Choosing the Most Economical and Effective Energy Sources Available for Dairy Diets

Because of world demand for energy sources, it is critical that producers choose the most economical and effective energy sources available for dairy diets. The most effective energy sources are those that promote efficient ruminal fermentation and possibly provide benefits beyond just providing energy. These benefits could include improved reproductive efficiency and promotion of health. Traditionally corn was used as the major energy source in dairy diets, but with the cost of corn in the current market, other energy sources are being considered. Common fat sources have also increased in price. So, choosing the most economical and effective energy ingredient is critical.

In today's dairy economy, high-quality forage is an even more critical component of the lactating cow diet. Nutritionists and producers need to ensure maximum forage utilization is achieved. The balance of various energy sources from carbohydrates to fats is critical for optimizing ruminal fermentation of forages to maximize milk production. Feeding too much rapidly fermentable carbohydrate, such as from grains, and/or not feeding enough effective fiber (promoting cud chewing) can depress fiber digestion of forages. Feeding too much fat, especially ruminally available vegetable fat, will also depress forage fermentation.

The following information will focus on the effects of fat source on production and benefits of feeding a rumen inert (bypass) fat.

Fat Source Affects Ruminal Forage Fermentation and Milk Fat Production

Supplemental fat continues to be a practical means of sustaining energy intake in high producing cows. However, the economic success of using supplemental fat depends not only on proper selection of fat sources, but also on knowing how much fat to feed and when to feed it.

Milk fat depression has been studied for many years and the cause of it has remained a mystery. However in recent years, studies have shown a strong link between the bio-hydrogenation (a microbial form of making margarine) of unsaturated fats (vegetable fat sources and a portion of choice white grease, pork fat) in the rumen to trans-fatty acids and the depression of milk fat production in the mammary gland. The production of these trans-fatty acids seem to be due to a change in the ruminal microbial population and a source of unsaturated fat. The change in the ruminal microbial population is probably why milk fat depression is seen with an improper balance of carbohydrate sources and lack of effective fiber. This theory also helps explain why milk fat depression is commonly observed with ruminally available vegetable fat sources such as finely processed oilseeds and distillers grains.

Use of animal fat and oilseeds, especially whole cottonseed, offered a good, economical source of fat to meet the energy needs of lactating cows. However, in recent months, these fat sources have increased in price more than some other energy sources that can be used in the lactating cow diet. Consequently, many dairy nutritionists are searching for alternative energy sources not only due to the current price situation, but also because animal fat in particular and some oilseeds depress butterfat due to their effects on rumen fermentation and bio-hydrogenation.

Distillers grains (DG) from the ethanol industry have become a common component of dairy diets. It was used mostly as a protein source, but has also become a valuable energy source because of its fat content (8-15%). However, the vegetable oil provided by DG is readily available in the rumen and has great potential to produce trans-fatty acids, depress ruminal fermentation, and depress butterfat production. Thus, feeding DG in lactation diets is somewhat limited because of the potential negative effects on ruminal forage fermentation and butterfat production. Due to rumen active fat's potential effect on ruminal forage fermentation and butterfat production, ADM Animal Nutrition's version of a dairy ration balancing program, incorporates a method to evaluate the amount of rumen active fat fed to dairy cows.

Rumen inert fat sources have been developed to prevent the negative effects on ruminal forage fermentation and butterfat production. The most common rumen inert fat sources include calcium salts of long-chain fatty acids (palm oil is the most common source of these long-chain fatty acids; e.g., Enertia, ADM Animal Nutrition; Megalac®*, Church & Dwight Co., Inc.) and partially hydrogenated fatty acids of hydrolyzed tallow (e.g., Energy Booster 100, Milk Specialties, Dundee, IL). These rumen inert fat sources allow a dairy producer to feed fairly high fat levels (4-6 % of diet dry matter) without detrimental effects on ruminal forage fermentation and butterfat production.

Feeding Enertia, a rumen inert fat, in early lactation rations can effectively and economically boost ration energy density without adverse effects associated with conventional feeding strategies. Using Enertia, soy hulls and soybean meal to replace whole cottonseed in lactating cow rations can be an effective and economical means to lower ration costs and maintain milk production.

Enertia Pellet

Enertia can positively impact body condition, peak milk production, and reproductive efficiency, all critical to profitability. Enertia is offered in several different forms to allow more effective means of improving Enertia intake and reproductive efficiency. Enertia is available in **granular** form (the most economical form) or **pelleted** form which provides a very palatable form of Enertia that competes very well with other saturated, tallow-based rumen inert fats on the market. Some research studies have shown a slight depression in dry matter and energy intake when calcium salts of palm fatty acids (e.g., Megalac or Enertia) are fed compared to the partially hydrogenated fatty acids of hydrolyzed tallow (e.g., Energy Booster 100). This depression in intake appears to be related to the palatability of the calcium salts or soaps.

ADM Animal Nutrition research found that pelleting Enertia reduces the surface area of the soap and produces a more palatable form of these calcium soaps. This research demonstrated that pelleted Enertia was consumed more readily than the granular form. ADM research also showed similar dry matter intake in high producing lactating dairy cows for pelleted Enertia compared to Energy Booster 100.

Enertia r/f

Pregnancy rate of lactating dairy cows has decreased over the past 30 years and has become a great concern for most dairy herds. During this same time period, milk production per cow has greatly increased, and to support higher milk production supplemental fat has become more common in dairy rations. Fat sources can also provide essential fatty acids, such as linoleic (omega-6 fatty acid) and linolenic (omega-3 fatty acids). These fatty acids are needed in order for the cow to produce various metabolites and hormones needed for health and reproduction. In approximately half of the scientific studies published, cows consuming supplemental fat exhibited improved pregnancy rates.

Research over the past several years has focused on the link between these essential fatty acids and their effect on the cow's reproduction and immune system. This research is providing evidence that a significant supply of omega-6 fatty acids can have positive influences on the cow's heat cycle (should help improve heat detection and time of insemination). The omega-6 fatty acids also seem to have a positive influence on the cow's immune system when feed in the transition period (three weeks prior to calving to six weeks post-calving).

This research is providing evidence that supplementing the cow with a significant level of omega-3 fatty acid can have a positive influence on maintaining pregnancy and decreasing incidence of early embryonic death (increase number of confirmed pregnant cows). Reproductive studies require hundreds of cows to detect difference in fat supplements; therefore, these studies have been limited. This requirement has also limited research devoted to investigating specific amounts of omega-6 and omega-3 fatty acids needed to demonstrate a significant response for improved pregnancy rate and immune function.

Enertia is also offered in a reproductive formula (**Enertia r/f**) that provides more omega-3 fatty acid compared to regular Enertia. It still supplies a significant amount of omega-6 fatty acid to help "set-up" the cow for heat detection and breeding through prostaglandin production. The increased amount of omega-3 fatty acid should then promote progesterone production to maintain pregnancy and embryonic survival.

Enertia for Hot Weather

During hot weather when cows are subjected to heat stress, it is usually a good idea to increase the energy density of the ration with an acceptable fat source. Enertia provides a very effective means to increase energy density of the ration and helps maintain butterfat production because of its rumen inertness. This is especially critical under heat stress conditions when the cow typically reduces cud chewing, which decreases saliva production. This in turn lowers rumen buffering, which usually leads to low butterfat production, especially in the presence of ruminally active unsaturated fat sources, such as distillers grains, animal fat, etc. Enertia can provide a nice complement to the use of Thermal Care® in the ration along with heat abatement management strategies.

ADM Animal Nutrition continues to develop exciting, new technologically advanced nutrition products that offer economy of production. Enertia is just one of such products aimed at helping dairy producers achieve a better return on investment. Enertia's economical energy value has proven beneficial in lactation diets.

*Not a trademark of ADM.