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12-13-2001

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Proceedings, The Range Beef Cow Symposium XVII
December 11, 12 and 13, 2001, Casper, Wyoming

FAT SUPPLEMENTATION FOR BEEF COWS

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It has long been known that adequate energy is required for high reproduction in beef cows. Historically, most high energy supplements contained starch from grains such as corn, barley, etc., which may cause some negative effects on forage digestion when fed at relatively high levels. This is especially true when the ration is deficient in protein. An alternative to energy supplementation is utilizing plant and animal fat, which are much higher in energy than grains such as corn or barley. Early research has shown that very high levels of fat in the diet (in excess of 6-8% fat in the overall diet) lower forage digestion. It is felt that this may be due to fat coating the forages and may also alter the rumen microflora populations.

On the positive side of fat supplementation, more recent research was released from Ft. Keough (USDA) Station at Miles City, Montana that showed when 2 year old heifers were fed crushed safflower seeds, which are high in fat, before calving that pregnancy rate increased 18.5%. This research was initiated to evaluate the effect of fat supplementation on cold tolerance of new born calves, which was why the fat supplement was only fed pre-calving. Fat did appear to improve the cold tolerance of the new born calves, which is believed to be due to an increased level of "brown fat" in the new born calf, which is readily available as an energy source of the new born. In this early study the crushed safflower seeds that were fed were high in linoleic acid, which may be important in the composition of deposited fat. Although a tremendous gain was made in reproduction, a concern with this data is that the controls that were not fed supplemental fat only had a 57% pregnancy rate. This of course is usually much lower than experienced in most cow herds even with 2 year old, first calf heifers.

This research stimulated several other universities and the feed industry to conduct studies with fat in cow diets. Several feed companies currently manufacture and sell products containing relatively high levels of fat. As is often the case, when new concepts are researched, additional research has shown mixed results especially in the area of reproduction. A follow-up study at Miles City showed an equal response in pregnancy rate when soybeans, safflowers and sunflower seeds were fed. In this study, the overall reproductive rate was much higher. The heifers that were supplemented with the fat sources had pregnancy rates of 90-94%, while the controls were 79%. An interesting finding in this study was that the weaning weight of the fat supplemented calves were significantly heavier (17 lbs) at weaning than calves from the control cows. This was true even though fat supplementation was only provided before calving, raising the question, what effect does fat have on the hormonal pattern in young cows, if any? In this study, an improvement in pregnancy rate and weaning weight was achieved and yet no significant differences were found in cow weight, body condition changes, or calf birth weight.

In a more basic research trial with Brahman cross, first calf heifers in Texas were fed

different sources of fat after calving and they found increased follicular activity and an improvement in reproductive rate. The pregnancy rate was 94% for the fat supplemented cows versus 71% for the control heifers. The Texas researchers conducted considerable basic research in evaluating hormonal patterns, plus measuring follicular activity. There was a trend for more and larger follicles to be produced on the ovaries in the fat supplemented heifers. For example, the fat supplemented heifers had 3.6 active follicles 29 days after calving versus 2.3 follicles in the control heifers.

As indicated earlier, not all data have shown benefits to supplementing fat. Data from Oregon, where crushed safflowers were fed to cows after calving, found no differences in cow weight change or rebreeding performance. As indicated, the supplementation in the Oregon study was only after calving while supplementation in Ft. Keough was before calving, which may explain why different results were achieved.

In a very detailed study at the University of Wyoming, where first calf heifers were individually fed and supplemented with two different types of crushed safflower seeds after calving, no benefit was found in cow weight or rebreeding performance. In their study, one type of the safflower seeds contained primarily oleic fatty acid, while the other source of safflower seeds contained high levels of linoleic fatty acid. The fat sources did alter the fat composition in the heifers' milk considerably, as well as it had some effect on the composition of the cows' body fat.

It is unclear at this point if the source of fatty acids in the fat is important. Questions arise as to what effect fat and the fatty acids may have on the cows' metabolism and hormonal patterns. Fat is much higher in energy (TDN = 180%) than grain, such as corn or barley, however it appears that fat supplementation to cows is more than a direct energy response.

Some excellent research from Colorado State with fish oil supplementation has aided in answering perhaps why some of the benefit in reproduction is found. Fish oil is high in what is referred to as Omega 3 fatty acids, which is similar in chemical composition to linoleic and oleic fatty acids and <u>may</u> have similar effects on reproduction. The Colorado State research has found that reproductive rate tends to be slightly higher in first calf heifers that have been supplemented with fish oil. Their research has found that a lower embryonic mortality has occurred in very early pregnancy (first 21 days). This appears to be due to lower levels of prostaglandins presented to the uterus, thus providing a "quieter" environment allowing conception and pregnancy to continue.

Currently, the level of fat that is recommended to be fed should bring the total fat level up to at least 4% fat in the total diet. This usually means that approximately .4 lb of supplemental fat would need to be fed in a high roughage diet. Supplementing 2 lbs of a 20% fat supplement would be an example of a supplemental program. Unfortunately, supplements with this high level of fat pose considerable challenges in manufacturing. Also the cost of these high fat supplements is usually relatively high. One supplemental source that provides both high levels of fat but also includes high levels of protein is extruded soybeans or perhaps feed grade soybeans.

Researchers in Missouri compared feeding 3.5 lbs of whole soybeans to mature cows with 4.2 lbs of a supplement containing 1.1 lbs of soybean meal and 3.1 lbs of corn gluten feed 45 days before calving. In the first study, when soybeans were fed 45 days prior to calving, first service conception rate and pregnancy rate increased 7%. Feeding the higher fat soybeans after calving did not improve reproductive performance. In a follow-up study, similar results were found when soybeans were fed either 30 or 45 days before calving on first service conception and overall pregnancy rates. The obvious problem with feeding products such as soybeans or crushed safflowers or sunflowers is the need to feed in bunks or experience considerable waste. Questions arise whether these oil seeds need to be crushed or in the case of soybeans should they be heated or extruded? Data would indicate that soybeans do not need to be processed for beef cattle. The anti-trypsin factor that is a problem in swine diets is primarily destroyed in the rumen. Oil seeds that have hard seed coats such as sunflowers need to be crushed in some way before feeding.

Self-fed commercial blocks or tubs containing high levels of fat offer several advantages. The added cost of bunks or waste could be alleviated, plus it may be easier to deliver self-fed supplements on a less frequent basis. Some have used self-fed supplements to improve pasture utilization by placing them into areas that have historically had low utilization.

In summarizing the data, it appears that in most trials reproduction and cold tolerance (where measured) have been improved and in some cases at very high levels. In a couple of trials cited, no improvements were found in economic factors such as cow weight gain or reproduction. It is not apparent what factors may be different, but perhaps time of feeding (before or after calving) may be important. Even though it appears unsaturated fatty acids in the fat sources are important, it is not clear if any one fatty acid source, such as linoleic, is more important than other fatty acids.

Economic Consideration

As more research is conducted, it will be clearer as to the magnitude of the effect and the basic reasons for the effect, if present. The ultimate question today is, based on the knowledge we have, will feeding fat supplements increase economic return? A very simple way of evaluating is to ask, when considering additional cost how much more performance, especially reproductive rate, will be needed to justify cost?

For example, if we assume that it costs an additional $.25 per day to feed fat for 60 days, then that adds $15 to the cows' supplement cost. If we assume that an open cow is worth $250-$300 less than a pregnant cow, then an increase of 5-6% in pregnancy rate would be needed to offset the added cost. That does not assume other possible benefits such as increased calf survival in cold weather, improved pasture utilization, or additional cow gain or weaning weight of the calf. The added cost may be considerably less if a market can be found for inexpensive oil seeds, such as soybeans, even with added cost of bunks.

Currently, the cost of soybeans in eastern Nebraska is approximately $133/ton, so if they are valued at $150/ton in the intermountain range, the cost would be $.26/day if fed at 3.5 lbs/day. They would not only meet the protein needs, but would also provide .7 lb of added fat

to the cows' diet. In some cases soybeans that are not high enough for crushing quality can be purchased at a reduced level for feeding. The advisability of adding fat to the supplement will depend on the reproductive rate that a producer is currently achieving. If they routinely have 94% or higher pregnancy rate, it is doubtful that adding fat to the diet will be economically advisable unless it is cheaper than other energy sources. If reproductive rate is lower than 90%, then perhaps fat may be one factor, along with all other factors that affect reproduction, that should be considered.