

Dairy Cow Health and Metabolic Disease Relative to Nutritional Factors

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This NebGuide describes the various implications and effects of dairy cow metabolic problems, their causes, and management recommendations for prevention.

Nutritional imbalances, deficiencies, or erratic management of feeding programs for dairy cows can create large numbers and various types of health problems generally categorized as metabolic diseases.

Compounding the problem are the ever-changing nutritional needs of the cow, her lactation/dry period needs, feed quality changes, and the producer's personal management practices.

Herd health programs, as recommended by the veterinarian, must include a way to avoid metabolic disorders and prevent or control infectious disease. Frequently when metabolic disease increases, opportunistic infectious disease also increases.

Stress from metabolic problems may decrease the cow's resistance and compromise immune system function. If these diseases are not prevented, very costly consequences in the reproductive, milk production and human resource areas will occur. In some herds there have been death losses of up to 20-25 percent reported over a year's time, in addition to other related costs, as a result of these disease implications.

Nutritionally Related Dairy Herd Disease

I. Energy metabolism associated disease:

- A. **Fat cow syndrome.** Excess energy (concentrates, corn silage, some hays) fed during the dry period may cause obese cows near calving time. These "too fat" cows are more susceptible to a number of other metabolic problems (milk fever, ketosis, displaced abomasum, retained placenta, metritis), and the chance of dying is more likely.

It is not uncommon in some operations for overweight Holstein cows to weigh 1,600 to 2,000 pounds, which frequently creates problems. Feeding strategy is recommended to restore lost body condition during late lactation. Not only will this practice help avoid severely overweight cows, but feed conversion into body tissue is more efficient during late lactation, compared to the dry period.

Try to achieve a body condition score of about 3.5 at dry-off, and then maintain this condition during the dry period to minimize the incidence of fat cow syndrome. (To learn more about proper techniques of body condition scoring, refer to NebGuide 1583, *How to Body Condition Score Dairy Animals*.) The fat cow syndrome can be associated with every other metabolic disease discussed in this section.

- B. **Ketosis.** This metabolic disease occurs most frequently in early lactation and may be associated with other problems, such as fat cow syndrome, retained placenta, mastitis, metritis, and displaced abomasum. Ketosis-positive cows always should be examined for these other complicating factors.

Ketosis signs include "off-feed," weight loss, decreased milk production, listlessness and other unusual signs.

Ketosis is best prevented by keeping cows in good condition, **but not fat**, during the dry period. Begin to "lead feed" grain 10-15 days prior to calving. Increase the grain ration about 1 pound per day up to a maximum level of 15 pounds. Feed changes during the first six weeks of lactation also should be gradual. During lactation, good quality, high energy, palatable feeds should be fed.

- C. *Retained placenta.*** Retention of the afterbirth in dairy cows is common, but with proper management it can be maintained at 10 percent of the cows or less.

The effect of retained placentas on subsequent fertility is due to delayed involution of the uterus and chronic metritis, one of the more common causes of infertility. In most cows the major economic loss is due to a delay in conception, with associated loss of milk production.

Prevention of retained placentas is the key. For this disorder, it's difficult to pinpoint an exact cause, as many direct or indirect factors can be incriminated. The optimum plan is to maintain a healthy, properly conditioned cow prior to, during and after parturition. A balanced dry cow ration during the 45-60 day dry period; daily exercise; clean, dry and comfortable calving areas; and proper sanitation during the calving period minimize the chances of retained placentas.

Vitamins A and D and selenium-deficient cows have high placenta retention rates. Injections of these medications as advised by a veterinarian may be administered eight weeks prior to calving if a deficiency is suspected.

- D. *Infertility*** caused by nutritional problems include cows that may be too fat or too thin. Causes other than nutrition must be considered when obvious nutritional problems are lacking.

Cow body condition evaluation is important because extremely thin or too-fat cows' reproductive efficiency is considerably reduced. The too-fat cows have more problems post-calving (retained placentas, metritis, cystic ovaries) while the too-thin cows usually have breeding problems due to prolonged time lapse before resuming normal heat cycles (30-40 days post-calving).

Maintain and record body condition scores which rate 1 as too thin and 5 as too fat. Lactating cows, at peak production, should not drop below 2.5 and should be dried off at 3.5, and maintain this score throughout the dry period. Degree of overconditioning is related to the cow's initial condition, her own feed efficiency ability, energy in the feed, duration of excess energy intake, reproductive status, and level of milk production.

II. Diseases associated with low fiber/acidosis:

- A. *Bloat*** is a common problem when forage-to-concentrate dry matter ratio is too low. Generally, when feeding predominantly corn silage diets, do not go below 55 percent of the ration dry matter. When feeding haylage diets, do not go below 40 to 45 percent of ration dry matter.

Animals receiving rations that cause chronic bloat do poorly as ruminal pH is too low (too acidic), and normal digestion of nutrients is impaired and further feed intake is minimal.

A frothy, acute form of bloat can also occur when cows consume large amounts of certain legumes such as fresh, lush alfalfa and clover. Grazing of these forages must be carefully managed to avoid bloat.

- B. *Laminitis*** (foot problems and founder). This is a sequel to the bloat and indigestion/off-feed condition when the forage-to-concentrate ratio is too low. Laminitis causes lameness, continual discomfort when cows are standing, and poor performance.

- C. *Indigestion/off-feed*** occurs when considerable starch imbalance continues and creates very high ruminal acidity. Chronic (long duration) fluctuations in feed intake are common signs of low-fiber diets. A cow cannot maximize feed intake or milk production while on this feed intake "roller coaster."

- D. *Liver abscesses*** generally follow prolonged low forage-to-concentrate ratio and ruminal acidity to the point that excess acid may promote or cause rumen erosion/ulcers from which various bacteria may enter the bloodstream. These bacteria are filtered out by the liver, resulting in liver infection and creating abscesses, which impair liver efficiency.

- E. *Displaced Abomasum.*** Displaced abomasum (DA) is a disorder of cattle in which the abomasum (fourth or true stomach) becomes distended with gas, fluid, or both, and shifts to an abnormal position. The abomasum generally moves to the left and upward, coming to rest between the rumen and the left abdominal wall.

Most DAs occur in cows within two weeks after calving, so the conditions associated with calving appear to be at least one predisposing factor. A high concentrate (grain mix) level in the dry cow ration during late gestation and after calving appears to substantially increase the incidence of DAs.

Signs of DAs resemble ketosis (off-feed, intermittent eating), scant bowel movements, normal temperature, reduced milk production, and listlessness and general discomfort. Some less common types of displaced abomasums (right DAs) show signs somewhat different from those described above.

The treatment of these conditions usually involves abdominal surgery — correcting the displacement, by attaching the abomasum to its normal position by sutures, so the displacement cannot recur. Proper feeding, as mentioned above, can reduce incidence of DAs.

- F.** **Low milk fat content** can occur by feeding low forage-to-concentrate ratios, or rations that are high in fat, in which the forage has been too finely ground. Milk fat depression may be associated with acidosis, off-feed problems, and sore feet. Supplying the cow with adequate dietary fiber, both in terms of level and particle size, usually eliminates these interrelated nutritional problems.

Various buffers such as sodium bicarbonate can be useful in maintaining milk fat content when high concentrate rations are fed. Often buffers will stimulate feed intake, making them especially valuable for early lactation cows. Recommended feeding levels of sodium bicarbonate are between 0.5 and 0.75 percent of ration dry matter per head daily.

III. Calcium/Phosphorus metabolism diseases/ complications

- A.** **Hypocalcemia (Milk Fever)** generally occurs at or near calving. It is caused by a large calcium demand at the onset of milk production. The cow is unable to meet this calcium demand, due to ration imbalance, Vitamin D influence or parathyroid gland activity, all of which influence regulation of these metabolites during the dry period.

Milk fever signs include staggering, inability to rise, muscular weakness, recumbency (laying down) and a subnormal temperature. The following are other problems that may occur due to milk fever:

1. Difficult calving due to muscular weakness that prevents proper labor.
2. Increased chance of uterine prolapse.
3. Tendencies to increase retained placentas.
4. Increased possibility of metritis (uterine infection).
5. Decreased reproductive performance.
6. Increased tendencies to bloat due to rumen muscle tone loss (atony).
7. Greater numbers of abomasal displacements.
8. Much greater risk of ketosis.
9. Considerably greater risk of developing mastitis.
10. Greater risk of other infectious disease.
11. Decreased milk production.
12. Reduced total productive life in the herd.

The after-effects of hypocalcemia conditions are very costly, illustrating the importance of prevention.

- B.** **Disease Control of Calcium/Phosphorus Imbalance.** The most important and critical time to adjust imbalances causing metabolic problems due to calcium/phosphorus is the month prior to calving.

Requirements include:

1. Limit precalving calcium intake. Feeding an excess tends to inhibit normal calcium mobilization from the bones.
2. Total calcium requirement for a 1,200-pound dry cow is approximately **40 gm/day**. In general, try not to feed in excess of 0.40 percent calcium (percent of ration dry matter) to dry cows.
3. Nutrients fed to the cow should be generally low in calcium. For example, alfalfa contains approximately 6 grams of calcium per pound. The calcium intake could easily be in excess if alfalfa was the only feed.
If milk fever problems persist, limit total calcium to less than 60 grams per head per day. If herd problems of hypocalcemia continues on, reduce the precalving ration further to 20-25 gm per day.
4. Avoid feeding high phosphorus levels. Phosphorus requirement is 28-30 gm/day and should be maintained near this level. Try to feed approximately 0.24 percent phosphorus as a percentage of ration dry matter.
5. Keep pre-calving potassium levels as low as possible because high forage potassium levels may predispose cows to milk fever regardless of calcium intake. Forages low in potassium are usually low in calcium. If this is not practical, consult with a nutritionist about feeding anionic salts to dry cows.

IV. Other feeding management-related disorders that occur include:

1. **Hardware disease** is ingestion of metallic particles, wire, or nails in feed that can cause serious internal damage, chronic disease, poor performance and possible death.
2. **Indigestion** and poor performance due to poor feed quality, poor clean-out of bunks and feeders, and disregard for environmental facilities' abilities to provide proper comfort and shelter.
3. **Acidosis** due to poor timing or adaptation to feed, wrong forage-to-concentrate ratios, animal crowding at the feeding areas, or other negligent practices.
4. **Udder edema.** Severity of this disorder may be aggravated with nutritional imbalance. Excess energy, protein, salt and deficient magnesium may be implicated as possible causes. University of Tennessee researchers have produced some data indicating magnesium supplementation of 18 gms per head per day beginning 42 days prior to expected calving date has shown promise in reducing udder edema.

In summary, good nutritional management guidelines to keep metabolic disease low include:

1. Feed a ration balanced for protein, energy, fiber, vitamins and minerals. (For more information refer to NebGuide 1629, *Nutritional Management of the High Producing Dairy Cow in the 21st Century.*)
2. Group cows according to production and adjust body condition accordingly during lactation.
3. Dry cows off at a 3.5 body condition score, the desired score for the dry period and at calving. Maintain this condition throughout the dry period, avoiding the fat cow syndrome and related metabolic disorders.
4. Provide exercise for dry cows.
5. Maintain a balance of forage-to-concentrate in the total ration after calving to maximize intake but to prevent digestive upsets (ketosis, acidosis, DAs) during adaptation to the peak lactation ration.
6. Feed grass hay, haylage or pasture to dry cows to minimize calcium intake to prevent milk fever.
7. Limit corn silage fed to dry cows to approximately 30-40 pounds daily and feed approximately 10 pounds of grass hay or equivalent forage.
8. Limit concentrate feeding after peak lactation and conception have occurred.
9. Maintain a 12- to 13-month calving interval to avoid long dry periods by providing good health and nutrition measures and expert reproductive practices.

The goal for good production is to prevent feeding management diseases, provide the cow with a clean, dry, comfortable environment, and good water sources to maximize the intake of a palatable, well-balanced ration that meets her present production needs.

To solve problems described in this NebGuide, work with your local veterinarian, diagnostic laboratory, nutritionist, and extension personnel to prevent costly metabolic diseases.

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