JUST AGRICULTURE
multidisciplinary e-Newsletter

Role of Bypass Fat in Animal Production

Deepesh Bharat Mishra[1]*, Gaurav Kumar[2], Prateek Singh[1]
[1]PhD scholar, ICAR- National Dairy Research Institute, Karnal, Haryana-132001
[1]Ph.D Scholar, Animal Nutrition Division, NDRI, Karnal
[2]Ph.D Scholar, Animal Physiology Division, NDRI, Karnal

ARTICLE ID: 093

Introduction

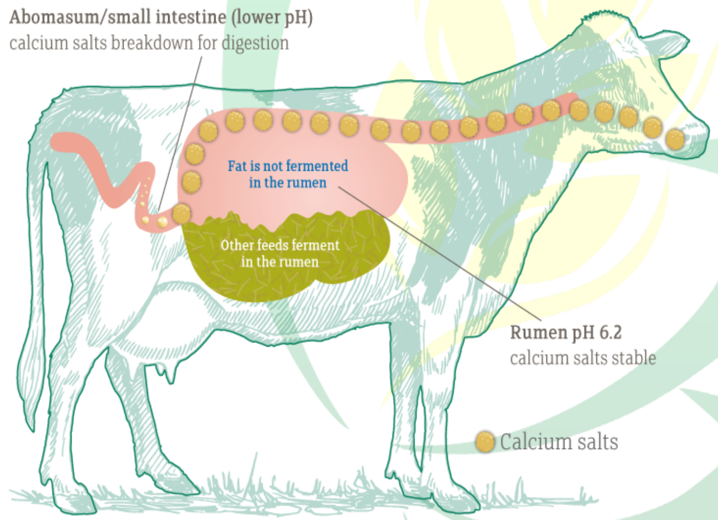
The quantity of energy necessary for body tissue maintenance and milk production in high-producing dairy cows, especially during early lactation, frequently surpasses the amount of energy available from diet (Goff and Horst, 1997). Reduced feed intake as a result of the stress of calving and milk production causes this disease. To meet energy needs, this forces the mobilisation of body fat reserves, which can lead to ketosis and other post-calving problems, as well as decreased reproductive effectiveness. Reduced disease resistance could lead to subsequent infections and a decrease in the animal's milk supply. To circumvent this constraint, the provided ration's energy density must be increased.

Cereal grains have traditionally been the most important source of highly digestible energy in the ration of high-yielding dairy cows. Feeding cereal grains can help to make up for the energy imbalance, although excessive grain feeding has been linked to rumen problems due to acidity. Another feasible strategy is to include fat sources in lactating cows' diets. Due to their high energy density, fat boosts energy intake to enable increased milk production. As a result, fat supplements may help animals achieve their energy needs; also, in some cases, providing energy in the form of fat rather than carbs may be less expensive. Increased caloric density without affecting fibre digestion, increased energy intake for higher milk supply during early lactation when cows do not drink enough feed, and increased energy usage efficiency are all direct benefits of adding fat to dairy cattle rations in small amounts.

It is thought that adding 3 to 5% fat to total DM increases milk production, but the lowering effect of un-esterified fatty acids on rumen cellulolytic microbial activity (Palmquist and Jenkins, 1980) has limited its usage at higher concentrations. As a result, a maximum fat concentration of 6-7 percent of dietary DM is recommended (Sklan et al., 1989). In both cattle and sheep, adding fat to the ruminant diet above this level reduced fibre digestibility. Four explanations were proposed by Davendra and Lewis (1974) to explain this effect:

1. Microbial assault is prevented by a physical layer of fat on the fibre.
2. A change in the rumen microbial community as a result of fat's harmful effects on certain microorganisms.
3. The surface-active action of fatty acids on cell membranes inhibits microbial activity.
4. Insoluble compounds formed with long chain fatty acids reduce cation availability.

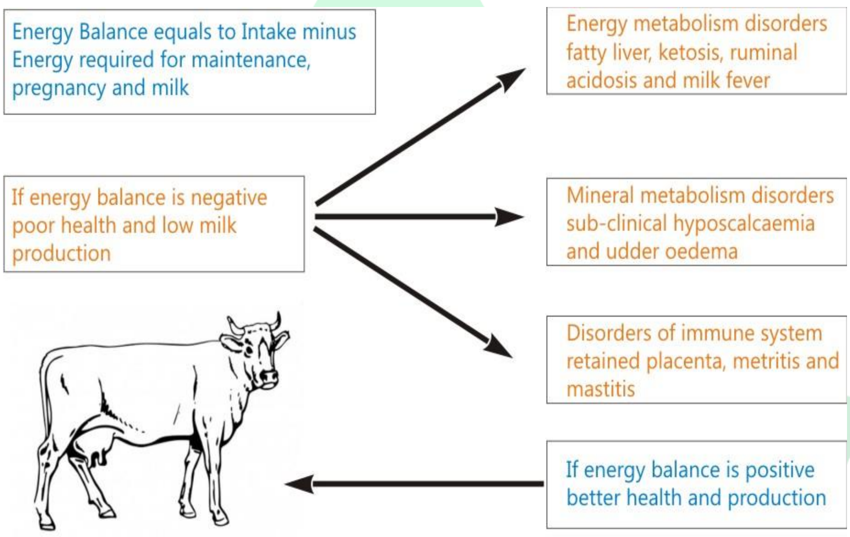
Various approaches of fat preservation have been used to minimise the extent of lipid ruminal bio-hydrogenation and the negative effect of additional fats on carbohydrate digestion. 'Fat sources specifically intended to prevent biohydrogenation by ruminal bacteria and affect the fatty acid profile of bodily tissues and milk' is how the term "protected fat" is defined.



Various methods have been developed to protect fat. Feeding oilseeds instead of oils gives a slight protection (Jenkins, 1993). Different technological treatments, either physical or chemical have been developed to improve this protection. First method is the encapsulation of an emulsion of oil by formaldehyde treated protein. This coating is disrupted in abomasum. Because of the physical action of mastication on the items, protection is usually only partial. The development of technology for producing Ca soaps of fatty acids has rekindled interest in bypass fat research. Jenkins and Palmquist (1984) introduced this strategy due to the connection of Ca and FA as soaps, also known as salts, were assumed to be inert in the rumen. Protected fat is sometimes referred to as fat prills. Saturated lipids with a high melting point are subjected to a physical treatment (Schauff and Clark, 1989) in order to render them inactive in the rumen. Ruminal disturbances are often mild to severe with C16 and C18 fatty acids in such products.

JUST AGRICULTURE
multidisciplinary e-Newsletter

Feeding bypass fat to high-producing nursing cows, which is inert in the rumen, can increase ration energy density and intake in early lactation without impairing rumen cellulolytic bacterial activity (Jenkins and Palmquist, 1984). It is therefore possible to avoid the detrimental effects of acute negative energy balance on lactation. Protected fat was formerly thought to be just an energy supplement that improved reproductive performance during the transition phase, but it was later discovered that the benefit was partly due to fatty acids, which act as a precursor of progesterone via cholesterol and prostaglandins. Higher cohesion has been reported as a benefit of adding fat.



The availability of protected fatty acids serves the dual benefit of enhancing the reproductive efficiency of livestock on one hand and as a source of important unsaturated fatty acids through milk for human population on the other.Obesity and heart related problems in human population are a epidemic for today's world and the diet conscience consumers now a day's give preference to foods that are low in fat, cholesterol and saturated fatty acids. Consumers should limit their intake of saturated fatty acids from dairy products, according to medical and nutritional guidelines. Milk fat contains 70-80 percent saturated fatty acids and 20-30 percent unsaturated fatty acids. The mono-unsaturated fatty acid oleic acid makes up the majority of unsaturated fatty acids (70 percent). According to the milk fat round table discussion (O'Donnel, 1989), the optimal milk fatty acid composition should have less than 10% PUFA, up to 8% saturated fatty acids, and the remainder (82%) MUFA. The development of rumen inert fats, such as Ca salts of fatty acids, provides partial resistance to ruminal microbe bio-hydrogenation and modifies the fatty acid composition of milk and human tissues.