Swine UPDATE

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Use of Dried Distiller Grains with Solubles in Swine Diets

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Recently there has been increasing interest in the use of dried distiller's grains with solubles (DDGS) in swine diets. The DDGS are a co-product resulting from the fermentation of cereal grains. DDGS can be a valuable source of energy, amino acids, and minerals phosphorus in particular. Past studies in swine during the 1950s and 1960s showed that up to 20% DDGS could be fed to grow-finish pigs with only a slight decrease in daily gain and feed efficiency. However, because of different techniques used to produce and dry DDGS, variability of the product has historically been a factor limiting its use in swine and poultry diets.

The primary reason for low acceptance of DDGS by swine nutritionists is the variability of the product within and among plants. In the past, DDGS also was not economically attractive for use in swine diets. Today better processing techniques and tighter quality control measures have reportedly decreased the variability of the product and improved the nutrient profile for use in swine diets. Approximately 98% of the DDGS that are produced in North America come from plants that produce ethanol for oxygenated fuels, while the remainder is produced by the alcohol industry. The number of grain distillation plants or ethanol plants has recently increased dramatically, and the amount of DDGS that is supplied for use in the livestock industries has also increased, while reducing the cost of DDGS.

The nutrient profile of DDGS varies from that of the typical energy source from which it is produced, yellow dent corn. Distiller grains have higher crude protein, fat, and fiber than corn, but again, variation is a problem, with values varying by as much as 6 to 9%. However, a benefit of using DDGS is that it contains high amounts of available phosphorus, which reduces the need for inorganic phosphorus supplementation. While some nutrients in DDGS are higher than that for corn, the energy content of DDGS is reported by the National Research Council (NRC) as 82% of corn (1,279 vs 1,551 Mcal/lb ME, respectively). Recent data from the University of Minnesota has shown that the calculated ME energy content of DDGS from Minnesota and South Dakota ethanol plants is approximately 1,512 kcal/lb compared to 1,466 kcal/lb for older Midwestern plants. The potential differences in energy content of DDGS based on the type of processing plant will have a huge impact on determining the economical value in swine diets.

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Table 1. Projected value of using DDGS with no adjustment for energy concentration in the diet.

		DDGS Energy Value, kcal/lb		
	Corn /SBM	High 1,550	Intermediate 1,415	NRC 1,279
Projected ADG, lb	1.70	1.70	1.69	1.67
Projected F/G	3.00	2.99	3.03	3.07
Projected Market Weight	260.0	260.4	258.3	256.2
Projected Extra Days to 260 lb	—	– 0.3	1.0	2.3
Projected Margin over Feed Costs ($ / Pig)	59.19	60.33	59.15	57.95
Difference in Margin Compared to Corn/SBM ($ / Pig)	—	1.14	–.04	–1.24

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The University of Minnesota suggests that up to 20% DDGS can replace corn in corn-soybean meal diets for lactating sows, developing gilts and grow-finish pigs. They suggest inclusion rates as high as 25% for nursery pigs and 50% for gestating sows and boars. However, they recommend no more than 20% DDGS be added to grow-finish diets, because of concerns of reduced belly firmness and soft fat.

Several factors can influence the cost effectiveness of including DDGS in diets. The two major factors influencing its use are the relative price of corn and DDGS and the assumed energy value for DDGS. The NRC (1998) lists the energy value of DDGS as 1,279 kcal/lb, whereas the DDGS produced by some of the new ethanol plants has been projected by some to contain as much energy as corn (1,551 kcal/lb).

The table on page 1 provides an example of the projected value of using DDGS in grow-finish diets. We used three estimated energy concentrations for DDGS: the NRC 1998 value, 1,279 kcal/lb, a value equal to that of corn, 1,550 kcal/lb, or an average of these two energy levels 1,415 kcal/lb. We selected these three values because the energy value of DDGS has been estimated at anywhere from the NRC value to a value equal to corn (1,550 kcal of ME/lb). The projected impact in this table is based on the use of 15% DDGS in a 2.71 lysine: calorie ratio diet if there were no adjustments to equalize the energy level of the diets. The same available phosphorus level was maintained by removing dicalcium phosphate ($0.145/lb). The model uses a corn price of $2.40/bu soybean meal at $180/ton, DDGS at $85/ton, and a live hog price of $38 per cwt.

The model is based on a production operation with an average daily gain of 1.70 and feed/gain of 3.0 when pigs are fed a corn-soybean meal diet. Pigs enter the grow-finish barn at 50 pounds and are marketed 123 days later.

When the energy value of distiller's grain is the same as corn, feed efficiency improves, and projected market weight is slightly heavier causing margin over feed to be $1.14 greater when using DDGS compared to a corn-soybean meal diet. However, if DDGS has a lower energy value, margin over feed costs will be reduced by $0.04 and $1.24 per pig for intermediate and NRC energy values, respectively, compared to a corn-soybean meal diet without DDGS. Thus, the energy level of DDGS can have a large impact on economic return.

In Tables 2, 3, and 4, the breakeven price for DDGS included at 15% of a corn-soybean meal diet is calculated using the NRC (1998), an intermediate, and high-energy value for DDGS, respectively.

These tables demonstrate that the breakeven price for DDGS depends heavily on the assumed energy value. The use of DDGS can be profitable in swine production when corn and soybean prices increase; however, care must be taken to formulate diets with similar nutrient concentra-

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Table 2. Breakeven price for DDGS ($/ton) at NRC energy value (1,279 kcal/lb) assuming added fat inclusion to equalize energy concentration to a corn-soybean meal basis.

	Soybean Meal Price $ / ton				
Corn Price ($ / bu)	$150	$175	$200	$225	$250
$1.70	49.47	52.57	55.45	58.55	61.65
$1.90	56.50	59.60	62.47	65.57	68.67
$2.10	63.52	66.40	69.50	72.60	75.47
$2.30	70.31	73.42	76.52	79.40	82.50
$2.50	77.35	80.45	83.55	86.42	89.52
$2.70	84.37	87.47	90.35	93.45	96.55
$2.90	91.40	94.27	97.37	100.47	103.35
$3.10	98.87	101.30	104.40	107.50	110.37

Table 3. Breakeven price for DDGS ($/ton) at intermediate energy value (1,415 kcal/lb) assuming an added fat inclusion to equalize energy concentration to a corn-soybean meal basis.

	Soybean Meal Price $ / ton				
Corn Price ($ / bu)	$150	$175	$200	$225	$250
$1.70	65.92	69.18	72.21	75.46	78.71
$1.90	72.42	75.68	78.71	81.96	85.21
$2.10	78.92	81.95	85.21	88.46	91.49
$2.30	85.20	88.45	91.71	94.74	97.99
$2.50	91.70	94.95	98.21	101.24	104.49
$2.70	98.20	101.45	104.48	107.74	110.99
$2.90	104.70	107.73	110.98	114.24	117.27
$3.10	111.64	114.23	117.48	120.74	123.77

Table 4. Breakeven price for DDGS ($/ton) at higher energy value (1,550 kcal/lb) assuming an added fat inclusion to equalize energy concentration to a corn-soybean meal basis.

	Soybean Meal Price $ / ton				
Corn Price ($ / bu)	$150	$175	$200	$225	$250
$1.70	81.63	85.01	88.38	91.53	94.90
$1.90	87.55	90.91	94.29	97.66	101.03
$2.10	93.68	96.82	100.20	103.57	106.94
$2.30	99.59	102.96	106.34	109.48	112.86
$2.50	105.51	108.88	112.25	115.62	118.77
$2.70	111.42	114.79	118.16	121.53	124.90
$2.90	117.55	120.92	124.07	127.44	130.81
$3.10	123.46	126.84	130.21	133.58	136.73

Potential Mycotoxin Concerns for Swine Producers

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Mycotoxins are produced by fungi on or in grain (corn, wheat, barley, sorghum, rye, and oats) or other feedstuffs and may cause illness and death if consumed by humans or animals. Reports indicate that mycotoxin contamination in new crop grains may be a concern in certain areas this year. Grain terminal and elevator operators in northern Kansas indicate a range from only a few total cases up to 15% of the total new crop corn delivered having aflatoxin levels exceeding the maximum allowable value for normal corn of 20 parts per billion (ppb). Environmental conditions must be favorable for fungal growth and mycotoxin production. The following conditions must exist: humidity greater than 62%, temperature ranging from 77° F to 86° F, (fungi also can grow at temperatures up to 98° F), moisture levels that exceed 14 to 15%, oxygen availability, and energy and carbon sources for energy Cereal grains are an optimal source of energy. In addition, drought-stressed corn is less resistant to fungi, and therefore is at higher risk for contamination. In addition, mycotoxin contamination can occur during storage, so proper grain storage management practices need to be followed.

The most common symptoms in swine that are fed contaminated feed include depressed growth, infertility, decreased litter size and piglet birth weights, immunosuppression, liver damage, oral lesions and tremors. The table lists the recommended threshold levels for commonly encountered mycotoxins.

If grain has mycotoxin levels that exceed Food and Drug Administration limits, the grain is technically banned from feeding. Producers can clean corn to remove small and broken kernels and other fine particles, which usually contain the greatest concentration of mycotoxins. Cleaning the corn will reduce the overall mycotoxin level. The vast majority of samples that have tested positive for aflatoxins this fall are in a manageable range (less than 100 ppb) for producers to feed to livestock. Although FDA issues guidelines for livestock with maximum acceptable levels of mycotoxins in infected grain, levels below the acceptable level can also reduce performance. Research has shown that non-nutritive binding agents, such as sodium bentonite can prevent growth depression when added to the diet of contaminated corn. Bentonite clay partially binds the toxins and prevents their absorption in the digestive tract. Bentonite clay is currently priced at approximately 8.5 cents per pound, and was fed at 10 pounds per ton in the research trials.

Producers should verify that the grain they are purchasing or have raised has been tested if mycotoxins pose a potential risk for their farm. The veterinary diagnostic services laboratory at North Dakota State University has an excellent mycotoxin testing lab. You can reach them by telephone at 701-231-8307 or on the Web at *http://www.ndsu.nodak.edu/mycotoxins/*.

Contact your local K-State Research and Extension agricultural agent for more information on having your grain tested.

Table 1. Maximum recommended levels for common mycotoxins.

	Nursery	Grow-finish	Sows
Aflatoxin, ppb	20	200	100
Zearalenone, ppm	1	3	2
Deoxynivalenol, ppm	1	1	1
Fumonisin B1, ppm	10	10	10
Fumonisins, ppm	20	20	20

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tions to prevent reductions in growth performance, especially in systems on a fixed time marketing schedule.

Because the energy value for DDGS in swine diets is not well known, use of DDGS in swine diets needs to be carefully evaluated. Accurate nutrient values for DDGS from new plants are needed to make dietary modifications to ensure profitable performance. More research is needed to help determine a more precise energy value for DDGS.

In conclusion, DDGS may be used in swine diets. But, because of variation and limited information on the energy content, dietary formulations need to be evaluated by a nutritionist on a case-by-case basis to ensure that pigs will maintain similar growth performance.

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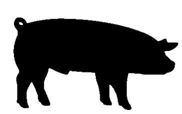

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