BEEF SOLUTIONS

Feeding supplemental fat to beef cattle

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Beef cattle have been supplemented fat for a number of years. The primary reason for this is that supplemental fats are a concentrated source of energy, containing nearly two to three times the net energy of cereal grains. Table 1 below contains examples of the net energy value of tallow and vegetable oil compared to different sources of cereal grains and soybeans. Fat can also affect a variety of physiological processes that improve performance. When priced appropriately, supplemental fats can be an effective means of increasing the energy density of the diet.

Table 1: Relative energy content of feedstuffs for beef cattle (Mcal/cwt, 100% dry matter basis)

Ingredient	NEm	NEg
Tallow[a]	272	205
Vegetable oil[a]	216	160
Whole corn[b]	98	65
Whole barley[b]	92	61
Soybeans[b]	103	70

[a]Net energy values obtained from NRC 1996

[b]Net energy values obtained from Beef Magazine 2018 feed composition table

Fat sources and metabolism

A variety of fat sources exist that can be included in the diets of beef cattle. These include fats originating from either oil seeds and grains, rendered animal byproducts or yellow grease from the food service industry. Once consumed, these fats go through a structural change in the rumen called biohydrogenation. This change can lead to an increase in the amount of propionic acid, which is one of the major volatile fatty acids produced and which is a precursor to glucose. Increased propionic acid production provides more energy to the animal. However, the exact advantages of fat supplementation are difficult to ascertain due to the differences in the fatty acid makeup and the extent of biohydrogenation in various sources.

Supplementing fat to feedlot cattle

Including supplemental fat in the diets of finishing cattle is known to improve feed efficiency, but the performance response is quite variable. A few factors need to be considered when deciding to use fat as an energy source in finishing diets. The type of fat must be taken into consideration, as the various types can affect the net energy of the diet differently, resulting in some variation in animal performance.

In addition to type, the quality of the fat can also affect performance. Measurements of quality include moisture, impurities and toxic compounds. Fats that are lower-quality can have a negative effect on palatability and feed intake.

The third factor to consider is the level of supplementation. As dietary fat levels increase, the intestinal digestion and absorption of fat decreases. In addition, increased levels of supplemental fat can result in reduced dry matter intake, negatively affecting performance. For these reasons, fat supplementation levels should not exceed 6% in finishing diets.

Due to price considerations, the most common types of fat supplemented in feedlot diets include tallow, fat blends and yellow grease. In a survey completed in 2015, about 54% of clients from surveyed nutritionists included supplemental fat in their finishing diets (Samuelson *et al*., 2016). The number of feedlots that add fat to their diets has decreased since 2007. This may be the result of the increased price of supplemental fat and/or the increased use of distillers grains, which contain an increased concentration of fat compared to corn.

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Effects of feeding fat on beef cow reproduction
The reproductive performance of beef cows is impacted by their dietary energy intake and body condition. Supplemental fat can increase the dietary energy density, and it can also have positive effects on reproduction when fed at specific times during gestation. Supplementing fat to cows during the final 60 days of gestation can improve pregnancy rates in the following breeding season, whereas fat supplementation during the postpartum period does not affect the pregnancy rate. In addition, it is possible to impair reproductive function if fats high in linoleic acid (such as the oils found in oil seeds) are supplemented to cattle during the postpartum period. Therefore, avoiding fat supplementation during the postpartum period is recommended.

Cattle consuming high-forage diets can only consume a limited amount of supplemental fat. Increased amounts of fat in the diet can result in decreased ruminal fiber digestion. Therefore, the amount of supplemental fat included in high-forage diets should be limited to 4% to ensure that it does not have a negative effect on digestibility.

Effects of feeding fat on neonatal calf performance
A calf's ability to withstand colder temperatures shortly after birth can greatly affect its survivability. Research indicates that calves born to mothers supplemented with fat 60 days before calving responded better to cold stress and had a higher survivability rate than calves born to un-supplemented cows (Hess, 2003). If producers are expecting to have calves born during adverse weather conditions, feeding fat to beef cows 60 days prior to calving can be an effective strategy to help calves combat the effects of adverse weather events.

Effects of feeding fat to replacement heifers
There is still a lack of information about whether fat supplementation increases the pregnancy rates of replacement heifers or whether it has little value in a well-developed replacement heifer program. However, there are indications that fat supplementation can result in positive physiological changes when heifers are supplemented 60 to 90 days prior to the breeding season to increase the pregnancy rate. Additionally, producers need to consider heifer body condition when supplementing fat. Over-conditioned heifers fed diets with supplemental fat may experience delayed estrus compared to heifers in adequate body condition.

Replacement heifers are typically fed high-forage diets during the growing phase. As with mature cows, fat supplementation for replacement heifers should not exceed 4% of the diet dry matter to limit any negative effects on fiber digestion.

Price considerations
Supplemental fat can be utilized to help improve performance, but as with any nutrition program, price must be taken into consideration regardless of the feeding advantages.

Corn is the most common cereal grain used as an energy source in cattle diets in the United States. For this reason, we will use corn as the base to determine whether supplemental fat is economically feasible. Table 2 below contains two different prices for corn to compare to two prices for tallow and soybeans. If the prices per unit of net energy for tallow or soybeans are equal to or below the price per unit of net energy for corn, they are a good option to include in the diet as an energy source. If the prices per unit of net energy are higher than the price of corn, it is advisable to use corn as the primary energy source. In our example, soybeans are not priced adequately enough to use as an energy supplement, whereas tallow, priced at $606 per ton (on a dry basis) can be an effective source of energy when the price of corn is high.

Table 2: Price per Mcal of NEm and NEg (100% dry matter basis) for various feedstuffs

Ingredient	Price, $/ton (dry basis)	NEm, $/Mcal	NEg, $/Mcal
Whole corn	122	0.06	0.09
Whole corn	243	0.12	0.19
Soybeans	398	0.19	0.28
Soybeans	546	0.27	0.39
Tallow	606	0.11	0.15
Tallow	859	0.16	0.21

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Hubbard product offerings
Hubbard Feeds offers a variety of products with increased concentrations of fat to improve the energy density of diets for beef cattle. Our cube options with increased fat include a dried distillers grain cake containing 6% fat and a new high-fat cake, available at our Rapid City location. The high-fat cake options from Rapid City include 15% and 20% crude protein Rangeland cakes and a 30% crude protein cottonseed cake, all of which contain 6% fat, and a 22% crude protein distillers cake containing 8% fat. Crystalyx® Breed-Up® Omega and Blueprint® Breed-Up® Omega low-moisture blocks provide 12% oil from flaxseeds and are an excellent alternative for providing supplemental fat to beef cattle.

Conclusion
A limited amount of supplemental fat can be an excellent way to increase the energy density of the diet. Cattle consuming high-concentrate finishing rations should be limited to 6% supplemental fat, whereas cattle consuming high-forage diets should be limited to 4% to prevent any negative effects on digestibility. Positive effects on feed efficiency and reproduction have been observed, but with feed costs constituting most of the expenses associated with raising cattle, the price of supplemental fat must be taken into consideration. Therefore, it is advisable for producers to use supplemental fat when it adds little to no cost to the ration.

Works Cited
Hess, B. W. 2003. Supplementing fat to the cow herd. Range Beef Cow Symposium. 67. https://digitalcommons.unl.edu/rangebeefcowsymp/67.

NRC. 1996. Nutrient requirements of beef cattle. 7th rev. ed. Natl. Acad. Press, Washington, D.C.

Samuelson, K. L., M. E. Hubbert, M. L. Galyean, and C. A. Loest. 2016. Nutritional recommendations of feedlot consulting nutritionists: The 2015 New Mexico and Texas Tech University survey. J. Anim. Sci. 2016.94:2648-2663.