethanol plants
  - improved fermentation technology = higher feeding value?
- Reduced nutrient variability?
  - corn supply from smaller geographic regions
- High P availability = reduced P excretion
- Reduce odor emissions?

Evaluation of the Feeding Value of "New" DDGS

- Ethanol plants participating in DDGS evaluation:

Aberdeen, SD
Bingham Lake, MN
Luverne, MN
Preston, MN
Winnebago, MN
Benson, MN
Claremont, MN
Morris, MN
Scotland, SD
Winthrop, MN

How Do Nutrient Levels of MNSD DDGS Compare to Published Values?

Comparison of MNSD Apparent Digestible Amino Acid Levels with Old Midwestern Plant DDGS and NRC (1998)

App. Dig. AA	MNSD	OMP	NRC (1998)
Lysine, %	.44	.00	.31
Methionine, %	.32	.24	.39
Threonine, %	.62	.36	.56
Tryptophan, %	.15	.15	.14
Valine, %	.92	.51	.88

Summary of Nutrient Level Comparisons vs. NRC 1998

- MNSD DDGS is higher in:
  - **crude fat**
  - **crude fiber**
  - **DE and ME**
  - **crude protein**
  - **total and apparent digestible lysine**
  - **total and apparent digestible threonine**
  - **phosphorus**
- MNSD DDGS is lower in:
  - **dry matter**
  - **apparent digestible methionine**

What Are the Effects of DDGS on Manure Nutrient Management and Air Quality?

Effects of DDGS on Manure Nitrogen Excretion

- THE BAD NEWS
  - Nitrogen content increases due to:
    - high crude protein:lysine ratio
    - reduced a.a. digestibility compared to corn & SBM
  - Excess N can be minimized by adding synthetic amino acids to the diet
  - High levels of DDGS may reduce pig performance due to the high energy cost of removing excess N
  - May increase ammonia emissions?

Effects of DDGS on Manure Phosphorus Excretion

- THE GOOD NEWS
  - Phosphorus content is reduced due to:
    - increased phosphorus content and bioavailability compared to corn and SBM
  - Decreases the amount of supplemental inorganic P or phytase to the diet.
    - Decreases diet cost

Effects of DDGS on Air Quality

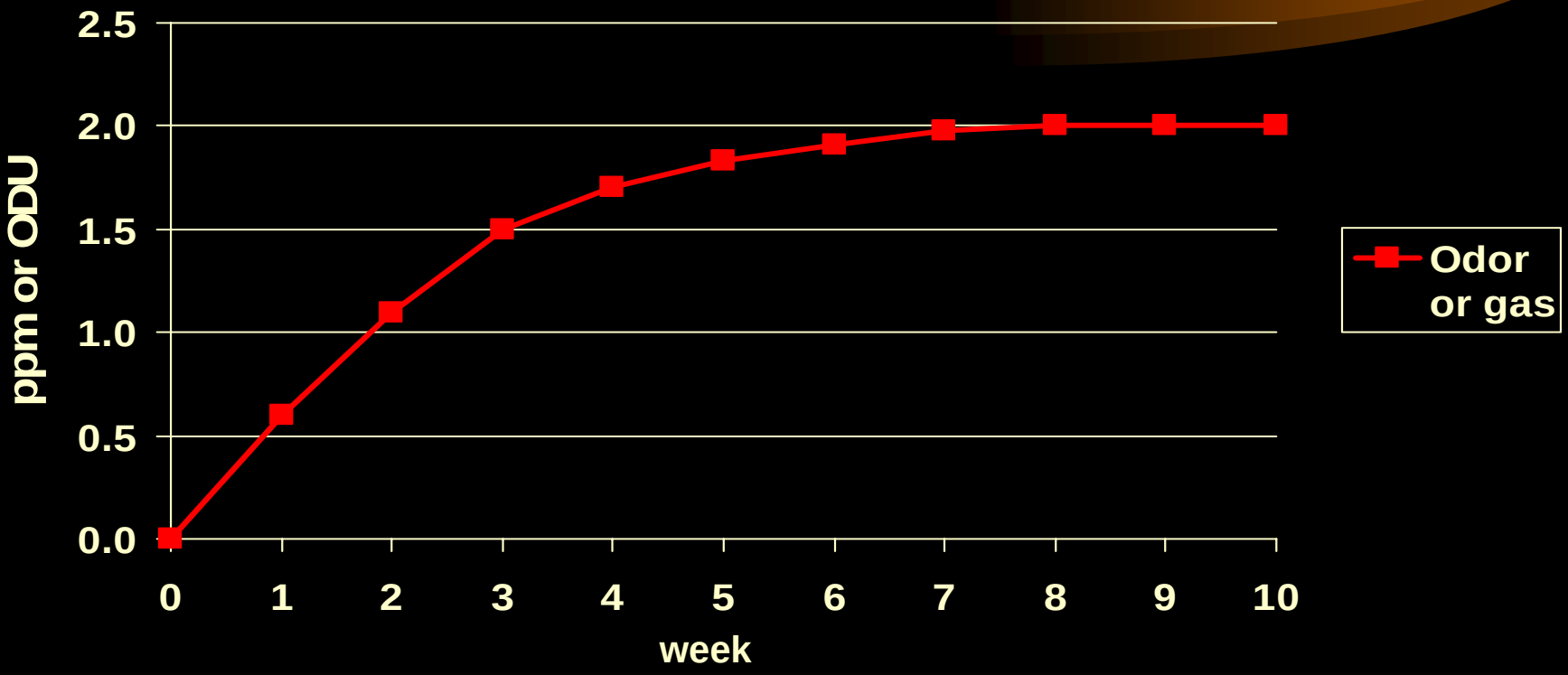
- Feeding DDGS increases N excretion
- Increased N excretion may increase ammonia emissions
- Increasing non-starch polysaccharides in the diet reduces ammonia emissions

Comparison of Fiber Characteristics of MNDAK DDGS with Other High Fiber Ingredients

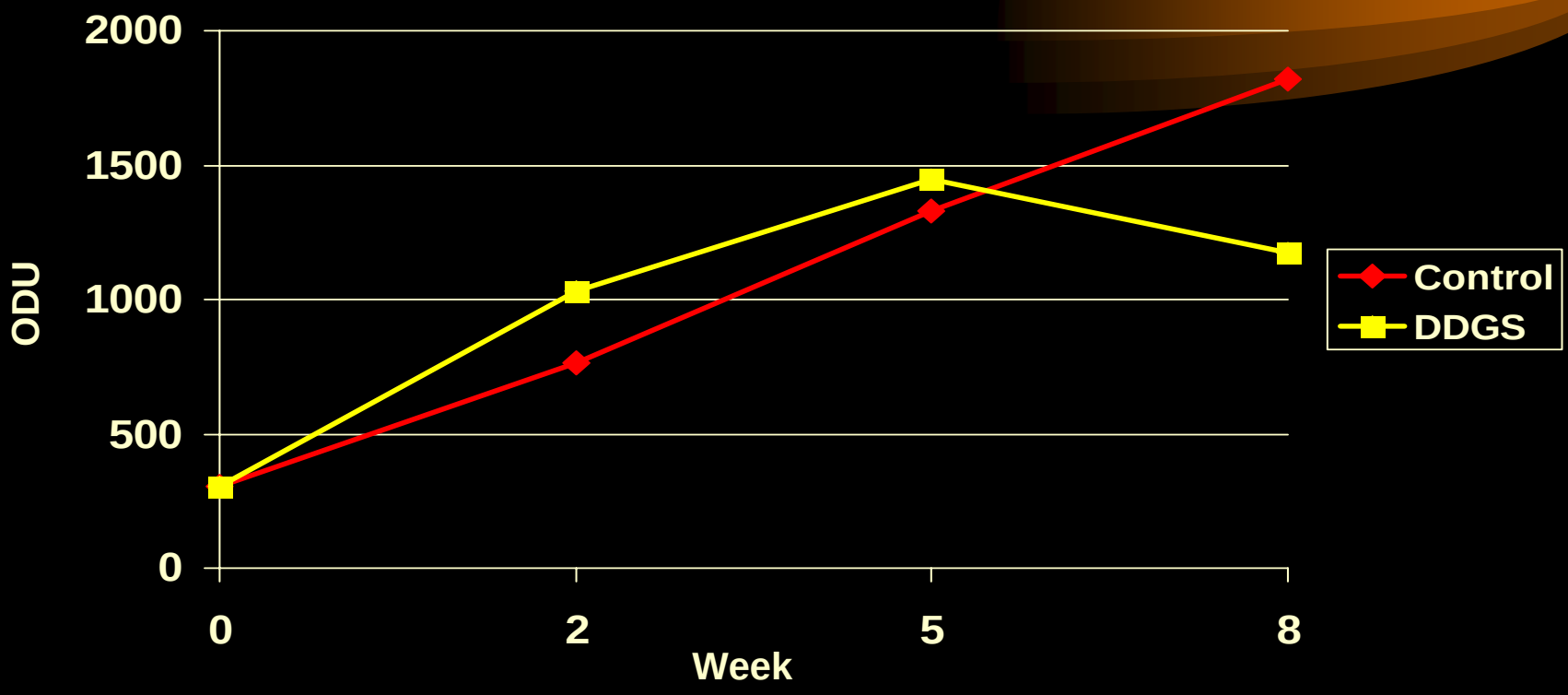
Ingredient	*Crude Fiber, %*	*NDF, %*	*ADF, %*	*Soluble Fiber, %*	*Insoluble Fiber, %*
Corn	2.6	9.0	3.0	1.7	4.7
Soybean meal	7.0	13.3	9.4	1.6	13.2
MNDAK DDGS	**9.9**	**44**	**18**	**0.7**	**42.2**
Beet pulp	19.8	54	33	11.7	53.9
Soybean hulls	40.1	67	50	8.4	75.5


S4-T
S4A2

Expected Curve of Odor and Gas Emissions Over Time

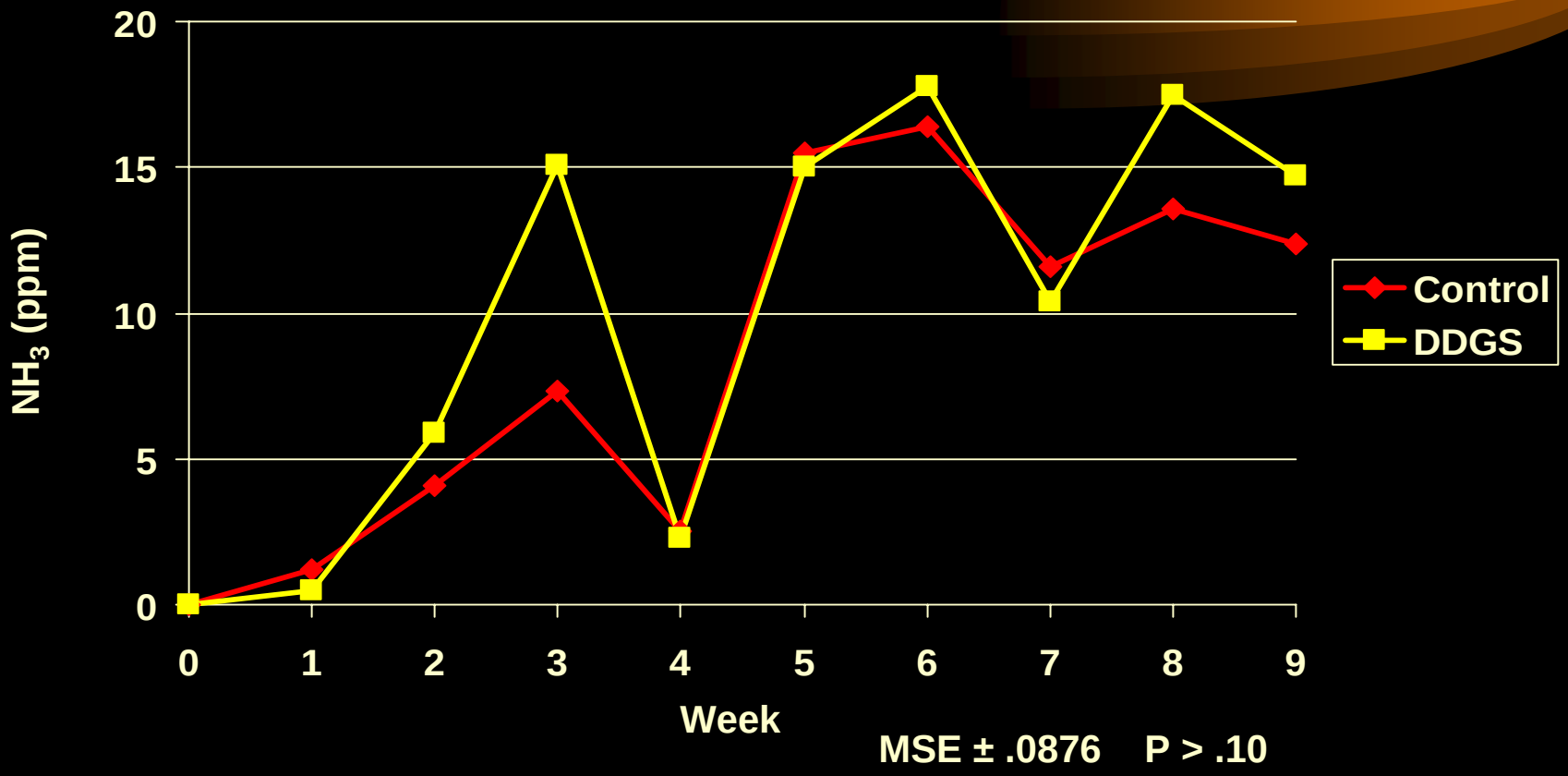


Effect of Dietary Treatment on Manure Odor Detection Threshold

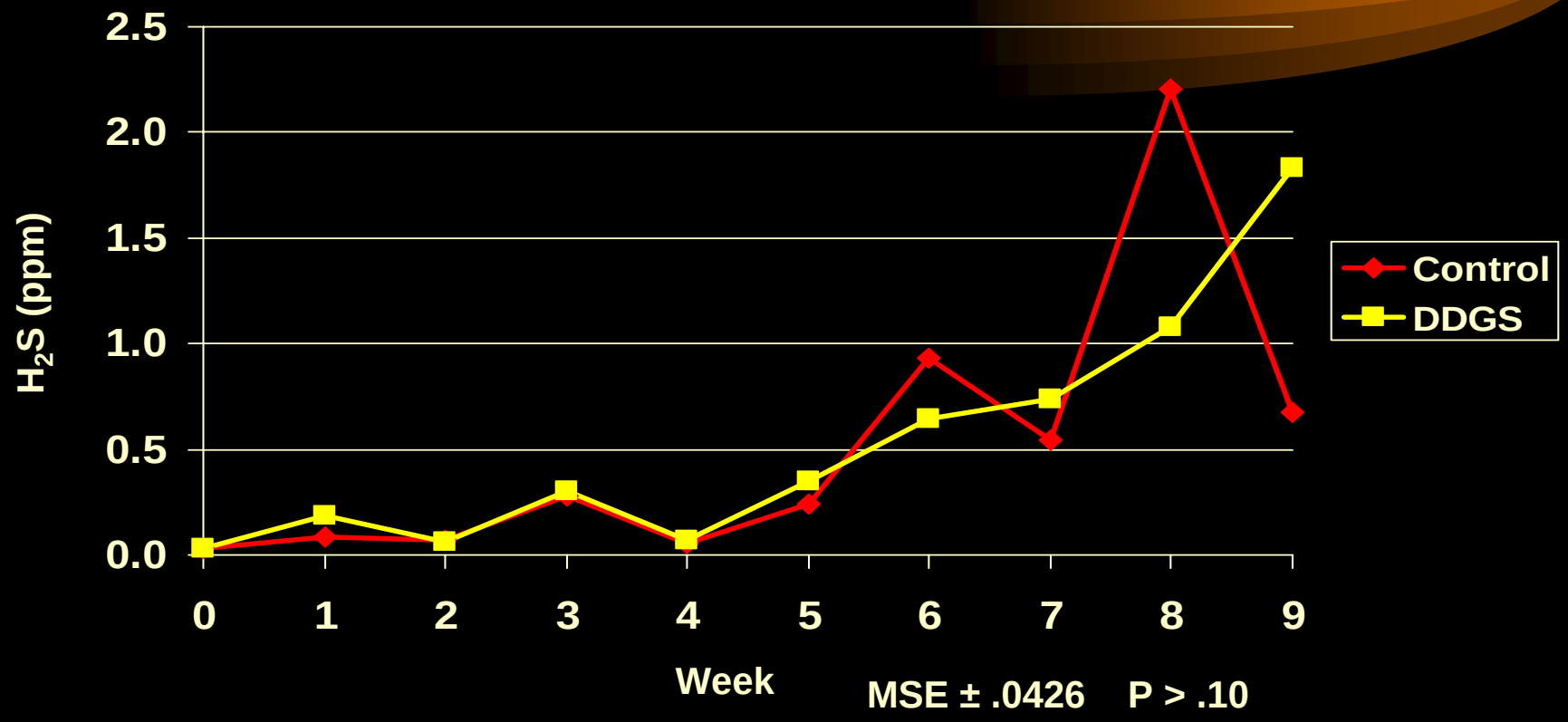


MSE ± .1152 P > .10

Effect of Dietary Treatment on Ammonia Emission



Effect of Dietary Treatment on Hydrogen Sulfide Emission



How Does This Information Apply to Practical Swine Diets?

- Maximum recommended inclusion rates were based on old diet formulation approaches and DDGS nutrient values.

Recommended Maximum Inclusion Rates for DDGS

Production Phase	Feed Co-Products Handbook (1997)	Pork Industry Handbook
Nursery	5 %	5 %
Growing pigs (18-55 kg)	7.5 %	10 %
Finishing pigs (55 kg to mkt)	10 %	10 %
Gestating sows	50 %	40 %
Lactating sows	20 %	10 %

How Does This Information Apply to Practical Swine Diets?

- It depends upon accuracy of energy values.

Net Effects of Adding 100 lbs MNSD DDGS to Grower Diets

- 3032 kcal ME/kg
  - - 93.6 lbs corn
  - - 11.7 lbs soybean meal
  - + 6.9 lbs fat
  - + 1.8 lbs limestone
  - - 3.4 lbs dicalcium P
  - - $0.20/100 lbs

Net Effects of Adding 100 lbs MNSD DDGS to Grower Diets

- 3917 kcal ME/kg
  - - 72.2 lbs corn
  - - 13.2 lbs soybean meal
  - + 13.0 lbs fat
  - + 1.8 lbs limestone
  - - 3.4 lbs dicalcium P
  - - $1.98/100 lbs

How Does This Information Apply to Practical Swine Diets?

- It depends upon accuracy of amino acid ratios.

Effects of Adding 15 and 30% MNSD DDGS to Practical Swine Grower Diets Using Total (T) or Apparent Amino Acid Digestibility (AD) Ratios on Amino Acid Balance

Amino Acid	Ideal	(T) CS-L	(T) 15% DDGS	(T) 30% DDGS	(AD) 15% DDGS	(AD) 30% DDGS
Lys	100	100	100	100	100	100
Met + Cys	57	59	63	69	57	57
Thr	65	67	67	71	56	55
Trp	18	20	19	18	16	15

Summary

- MNSD DDGS:
  - has higher levels and digestibility of most key nutrients
  - has less variability in nutrient levels
  - may not reduce or improve air quality
  - will reduce P excretion
  - can likely be added at higher inclusion rates than previously recommended to reduce cost while maintaining performance