

# Michigan Dairy Review



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## Tips for Feeding Corn Distiller's Grains to Dairy Cattle

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Corn distiller's grains (CDG) can be an excellent feed for dairy cattle. However, they must be properly and consistently processed at the ethanol plant, correctly incorporated in ration formulation, and properly stored and fed at the farm to optimize productivity and avoid changes in milk composition. In some cases, it may be possible to incorporate up to 20% of ration dry matter (DM). However, this will depend on the overall fermentability and types of forages in the ration, other sources and amounts of unsaturated (vegetable) fat and protein, and the stage of lactation and milk production level of cows.

The nutrient profile of CDG is similar to #2 yellow corn grain, except that nutrient concentrations are about three to four times greater in CDG, but they have low starch content. Starch in corn grain is converted to ethanol at the plant. A typical profile of CDG contains 30% crude protein (CP), 39% neutral detergent fiber (NDF), 10% fat (ether extract),

0.83% phosphorus (P), and 0.44% sulfur (S). Corn grain, DM basis, contains 9.4% CP, 9.5% NDF, 4.2% fat, 0.30% P, and 0.10% S (5).

### Tips

**1** Obtain complete and routine laboratory analyses of CDG. Composition will vary, from plant to plant and from batch to batch, so routine analysis is important.

**2** The nutrient composition can vary greatly among wet versus dry CDG, with or without added condensed solubles. Adding condensed solubles to the distiller's grains whether wet or dry results in a feedstuff containing more fat, phosphorus, and sulfur. Also, the nutrient concentrations may vary depending upon the amount of solubles added, even from the same ethanol plant. This variation emphasizes the need for complete and routine laboratory analyses.

**3** Establish appropriate inclusion levels (concentrations) in lactation rations based on nutrient profiles determined by laboratory analyses of CDG and other feed ingredients (concentrates and forages) available for the ration.

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To optimally balance the ration, this almost always means that the amounts of other ingredients in the ration must be lowered when CDG are introduced. For example, other ingredients contributing significant amounts of crude protein, fat (especially polyunsaturated vegetable oil), phosphorus, and sulfur must be reduced to balance the nutrient composition of the final ration when CDG are incorporated.

**4** Initially include no more than 10 to 15% CDG in the ration, and monitor milk production and composition before and after the ration change. A recent evaluation (meta-analysis) of 26 research studies published in refereed scientific articles evaluated the effects of CDG on milk production and composition (3). In the combined analysis of all results (all studies, all ration types, and cows in all stages of lactation) no differences in feed intake, milk yield, or composition were detected with 0 to 30% CDG (DM basis). However, the forage base of the ration made a difference as discussed in Tip #5 below.

**5** When the effects of increasing CDG (0 to 30%, DM basis) were compared based on the main forage in the ration (corn silage versus alfalfa), different responses occurred. Milk yield was reduced as CDG content increased with corn silage as the main forage, but not with alfalfa as the main forage. This interaction likely is due to the overall fermentability of the total ration, the different physical form and effective-fiber of the forages, the quality and chemical form of protein, and (or) the overall amount of “corn-based feedstuffs” such as corn grain, CDG, and corn silage in the ration. Rations that have higher concentrations of very fermentable ingredients such as corn silage and corn grain (ground and high moisture) can reduce ruminal pH, feed intake and milk yield, and when in combination with excess polyunsaturated fat (such as corn oil) can reduce fat yield and concentration (1).

**6** CDG contain 30 to 40% highly digestible NDF. However, this fiber is not effective to promote a good rumen mat and healthy digestive function. When using CDG, incorporating adequate effective-fiber from forages is crucial.

**7** CDG have no better protein quality (essential amino acid profile) than corn grain. Both feedstuffs are particularly deficient in lysine, a dietary essential amino acid. If, for example, CDG replace part or all of other supplemental protein sources such as soybean meal or blood meal, which have higher lysine contents, a lysine-deficient ration may result.

**8** Balance the rumen degradable protein (RDP) and rumen undegradable protein (RUP or bypass protein) and check the essential amino acid profile of the final ration. Assurance that there is enough RDP to maximize ruminal digestion and microbial protein synthesis is crucial when feeding CDG with other feed ingredients that do not contribute to

adequate RDP in the ration.

**9** Phosphorus content of CDG with solubles typically is in the range of 0.8 to 1.2% (DM basis). In many lactation rations, incorporation of CDG increases the amount of P beyond the cows’ requirement and increases P in manure. For example, if the P content of the ration increases by 0.05 percentage units (such as from 0.38 to 0.43%, DM basis) above recommendations (5) for a 200-cow Holstein herd, an additional 80 acres will be needed annually for manure application (at a crop removal rate of 50 lb of P<sub>2</sub>O<sub>5</sub>/acre). To not have excess P in the ration, the most CDG (at 0.83% P, DM basis) that can be incorporated and not result in excess ration P is 15% of the total ration DM if the average P content of the other ingredients is 0.30%, DM basis.


**10** The optimal concentration of CDG for high yielding and (or) early lactation cows has not been adequately studied. Doubtless, it is different and likely lower than estimated when combining all available research results from all stages of lactation and rates of milk production into one analysis (3). Unique characteristics of high yielding cows, such as higher feed intake and faster rates of passage, suggest those cows utilize CDG differently than the “average cow”. Also, high yielding cows typically are fed more highly fermentable rations (such as rations with higher corn silage and corn grain) that may reduce ruminal pH and milk fat content (see Tip #5). Therefore, starting at a moderate inclusion level such as 5 to 10% of ration DM for high yielding cows is recommended. If it appears economically feasible to include more CDG, upward adjustments can be made while monitoring feed intake, milk yield and fat composition.

**11** Inclusion of more than 20% in the ration DM as wet CDG reduced feed intake and milk yield compared with inclusions between 4 to 20% of ration DM (4). The reasons for this effect are not understood or widely researched.

**12** When purchasing wet distiller’s grains, require a specific target for DM content (such as 30% DM) for full payment, and have an agreement for price adjustment below specified target DM content.

**13** Periodically, determine the fat, phosphorus, and mycotoxin concentrations in purchased CDG. Aflatoxins, one of the mycotoxins, if present in the original corn grain used to produce ethanol, are able to withstand the elevated temperatures of drying. Thus, they are a potential concern in CDG (2). Aflatoxins in milk are illegal and a human health hazard.

**14** Pay especially close attention to the nutritional quality and consistency of CDG for best success. Over-drying can result in heat-damaged protein. Darker dried



CDG are associated with heat-damaged protein and poorer nutritional quality. Variable amounts of condensed solubles added back to the grains before drying also can result in variable nutrient composition and quality.

**15** For growing dairy heifers, concentrations of 20 to 30% (DM basis) CDG are used in the field. Similar nutritional considerations as listed above for lactating cows should be used to optimize use in heifer rations. Sulfur content of the final ration should not exceed 0.3% (dry basis) for either heifers or lactating cows. Polio encephalomalacia (resulting from excess dietary sulfur) is a concern, especially with heifers.

More research is needed to better define the maximum inclusion concentrations for CDG given different characteristics of rations such as forage type and amount, other protein and fat sources, environmental considerations (such as a possible excess P excretion), economic value, and best processing practices at ethanol plants to optimize nutritional characteristics for maximum use in dairy rations.

### Selected References

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