

FEEDING FAT TO DAIRY COWS

In early lactation, most dairy cows cannot consume enough dry matter to meet their energy needs. This requires dairy cows to utilize body reserves as an energy source. If dietary energy concentration is low, cows will lose excessive body weight, and peak milk production may be compromised. Reproduction may also be compromised due to a severe negative energy balance. A common practice is to add fat to the diet to increase energy concentration. Fat is a more dense form of energy than carbohydrates or protein. One pound of fat contains about as much energy as 3 lb. of corn. Unfortunately, even though fat may correct the energy imbalance, it has the potential to create other problems if used incorrectly. When fat is being considered, it is important to understand both the benefits and limitations.

CHEMICAL STRUCTURE:

Depending on their physical composition, fats are classified into two structural categories, namely, saturated and unsaturated. The building blocks of fat are called fatty acids. Fatty acids are composed of long chains of carbon atoms with attached hydrogen atoms. If a fatty acid has as many hydrogen atoms as it can hold, it is said to be **saturated** with hydrogen. Sometimes, carbon atoms bond to each other more than once, rather than fill up with hydrogen atoms. These fatty acids are said to be **unsaturated** with hydrogen. Most dietary fats have three fatty acids that are connected together to form a **tri-glyceride**. The three fatty acids which make up a tri-glyceride can be any combination of saturated or unsaturated forms. Animal fats tend to have mostly saturated fatty acids and vegetable fats tend to have mostly unsaturated fatty acids. The easiest way to tell the difference is that in a free form, saturated fats are usually solid at room temperature and unsaturated fats are usually liquid at room temperature. Unfortunately, when fat is bound up in other structures (i.e. whole oilseeds) this test is not always true.

PHYSICAL EFFECTS:

Both saturated and unsaturated fats can be used to increase the energy density of dairy rations but, unlike protein or carbohydrates, fats are not utilized by the rumen microbes as building blocks. Rumen microbes break the tri-glycerides back into individual fatty acids, and then add hydrogen to unsaturated fatty acids to make them saturated. This is the extent of microbial fat digestion. The free fatty acids pass out of the rumen and are absorbed further down the digestive tract. Small amounts of fat don't harm the rumen environment, but too much fat has been shown to decrease fiber digestion by the rumen microbes. Although the reasons for this are not clear, some researchers have suggested that fat may inhibit contact between the rumen microbes and feed particles by coating either, or both. Fat also may be toxic to some microbes, and thus alter the rumen microbial population towards microbes less adept at digesting fiber. The end result is that too much fat usually depresses milk fat, and in severe cases may even depress dry matter intake. Saturated fats can usually be fed at higher amounts than unsaturated fats. Saturated fats are more solid than unsaturated fats at the same temperature, and therefore less apt to mix into the rumen fluid to cause detrimental effects.

TYPES OF FAT

SATURATED: Tallow, White grease, Palm oil

UNSATURATED: Most vegetable fats, Whole oilseeds, Yellow grease

ANIMAL FATS

Many Master Mix feeds contain animal fats (HF, high fat versions) to increase energy concentration. Because animal fats are fairly saturated, they are less likely to cause detrimental effects in the rumen. This enables the producer to feed a greater amount of these fats.

LIQUID FATS

Liquid fats are unsaturated vegetable oils, and are often too expensive for producers to feed. Sometimes by-products from another industry (such as a potato chip manufacturer) may be available to an economical price. These types of fats are the most detrimental to the rumen environment. Caution should be used when feeding these types of fats.

WHOLE OILSEEDS

Many producers add unsaturated fats to rations in the form of whole soybeans or whole cottonseed. When fed as the whole seed, unsaturated fats can be fed at slightly higher amounts than when they are in the free form. This is because the fat is not released into the rumen as rapidly.

RUMEN-INERT OR SPECIALITY FATS

Many feed companies (including Master Mix Feeds) offer what is known as "By-pass" or "Rumen-inert" fats in their feeds. These fats are either a tallow which has been artificially saturated to an even greater degree (i.e., Energy Booster 100, Alifet), or fats which have been treated with calcium salts (i.e., Megalac) to make sure that they have very little effect in the rumen. Because these fats are more expensive, it is best to feed as much animal or vegetable fat as permissible, and then add specialty fats to the ration if additional energy is still needed.

FEEDING RECOMMENDATIONS

The following thumb rules based on research and field experience can be used when feeding fat.

FAT TYPE/SOURCE	MAXIMUM LEVEL lb fat/d-1	
Unsaturated, liquid fats	0.5 Whole Oilseeds	
1.0 Saturated	1.5 Combinations (above sources)	1.5-2
Rumen-Inert	1.0-3	

- 1- Maximum level may not work in all situations, or for all producers.
- 2- Do not exceed individual maximum level in a combination.
- 3- Rumen-inert fat can be added once maximum level of animal or vegetable fat is attained. Feeding more than 1 lb/d rumen-inert fat is usually not economical.

RATION ADJUSTMENTS:

FIBER CONCENTRATION

Because fat may decrease fiber digestibility by the rumen microbes, minimum ADF concentrations within the diet should be raised to account for this. Otherwise, insufficient acetate production may result, and milk fat level may decrease.

PROTEIN CONCENTRATION

Efficient milk production results when both energy intake and protein intake are properly balanced. Increasing the energy content of the diet is beneficial only if the cow also has sufficient amino acids available for the desired milk production. When fat is included in the ration, provide a minimum of 38% rumen undegradable protein (RUP).

MINERAL REQUIREMENTS

Within the digestive tract, calcium and magnesium are attracted to fatty acids, and bind with them to form soaps. The concentration of these two minerals in the diet should be increased to account for this.

ITEM	CONCENTRATION	
Protein, RUP	38-42% ADF	Minimum 20%
Calcium	1.0% Magnesium	.3%

SUMMARY

Feeding high-producing dairy cows to meet their energy requirement has been, and will continue to be, a nutritional challenge. Using fat to increase dietary energy concentration is a very common practice. Dairy producers must recognize that quality and quantity of fat are important when balancing dairy rations. Fats can be used to correct energy imbalance, however, one must recognize that there are many limitations to feeding fats.