



Should You Be Feeding Fat to Your Dairy Cows?

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Donna M. Amaral-Phillips, R.W. Hemken, and J.A. Jackson

Feeding fats to dairy cows has become increasingly popular primarily for two reasons:

1. Supplemental fat can be used to increase the energy concentration of diets for high-producing cows. During early lactation, high-producing cows cannot consume enough feed to meet their energy needs. Fats are fed to cows:

- to prevent them from losing too much weight,
- to shorten the time frame during which they are losing weight, and
- to help them regain weight lost in early lactation.

2. Feedstuffs high in fat have become more available and economical.

Merits of Feeding Fat

Feeding fats to the milking herd increases the amount of energy contained in the diet. Fats contain 2.25 times more energy than the starches and digestible fiber found in common grain or forage sources. For example, fats contain approximately 2.65 Mcal NE_L/lb compared to 0.95 Mcal NE_L/lb found in corn grain or 0.63 Mcal NE_L/lb in excellent quality alfalfa hay. By adding fat to the diet, more energy can be packed into each mouthful of feed a cow eats. At the same time, adequate amounts of forage and fiber can be fed to maintain a healthy rumen and acceptable milk fat test.

Some scientists have suggested that feeding fats during early lactation may improve reproductive

performance and may decrease the incidence of ketosis. Adding fat to grain mixes also reduces the dustiness of these feeds.

Effects of Feeding Fat on Feed Intake and Milk Production

Feeding fat to lactating cows has been shown to increase milk production. This increase in production is attributed to an increase in peak milk production, but also to an increase in persistency of the lactation curve. First-calf heifers do not respond as well as mature cows to the addition of supplemental fat.

Generally, milk fat percentage has increased when the recommended amount of supplemental fat is fed (see Table 1). However, the feeding of unsaturated fats or large quantities of fat has decreased milk fat percentage. Some scientists believe that the rumen's microorganisms (bugs) may be inhibited by unsaturated fatty acids found in vegetable oils and fish oil. Feeding unsaturated fats or feeding large amounts of fat may decrease fiber digestion and decrease milk fat percentage.

Milk protein percentage frequently has decreased in cows receiving various sources of supplemental fat. Various studies have shown one- to two-tenths decrease in milk protein percentage. This decrease seems to occur in the casein fraction.

Responses in dry matter intake with the feeding of fat have varied. In trials using whole cottonseeds, whole soybeans or tallow, some studies have shown a

decrease in dry matter intake, whereas others have shown increases in dry matter intake. In some of these trials where dry matter intake has decreased, the amount of energy consumed has remained constant or increased slightly to account for the increase in milk production. Decreases in feed intake may be seen especially when the amount of fat in the diet exceeds the amount needed for milk fat synthesis.

Feedstuffs Containing High Amounts of Fat

Table 1.
Sources of supplemental fat

	% fat	% protein	Feeding recommendation*
Whole cottonseed	23	24	4-6 lb/cow/day
Whole soybeans	19	43	3-5 lb/cow/day
Tallow	100	--	1 lb/cow/day
Specialty fats	80-99	--	1-1.5 lb/cow/day

* Assuming a 1200-1300 lb cow and only one source of fat is fed.

Oil Seeds

Oil seeds are a natural source of fat and protein in diets for lactating cows. Oil seeds are usually fed whole or crushed. The oil is believed to be slowly released when the seed is chewed, which may help decrease the detrimental effects on rumen fermentation and milk fat test. These oil seeds include cottonseed, soybeans, canola, sunflower, and safflower seeds.

Whole Cottonseed: Whole cottonseed is an excellent source of energy, protein, and effective fiber. One limitation in feeding fuzzy (linted) whole cottonseed is that it does not flow out of grain storage bins or in auger-type systems. Thus fuzzy whole cottonseed must be handled with a shovel or front-end loader. Mechanically delinted whole cottonseed and pima (naturally delinted) cottonseed are very similar to the feeding value of whole cottonseed. Acid-delinted cottonseed is an inferior source of fat and fiber compared to mechanically delinted, whole fuzzy, or pima cottonseed.

Mycotoxins, especially aflatoxins, can become a problem either in the field or during storage if

conditions are favorable. To reduce the chances of increasing the concentration of aflatoxin during storage:

1. Store seed at less than 10% moisture,
2. Force air through the seed,
3. Shelter from rain, and
4. Store on sloped concrete.

Whole cottonseed contains gossypol, a compound that is toxic to swine and poultry. With the amounts of cottonseed and cottonseed meal normally fed to dairy cows, gossypol is not believed to cause any health problems.

Whole Soybeans: Whole soybeans are slightly lower in protein than soybean meal (42% vs. 50% dry matter basis). They are a very palatable feed and are easily fed in different feeding systems, such as topdressed on silages, part of the total mixed ration, or in a grain mix (cracking prevents separation during storage of the grain mix). Whole soybeans can be fed either raw or roasted.

Raw beans **should not** be fed in diets containing urea. Also, the chances for rancidity are increased when beans are ground or when they are added to ensiled forages or wet byproducts during the warm months. Raw beans work well in corn silage-based or alfalfa/grass hay diets.

Properly roasted soybeans contain more ruminally undegraded protein (bypass protein), and the urease and trypsin inhibitor are destroyed. A large variation exists in the amount of heat applied during the roasting process. This results in a large variation in the amount of bypass protein and lysine available to the cow in the small intestines when soybeans are roasted, or roasted and then steeped. These nutritive differences may be explained by differences in temperatures, time of heating, moisture of the seed at the start of roasting, and how beans are handled after they come out of the roaster. Beans should not be charred but should be cooked throughout and not raw in the center. Unfortunately, color is not a good indicator of the quality of the roasting process. Scientists are currently studying ways to make this determination.

Canola, Sunflower, and Safflower Seeds: Other oilseeds, such as canola, sunflower, and safflower seeds, can be fed to dairy cows. These seeds contain more oil that is more highly unsaturated and, therefore, lower amounts should be fed. For example, only half as much canola should be fed as compared to whole cottonseed or soybeans.

Free Vegetable Oils or Fish Oil

Free vegetable oils and large amounts of fish oil **should not** be fed to dairy cattle. These sources of fats contain unsaturated fats and the free oil may coat the feed particles or rumen bacteria (bugs) and reduce fiber digestion and milk fat test. Free vegetable oils are found in byproducts such as waste potato chips. Fish oils become a problem when large amounts of fishmeal are fed.

Tallow

Tallow is primarily derived from rendered beef fat but can include other animal fats. It contains more saturated fatty acids than oilseeds and requires special handling equipment since it is a solid or semi-solid at room temperature. Thus, in order to be mixed into feed, it first must be heated.

Nine different grades of tallow are sold which include extra fancy, fancy, bleachable fancy, prime, edible, special, #1, #2, and #3. From research conducted at The Ohio State University, Palmquist recommends that good quality (bleachable fancy) tallow be used for the most consistent animal response.

Yellow Grease

Yellow grease is a byproduct derived from grease used in the restaurant industry. This product may be best used in feedlot rations instead of rations fed to lactating cows.

Specialty Fats

Specialty fats available are summarized in Table 2. These products are commonly referred to as ruminally inert fats. A ruminally inert fat is a fat that will have little effect on rumen fermentation. (They also are commonly called bypass fats. However, all types of fat are not absorbed in the rumen and pass to the small intestines where they are absorbed.)

These products contain 80-99% fat and no other appreciable nutrients. (One exception is Megalac which contains 0.9% calcium; this amount of calcium should be taken into account when balancing rations.) One to one and a half pounds of a specialty fat is the recommended amount to be included in diets for lactating cows. These sources of supplemental fat are the most expensive and, from an economic standpoint, should be used only after the amount of natural fat products (i.e., grains, forages, whole cottonseeds, whole soybeans, and tallow) exceeds 5% fat added to the diet.

Table 2. Summary of Specialty Fat Sources*

Product	Company	Ingredient Composition	Fat %
Megalac	Church and Dwight Co.	Calcium Salts of Palm Oil Fatty Acids	80
Energy Booster	Milk Specialties Co.	Relatively Saturated Free Long-Chain Fatty Acids - Prilled Fat*	99
Booster Fat	Balanced Energy Co.	Tallow plus Soybean Meal Treated with Sodium Alginate	90
Alifet	U.S.A.	Hydrogenated Tallow** Mixed with Wheat Starch and Crystallized	92
Dairy 80	Morgan Mfg.	Hydrogenated Tallow - Prilled Contains some Phospholipid, Flavor, and Coloring Agents	80
Carolac	Carolina Byproducts	Hydrogenated Tallow - Prilled	98

* Shaver, 1990. Fat sources for high-producing dairy cows. Proceedings Minnesota Nutrition Conference.

* Prilled Fat -- Fat processed into small spherical pellets.

** Hydrogenated Tallow -- Tallow that has been chemically saturated.

Recommendations for Feeding Fats

1. With the introduction of any feedstuffs or new ration, cows should be adapted slowly to the new ration.
2. The nutrient content of oilseeds, tallow, and greases can vary between sources. These feeds need to be analyzed routinely to determine their nutrient content, and the purchaser needs to ask questions regarding how these products have been processed.
3. The type of fat added to the diet must be in a form that can be easily and economically handled in the farmer's feeding system. For example, whole fuzzy cottonseed does not flow through bins and, as such, must be stored in a commodity shed and moved with a shovel or front-end loader.
4. When supplemental fat is added, the percentage of calcium and magnesium in the total diet should be increased to 0.9-1.0% calcium and 0.3% magnesium (DM basis). Also, the amount of undegradable protein should be increased by 1% for each addition of 3% fat to the diet. (For each 1 Mcal of NE_L from added fat, add 72 g of undegradable protein.)
5. The recommendation is that diets for lactating cows not exceed 5% total fat from natural fat sources (includes forages, cereal grains, oilseeds, and tallow). Two to three percent would be supplied by the forages and normal cereal grains found in the diet. Two to three percent could be supplied from oilseeds or tallow. An additional 2-3% fat (to make a total of 8% fat in the total ration) can be added by using specialty or ruminally inert fats. Exceeding these recommendations may decrease fiber digestion and cause milk fat depression.

Table 3. Recommendations for the Percentage of Fat in Diets Fed to Lactating Cows

Source	Percentage in total diet
Forages and cereal grains	2 - 3%
Oilseeds and tallow	2 - 3%
Specialty or ruminally inert fats	2 - 3%
Total in diet	8%

When calculating the amount of fat found in the diet, be sure to account for the amount of fat found in byproducts that may be used in the grain mix. For example, dried distillers grains contain approximately 10% ether extract (fat), and hominy can contain 5-12% ether extract. These byproducts increase the amount of fat found in the diet.

6. High-producing herds are the most likely to benefit from the addition of fat. In these herds, fiber contents are at a minimum with large amounts of grain being fed, and fat can be used to increase the energy density of these diets.

In herds where low quality forages are fed, the most economical approach should be used to increase the energy density of the diet. In the long term, this can be accomplished by harvesting high quality forages. However, the short-term feeding of more grain or the addition of fat may be necessary to provide the needed amount of energy to these cows.

When considering when to add supplemental fats to a diet, the bottom line is to formulate a ration that:

- is economical to feed,
- allows cows to produce milk to their genetic potential, and
- fits a farmer's feeding system.

This objective allows dairy farmers to produce milk as profitably as the market situations allow.

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