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Therapeutic nutrition for dairy cattle

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Topics Include:

INTRODUCTION

A number of nutritional products and feeding management strategies can be used as supportive treatment for various metabolic and infectious diseases. Proper nutrition can minimize the incidence or help control metabolic, infectious, and reproductive disorders in a dairy herd. In this fact sheet information will be presented on the topics of clinical testing, supportive therapy, and prevention of common disorders affecting dairy cattle. It should be noted that infections may complicate a situation and may be the primary factor in some disorders that appear to be entirely metabolic in nature.

There are several indicators that a possible nutritional problem exits. Consider the following when evaluating a herd.

1. Abnormally high incidence of metabolic disorders. Usually an incidence greater than 10 to 15% in a herd is considered a problem.
2. Increased incidence of infectious disease and poor response of animals to vaccinations.
3. Higher than normal occurrence of weak or silent heats and low conception rate.
4. Milk fat content that deviates more or less than 0.3% from breed average for the season of year.
5. Milk protein content that deviates more or less than 0.2% from breed average for the season of year.
6. High incidence of off-flavors in milk, especially rancidity, oxidized or cardboardy milk, and malty or unclean tastes.
7. Excessive decline in milk production, failure to achieve high milk yields during peak lactation, and generally lower production than what nutrition or genetics would warrant.
8. Greater than 10% of the herd is classified in the extreme categories of body condition. This would be based on the five point scale of 1=very thin and 5=obese.
9. Depressed dry matter intakes for the whole herd or within certain milking groups.

There are several fact sheets and publications available from Penn State that provide more detail on several of the disorders presented here. They include:

- Trouble-shooting milk fever and downer cow problems – DAS 96-27
- Trouble-shooting infertility problems in cattle – DAS 93-39
- Heat detection and timing of insemination for cattle – EC 402
- Survey tool for the mastitis problem herd – VSE 9.4-3
- Dairy Reference Manual – NRAES-63

OFF-FEED PROBLEMS

A. Supportive clinical tests

1. Ketone levels can be checked on individual animals. It is recommended to check milk ketone levels rather than urine ketone levels. The urine test is somewhat overly sensitive for diagnosis. The milk test is more conservative but more accurate in indicating when there may be a problem.

2. All ensiled feed and water should be tested for pH. Water should also be tested for total bacteria and total coliform counts.
3. Mycotoxin screens should be conducted on individual feeds or on the total mixed ration, especially when cows are experiencing hemmorragic diarrheas, irregular estrus cycles, and low conception rates.
4. Carefully examine animals that are off-feed for signs of bovine respiratory disease. In adult dairy cows, signs may be limited to moderate increases in temperature and respiratory rate. Consider serology for IBR, BVD, BRSV, PI_3 and/or a tracheal washing for bacterial culture.
5. If it is a herd problem, a metabolic profile may be warranted. A representative group of early and close-up dry cows and cows fresh greater than three weeks is suggested. Tests to include would be a differential white blood cell count, blood urea nitrogen, serum minerals, fibrinogen, and in chronic cases, arginase (possible indication of liver damage). High white blood cell counts are often associated with chronic infections or leukosis. Abnormally low white blood cell counts are sometimes found in animals with an acute infection and viral diseases. Fibrinogen generally is elevated in animals with an inflammation from abscesses, neoplasia, peritonitis, salmonellosis, or fractures.

B. Supportive treatment

1. There are several feed additives that can be administered. They include B-complex boluses, or two to four ounces daily of dried brewer's yeast, or four ounces of live cell yeast for 5 to 10 days, or three to six grams daily of aspergillus oryzae for 5 to 10 days, or feeding sodium bicarbonate.
2. Encourage intake by feeding unusual feedstuffs to those animals that are severely off-feed for several days. Items could include different forages like grass hay or straw, calf starter, or cereal grains. If at all possible, encourage forage intake over concentrates.
3. Try sources of rumen bypassable or protected amino acids.
4. Look for complicating infections or inflammations.
5. Consider additional supportive treatments for ketosis (see next section).

C. Prevention

1. Balance rations with an emphasis on crude protein, soluble intake protein, undegradable intake protein, forage and total neutral detergent fiber, calcium, magnesium, sodium, and chloride intakes for both dry and lactating cows. Maintain the proper mineral balance during the dry period.
2. Avoid overfeeding concentrates to dry cows and recently fresh cows. Close-up dry cows should not receive over 30% of the total dry matter intake as concentrate. In conventionally fed herds, gradually increase grain from 1.0% of body weight after calving. In herds feeding a total mixed ration, recently fresh cows should not receive greater than 50 to 55% concentrate dry matter.
3. Keep sodium bicarbonate in the lactating cow ration, especially for just recently fresh animals.

OFF-FEED PROBLEMS, CONT.

4. Full feed good quality forage for the first one to two weeks after calving. Avoid or feed reduced amounts of abnormally fermented feeds for two weeks prior to and six to eight weeks after freshening. Upgrade forage quality two to four weeks prior to calving if a low digestible forage(s) is being fed during the early dry period. Check and monitor forage intake and particle size of the diet.
5. Administer high-calcium boluses (75g calcium carbonate total) as soon as possible after freshening and within eight hours of parturition.
6. Sample and analyze total mixed rations for the dry cows and post fresh groups and compare to the programmed specifications. Check feeding rates on a routine basis.
7. Test drinking water for heavy bacterial contamination, pH, and nitrates.
8. Check that cows do not have access to excessive amounts of acorns, apples, green-chopped corn silage, toxic weeds, and heating forages.

KETOSIS

A. Supportive clinical tests

Supportive clinical tests would be the same as those listed under the section on off-feed problems. Herds with a high incidence of ketosis may also be complicated by infectious involvement. There is also evidence of either too low or high protein intakes with these particular herd problems.

B. Supportive treatment

Supportive treatment would be very similar to those listed under the section on off-feed conditions. There are some additional treatments that can be administered. These include:

1. Provide 8 to 12 ounces of propylene glycol orally per day for several days.
2. Administer orally 12 grams of niacin daily for one to two weeks.
3. Administer parentally one to six milligrams of vitamin B_{12}.

C. Prevention

Preventative steps or precautions in addition to what is listed under the section on off-feed conditions include:

1. Avoid obesity or body condition scores greater than 4 (1 to 5 scale) in dry cows and springing heifers.
2. Provide six grams of niacin orally per cow daily starting two to four weeks prior to expected calving and continuing for 90 to 120 days postpartum.
3. Avoid sudden changes in the physical nature of the feeds within the ration.

MILK FEVER

A. Supportive clinical tests

1. It is recommended to sample blood from four to seven dry cows and any clinical cases prior to treatment. Important parameters to include in the profile are serum minerals, packed cell volume, white blood cell count (plus differential) and blood urea nitrogen. In a herd wide problem, consider selenium and vitamin E. It is important to determine if milk fever is being complicated by a low magnesium status. In typical milk fevers, magnesium is elevated.
2. If a cow does not respond to milk fever therapy culture milk samples from all four quarters.
3. If a downer cow is necropsied, look for white muscle disease and cardiac calcification, multiple leg fractures in bred heifers, and spinal cord compression or injury.

B. Supportive treatment (use *one* of the following)

1. Use plain calcium borogluconate for the first treatment to minimize incidence of refractory cases.
2. Administer high calcium boluses (about 75 grams of calcium carbonate) as soon as possible after calving and within eight hours of freshening; or administer calcium paste paying close attention to the manufacturers recommendations and directions.
3. For downer cows not responding to treatment, give a drench of two pounds of Epsom salts in one gallon of water. This will sometimes remove toxins in the lower gastrointestinal tract and enable cows to stand within two to four hours.
4. Inject intramuscularly 10 million units of vitamin D_3 in a water-soluble, highly crystalline form within 24 to 48 hours of expected freshening. Do not repeat dose for at least 10 days if cow doesn't freshen. Use three million units in a repeat dose.
5. Feed 100 grams (3.5 ounces) of ammonium chloride per head daily beginning not less than two days before and continuing at least two days after freshening. The ammonium chloride should be mixed with the grain or other quickly eaten feed. This therapy is particularly appropriate if high rumen pH is suspected. Check urine pH promptly.

C. Prevention

1. Feed a balanced ration throughout the early and close-up dry period. Avoid low or high calcium intakes, meet magnesium, potassium, and selenium requirements. Dry cows should receive between 15,000 and 25,000 units per head daily of vitamin D. A maximum intake of 50,000 units per head daily should be used for all cows.
2. Check feeding management practices, especially if animals have free-choice access to forages and minerals. Animals should be limit-fed all forages, grains, and minerals.
3. Limit concentrate intake to a maximum of 0.5 to 0.8% of body weight during the last two to four weeks prior to calving.
4. If milk fever is a herd problem, then feeding an anionic or acidic diet may help in the control and prevention. The anionic salts should be fed in a total mixed ration and dry cows should receive them at least three to four weeks prior to expected calving. Urine pH can be checked to help monitor the effectiveness of the anionic ration. Urine pH on an anionic ration (<0 mEq/100g) should be between 6.5 to 5.5.

GRASS TETANY

A. Supportive clinical tests

1. A blood profile should include serum minerals. If sudden deaths occur, selenium and vitamin E should be added.
2. Check for white muscle disease and multiple leg fractures in downer young stock if an animal is necropsied.

B. Supportive treatment

1. Two ounces of magnesium oxide can be given orally per cow daily.
2. Epsom salts can be given orally at two pounds per gallon of water.

C. Prevention

1. Proper mineral intake, avoiding deficiencies and excesses, should be maintained on calcium, phosphorus, magnesium, potassium, copper, and salt.
2. If there is white muscle disease involvement, check intakes of selenium and vitamin E. If multiple leg fractures or cardiac calcification are determined to be present, check for proper intakes of vitamin D.

DISPLACED ABOMASUM

A. Supportive clinical tests

1. Check fecal and urine pH. In normal cows, fecal pH should be between 6.5 to 7.1 with most cows falling in the range of 6.6 to 6.8. Urine pH for dry cows that are not on an anionic diet generally falls between 7.0 to 8.0.
2. Screen forages, grains, and/or the total ration for mycotoxins.

B. Supportive treatment

1. Treatment would be similar to items listed under the section on off-feed problems and ketosis.

C. Prevention

1. Avoid acidosis from occurring due to over-feeding concentrates and under-feeding forage. Evaluate rations for their contents of forage and total neutral detergent fiber and nonstructural carbohydrates. Take into consideration the levels as well as how the feeds have been processed.
2. Avoid alkalosis from occurring due to excessive mineral or protein intakes.
3. Avoid toxemia and calcium-related problems. Nutritional factors related to causing milk fever can also cause a displaced abomasum.
4. Feed sufficient forage with reasonably good digestibility and particle size. Early dry cows should receive 1.5 to 2.0% of their body weight as forage dry matter. Close-up dry cows should receive 1.0 to 1.4% of their body weight as forage dry matter.
5. Avoid excessive grain intakes prior to parturition. With conventionally fed rations, sequence dietary components to avoid a heavy intake of grain during a short time period.
6. Eliminate or reduce amounts of any feeds that are moldy, contain mycotoxins, or that are heating.

RETAINED PLACENTA

A. Supportive clinical tests

1. When retained placenta is a herd problem (greater than 8 to 10%), a blood profile should include serum minerals, selenium, vitamin E, and beta-carotene. In individual cases, blood urea nitrogen and packed cell volume should be included.
2. If abortions and/or weak calves are also associated with retention of the placenta, serology should include BVD, IBR, PI3, Hemophilus, and Leptospirosis.

B. Supportive treatment

1. Dry cows can be injected with 20 milligrams of selenium and 680 units of vitamin E. Vitamin A and E injections can be given at a level of one to three million units of vitamin A and 1,000 units of vitamin E.
2. If accompanied by off-feed conditions, administer calcium boluses (75 grams of calcium carbonate).

C. Prevention

1. Balance rations for dry cows and springing heifers, especially during the last two to four weeks prior to expected calving. Pay particular attention to the levels in the diet of calcium, phosphorus, selenium, vitamins A, D and E, and beta-carotene. Avoid deficiencies of and excesses of calcium, phosphorus, and vitamin D. For dry cows, vitamin A should be formulated between 135,000 to 150,000 IU/cow daily, vitamin D at 15,000 to 25,000 IU/cow daily, and vitamin E at 2000 IU/cow daily.
2. Use an anionic diet if necessary when milk fever is a herd problem. Check the levels of sulfur, chloride, potassium, and sodium in all feeds and in the total ration.
3. Avoid extremes in body condition before and after calving, especially over-conditioning.
4. Keep cows on feed during the pre- and post-partum period. Cows should not have access to corn silage free choice. Intake of concentrates should be controlled.
5. Minimize stressful conditions, including dirty calving areas, during the dry period and at parturition.

METRITIS

A. Supportive clinical tests

1. If the problem persists more than three weeks postpartum, uterine culturing for anaerobic and aerobic bacteria should be requested.
2. A metabolic profile on dry and fresh cows should include a white blood cell count, selenium, zinc, copper, iron, magnesium, blood urea nitrogen, vitamins A and E, and beta-carotene.
3. Test water for bacterial contamination and mineral content.

B. Supportive treatment

1. Injectable selenium-vitamin E and fat-soluble vitamins can be used if clinical tests suggest they are needed.
2. Remove or greatly reduce the level of any feeds containing molds or mycotoxins.
3. Natural or induced estrus is probably the best therapy for uterine infection.

METRITIS, CONT.

C. Prevention

1. Maintain good sanitation in the calving area and during the first 72 hours after calving.
2. A well-balanced ration, especially protein, minerals, and vitamins are essential for dry cows as well as the lactating animals.
3. Avoid extremes in body condition (too thin to too fat).
4. Maintain clean insemination equipment. In chronically infected herds use a protective sheath or double-rod technique of insemination.
5. Avoid using natural service.

INFERTILITY

A. Supportive clinical tests

1. A disease profile can be requested including BVD, IBR, Leptospirosis and Hemophilus.
2. Uterine and/or vaginal cultures using culturettes with Amies media can be requested to check for Ureaplasma, Mycoplasma, Hemophilus and others.
3. Milk progesterone testing can be performed to check on the accuracy of heat detection and timing of insemination.
4. Metabolic profiling may be useful and parameters to include are: white blood cell count, red cell count or packed cell volume, blood urea nitrogen, serum minerals, especially magnesium, copper, iron and selenium, vitamins A and E, and beta-carotene. Four to 12 problem animals should be selected as well as a similar number of more fertile cows at the same stage of lactation.
5. Milk urea nitrogen testing can be used to determine if any nutritional problems exist.

B. Supportive treatment

1. Make ration adjustments and supplement ration as indicated by clinical testing.
2. Vaccination protocols may need to be updated as indicated by clinical testing.

C. Prevention

1. Evaluate current management practices in disease control, heat detection, breeding technique, and semen storage. Maintaining good records on reproduction and health will help monitor progress in these areas.
2. Feed a balanced ration with a focus on avoiding high serum phosphorus levels. This may result from a deficient or excess intake of phosphorus and vitamin D. Rations containing excessive levels of protein, coupled with excessive degradable intake protein or soluble protein, may result in milk urea nitrogen values over 19 mg%. This can cause infertility problems. Check rations for adequate levels of magnesium and copper. Avoid gross excesses in calcium and also rations low in calcium.
3. Evaluate the body condition of the herd. Cattle should be maintaining or gaining weight at time of breeding. Animals are less likely to show heats and conceive if they are extremely thin or are losing considerable weight between calving and first service (>1 body condition score change).

CYSTIC OVARIES

A. Supportive clinical tests

1. Testing should be considered when the incidence of cystic ovaries is more than 15% in a Holstein herd and more than 5% in dairy heifers. A metabolic profile should include calcium, phosphorus, selenium, vitamins A and E, and beta-carotene.
2. A mycotoxin screen should be done on a total mixed ration or on individual grains and forages. Zearalenone should be included in the screen.
3. Using the milk progesterone test can aid in differentiating luteal and follicular cysts.

B. Supportive treatment

1. Supplement the ration with selenium if tests indicate a deficiency.
2. Maintain adequate levels of fat-soluble vitamins.

C. Prevention

1. Minimize metabolic problems and disorders during calving or early lactation.
2. Avoid over-conditioning during late lactation and during the dry period.
3. Maintain adequate intakes of selenium and fat-soluble vitamins.
4. Avoid feeding rations heavy in forages containing high levels of estrogen. Ingredients that can be a problem are moldy feeds and fresh forage legumes such as alfalfa, birdsfoot, ladino clover, and white clover.

ABORTIONS

A. Supportive clinical tests

1. Some infectious causes of abortions that should be included in a disease profile are BVD, Brucellosis, Chlamydia, IBR, Leptospirosis, Listeriosis, Mycoses, Neospora, Trichomoniasis and Vibriosis.
2. Submit vaginal swabs on culturettes with Amies media for Ureaplasma and Mycoplasma
3. Submissions to a diagnostic lab should include the placenta, fresh fetus, and a blood sample from the dam. Another blood sample should be taken approximately three weeks after the abortion occurred and submitted to the diagnostic lab.
4. Metabolic testing of aborting individuals or specific groups if a herd problem should include a white blood cell count with differential, blood urea nitrogen, selenium, vitamins A and E, and beta-carotene.
5. Test the ration and water for nitrates. Check for evidence of silo gas, prussic acid poisoning and ingestion of toxic plants.

B. Supportive treatment

1. Treatment will depend on results from items sent for testing. A veterinarian should be consulted.

ABORTIONS, CONT.

C. Prevention

1. Establish and maintain biosecurity practices. Quarantine new additions to the herd.
2. Evaluate feedstuffs for nitrates and mycotoxins. Evaluate the ration for selenium, iodine, and vitamins A and E.
3. Avoid conditions where pregnant animals may be injured or bruised.
4. A good rodent control program should be in place. They can spread disease.

INFECTIOUS FOOT PROBLEMS

A. Supportive clinical tests

1. When foot problems exist in a herd, it may be necessary to rule out any nutritional deficiencies as an underlying cause affecting hoof health. A metabolic profile on both dry and lactating cows should include white blood cell count, selenium, zinc, copper, iron, blood urea nitrogen, vitamins A and E, and beta-carotene.
2. Close inspection of the foot is the best way to determine what kind of condition the cow is afflicted with. Infectious foot problems include foot rot and foot warts. Foot rot is a smelly infection of the foot, which generally occurs high between the claws and toes. Foot warts are clearly demarcated, circular or oval in shape, moist and slightly tufted with a strawberry-like surface. They are particularly painful and prone to bleeding when manipulated.

B. Supportive treatment

1. Systemic and localized treatment often is needed. Debris should be removed from the lesion or area. A topical application of caustic chemicals and/or antibiotics is usually very effective.
2. Special trimming of the feet and infected areas often is necessary. In the case of large, persistent, mature foot warts greater than two inches in diameter, surgical removal may be elected.
3. All treatments and therapies should be done by or in consultation with the herd veterinarian.

C. Prevention

1. Feed a well-balanced ration paying close attention to levels of protein, trace minerals, and vitamins. Avoid feeding excessive levels of protein. Copper should be at 15 ppm and zinc at 70 to 80 ppm in the total ration dry matter.
2. Sanitation is very important because poor environmental conditions can predispose animals to infectious foot problems. Examples of high-risk conditions include wet free-stalls, poorly drained lots, and mud holes.

INFECTIOUS FOOT PROBLEMS, CONT.

3. Some foot infections may stem from cracks, which result when feet are too soft or too hard. Excessively soft feet are more apt to occur in free-stall systems from cows standing in manure and urine. Soft feet can be restored to proper hardness by improved sanitation (more frequent scraping of the free-stall), allowing cows to stand in dry soil or sand, or routinely using a dry mineral mixture in a walk-through footbox. Excessively hard feet usually occur in stall-barns, especially when kiln dried shaving or sawdust is used for bedding. Hard feet can be softened by allowing cows to stand or graze on sod (not too soft or muddy), avoiding barn lime or superphosphate in walkways, and routinely using a walk-through foot bath containing plain water (drain and replace frequently).
4. Trim feet annually with problem animals being trimmed more frequently, at least two to four times a year.
5. Isolate newly purchased animals from the rest of the herd for at least 30 days. Examine for evidence of foot rot and hairy warts. Treat animals as necessary.

LAMINITIS

A. Supportive clinical tests

1. Nutrition is probably the single most important factor contributing to the development of laminitis. When this is a herd problem, a metabolic profile on both dry and lactating cows as well as springing heifers should include both red and white blood cell count, packed cell volume, selenium, zinc, copper, iron, blood urea nitrogen, vitamins A and E, and beta-carotene.
2. Herds feeding a total mixed ration should have it tested. Excessive ruminally available carbohydrate reduces fiber digestion, increases lactic acid production, reduces feed intake and fat test, and increases the occurrence of metabolic diseases. Include in the standard analysis, neutral detergent fiber, ash, fat, and soluble protein. In conventionally fed herds, evaluate levels of grain and forage being fed as well as the ration levels of neutral detergent fiber and nonstructural carbohydrate.
3. Observing animals is the best way to determine the degree and severity of laminitis in the herd. The general signs of an animal with laminitis consist of moving very stiffly; she may stand with an arched back. Local signs consist of some inflammation and sensitivity to pressure and the hoof may appear slightly, longer, and more concave than normal. Solar characteristics include sole hemorrhages and yellowish discoloration. Often times a white line separation (juncture between the sole and the outer keratinized wall) may be apparent.

B. Supportive treatment

1. Maintain a frequent and routine hoof-trimming schedule.
2. Therapeutic trimming can be done on animals with sole ulcers, bruises etc. to help relieve pressure and allow healing to initiate. One procedure is to block or elevate the unaffected toe such that pressure can be reduced on the affected toe. Commercial blocking kits are available.
3. Consult the herd veterinarian and hoof trimmer for any additional therapies.

LAMINITIS, CONT.

C. Prevention

1. A key component is to prevent overloads of rapidly fermentable carbohydrates, especially in the late precalving and early postpartum diets. Avoid feeding rapidly fermentable carbohydrates separate from forage. Increase grain gradually after calving, particularly during the first two weeks in conventionally fed herds. Forage to concentrate ratios in the first 30 days in milk should not exceed 55% concentrate.
2. In early lactation diets, keep adequate levels of forage dry matter, forage and total neutral detergent fiber, and sufficient particle size in the diet. Feed some long hay for the first 14 days postpartum. Utilizing buffers during this time may be beneficial in helping dry matter intakes and maintaining rumen health.
3. Feed a balanced ration focusing on protein levels, protein fractions, carbohydrates, and trace minerals.
4. There is a spectrum of largely interdependent factors to consider in addition to nutrition alone. They include feeding management, metabolic and digestive disorders, stress of parturition and hormonal changes, infectious processes, environmental stress including hard stall surfaces and lack of bedding, and general overall stress.

MASTITIS

A. Supportive clinical tests

1. Culture all quarters of cows with clinical cases or somatic cell counts over 500,000 when pathogens in a herd are not known. For meaningful test results, all milk samples should be taken in a way that avoids environmental contamination. The teat ends should be washed, dried, and wiped with an alcohol swab prior to sampling.
2. A sensitivity test can be performed to determine which antibiotics is likely effective against the bacteria.
3. Measuring leukocytes is one way to evaluate an individual animal's or herd's mastitis status. There are several methods that can be used. They include the following: Direct Microscopic Somatic Cell Count; Somatic Cell Count; California Mastitis Test.
4. A metabolic profile on dry and fresh cows should include white blood cell count with differential, selenium, zinc, copper, blood urea nitrogen, vitamins A and E, and beta-carotene.
5. Screen any suspicious forages or grains for mycotoxins.
6. Test water used for both sanitation and drinking, for coliform and pseudomonas if these organisms are involved in the mastitis problem.

B. Supportive treatment

1. Treatment protocols should be developed with the assistance of the herd veterinarian.
2. Administering a dry-cow treatment when cows are dried off will help reduce new infections. Approximately 40% of new udder infections occur during the dry period and within a few days after calving.

3. Treatment regimens depend on the type of bacteria found. Some bacteria, depending on whether they are contagious or environmental, respond to antibiotic therapy better than others do. All treatments should be done under the close supervision of a veterinarian.

C. Prevention

1. Have an equipment dealer, veterinarian, or both check milk machines and other equipment at least once a year, or in medium- to large-size herds, twice a year.
2. Examine milking routines, including udder preparation, milk letdown stimulation, milking time per cow; milk cows with dry teats and post-dip after milking.
3. Examine teat ends for injuries, examine milk with a strip cup or plate.
4. Regularly dip all teats with an effective, nonirritating teat dip immediately after removing milking machines. Use a teat dip that has been proven to reduce new cases of contagious mastitis.
5. Removing chronically infected cows from the herd will remove a source of mastitis organisms and help reduce the herd's somatic cell count.
6. Maintain a sanitary environment by frequently adding or changing bedding and restricting access to wet areas. Clean environmental conditions are important in the calving areas and for early lactation cows.
7. Feed a balanced ration to dry and lactating cows focusing on levels of protein, selenium, trace minerals, and vitamins.
8. Monitor records routinely (i.e. DHIA) to check on somatic cell counts for the herd and on individual animals.
9. Avoid moldy feeds or those with mycotoxins present at appreciable levels.
10. During hot, humid weather, take extra steps to maintain sanitation.

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