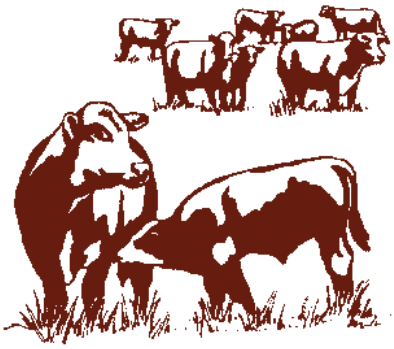
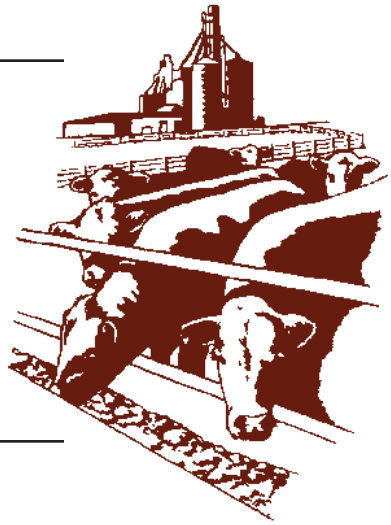


Beef Cattle Handbook



BCH-3500

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Acidosis

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Acidosis is the most important nutritional disorder in feedlots today. Acidosis, which causes cattle to be stressed, is caused by a rapid production and absorption of acids from the rumen when cattle consume too much starch (primarily grain) or sugar in a short amount of time. As long as cattle are finished on grain, cows are grazed on cornstalk fields (grain consumption), or high energy (grain) diets are fed to dairy cows, acidosis will be an important problem. Cattle evolved digesting roughage that are fermented slowly in the rumen. The rumen microbes of forage-fed animal are selected for fiber digestion. Adjusting cattle to high grain diets from predominantly forage diets disrupts the normal microbial environment and precipitates acidosis.

Acidosis is not one disorder, but rather a continuum of degrees of acidosis. The effects of continuum of degrees of acidosis can be as slight as to reduce feed intake by 0.25 lb./day or as severe as to result in death of the animal. Several acidosis-related problems occur in the feedlot: sudden death syndrome, polioencephalomalacia ("brainers"), founder, rumenitis, liver abscesses, malabsorption, clostridial infestations, and off-feed or reduced feed intake. The dairy industry has an additional problem, low milkfat syndrome, that is partly related to acidosis.

Acute Acidosis

Although acidosis is a continuum of degrees of acidosis, for simplicity, it can be divided into categories of acute and subacute . Most feedlot managers readily recognize the effects of acute acidosis. Many cattle that are diagnosed as "sudden death" may have died from acute acidosis. Managers sometimes observe cattle that are wandering aimlessly in the pen or cannot stand and appear to have "brain damage." When injected with thiamine, these cattle will recover quickly and show no signs of brain disorder. During acute acidosis, the production of thiamine by the rumen bacteria is impaired, resulting in a thiamine deficiency. However, not all brain disorders are caused by acidosis, and proper diagnosis and treatment are necessary.

Acute acidosis can have other, less obvious effects as well. During acute acidosis, ruminal pH drops to levels between 4 and 5, the lining of the ruminal wall is damaged, and abomasal and intestinal linings are severely inflamed. As mentioned earlier, animals may die suddenly or die later because of other acidosis-related problems. Destruction of papillae (finger-like projections lining the rumen wall that aid in absorption of nutrients) in the rumen and damage to the linings of intestines may result in poor absorption of nutrients, resulting in low gains and poor feed efficiencies ("poor doers"). Foundered cattle are an indication that acute acidosis occurred 40 to 60 days previously. Most of the problems associated with acute acidosis can be minimized with proper bunk management.

Subacute Acidosis

Subacute acidosis occurs more frequently, but is seldom recognized by the cattle feeder. The major response by the animal to subacute acidosis is reduced feed intake with an accompanying reduction in performance. When cattle are fed in groups of 100 to 200 head, identification of individual animals with subacute acidosis becomes

extremely dffficult. It is not until the entire pen is "off-feed" that low feed intakes or erratic intake patterns are observed. Some addi tional animal signs of subacute acidosis may be panting, excessive salivation, kicking at their belly, eating dirt, and diarrhea.

Nearly every animal in the feedlot will experience subacute acidosis at least one time during the feeding period because it is an important natural function in adapting to high-grain finishing rations. In addition, any interruption in the normal consumption pattern of cattle can cause acidosis. For example, storms can disrupt feed intake by causing cattle to consume a greater amount of feed before and after a storm. Other environmental effects include mud and heat. Mud and heat reduce feed intake and alter intake patterns. Extreme heat conditions may force cattle to eat a greater proportion of their feed at night rather than during the day. The design of the feedlot and location and operation of waterers are also important so that feed intake is not impaired.

Obviously, level of roughage is an extremely important factor affecting acidosis. In general, as the level of roughage increases, the incidence of acidosis decreases. However, cost/gain usually increases as level of roughage increases because roughage is poorly digested in high-grain finishing diets. The first increment of roughage (5 to 10 percent) will stimulate feed intake and gain without adversely affecting cost/gain. The roughage should be coarsely chopped to stimulate chewing and rumination, which in turn will stimulate saliva production. Saliva contains bicarbonate that will buffer the acidic conditions of the rumen and help reduce acidosis.

Buffers have limited potential in 90 percent concentrate feedlot diets, but have been quite effective in 50 to 60 percent concentrate dairy diets. In a summary of Nebraska research, extra limestone (ration balanced for.7 percent calcium) has been shown to increase feed efficiency 2.25 percent by the action of buffering acidic conditions.

In typical feedlot diets, grain is the single most important factor affecting acidosis. Grains fed to cattle may vary in rate (Fig. 1), site, and extent of starch digestion within the animal's digestive tract. Any grain processing method that reduces particle size and (or) causes gelatinization of the starch granules will increase the possibility of acidosis. Dry rolled wheat, dry rolled barley, and early-harvested, high moisture corn have rapid rates of starch fermentation and thus, have a greater potential for acidosis than dry-rolled corn or grain sorghum. Feeding rapidly fermented grains (wheat, barley, and high-moisture corn) in combination with more slowly digested grains (dry-rolled corn, dry whole corn, or dry-rolled grain sorghum) may reduce acidosis and improve feed efficiency.

Intake patterns are very important in discerning when subacute acidosis has really been a problem. A Nebraska study examined intake patterns of cattle being adjusted to high energy diets, using 35, 55, 75, and 90 percent concentrate diets. Each diet was fed for a 5-day

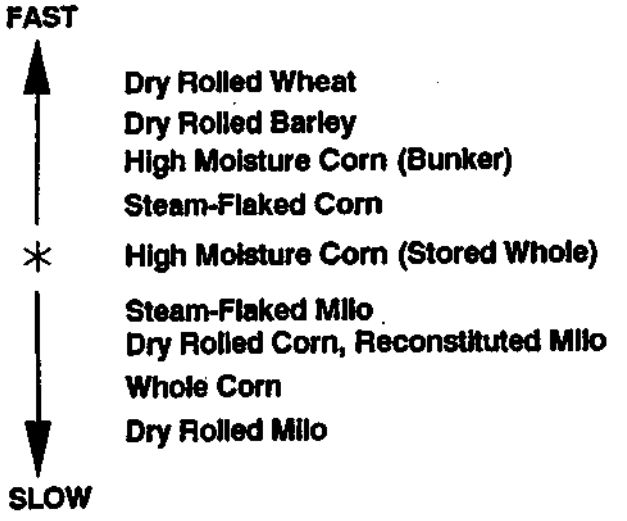

Fig. 1. Grains categorized by rate of breakdown in the rumen.

period, and then the cattle were switched to the next successive increment of concentrate.

The grains used in this experiment were either dry-rolled corn or dry-rolled wheat. Intake patterns (averaged across concentrate level) of the cattle fed the corn appeared to be smooth and normal, as indicated by increased intake, with increasing concentrate level (Fig. 2). Cattle fed the wheat diets appeared not to increase their intake at all. When the intake data is evaluated on an individual day basis within each concentrate level, rather than averaged over the 5-day periods, a much different intake pattern was seen (Fig. 3).

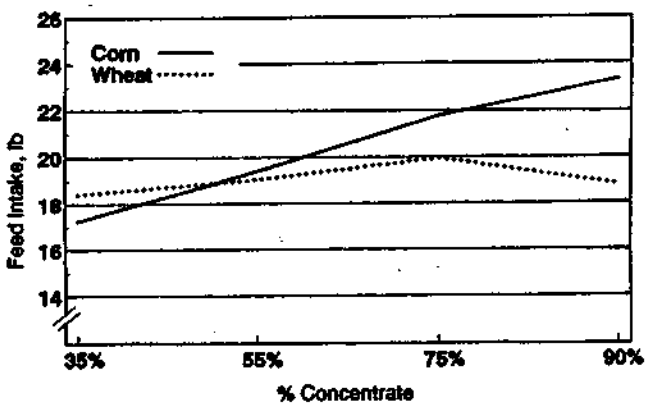

Fig. 2. Corn vs. wheat average feed intake.

Even though the corn-fed cattle looked like they were going-up on feed smoothly, there was a fair amount of variation in intake patterns across each concentrate level. Cattle appeared to eat, then back-off feed for a period of time and then repeat the cycle. This effect was quite pronounced in the wheat-fed animals. The wheat-fed cattle ate too much, experienced acidosis, and backed-off feed rather dramatically for a couple of days. Then they felt better, they would eat, and again, overeat. Their intake would then decrease for a couple of days. The roller coaster eating pattem never really adjusted

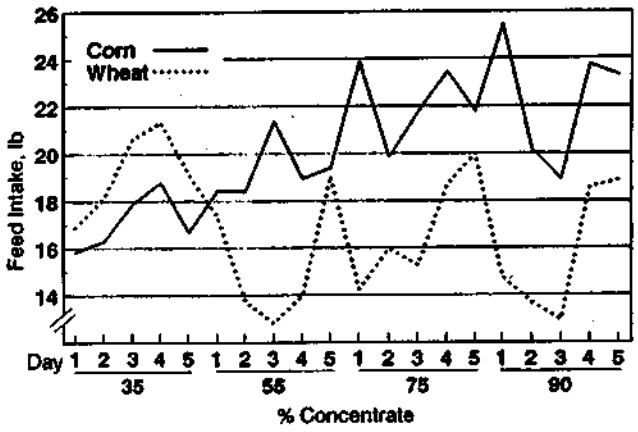

Fig. 3. Corn vs. wheat on daily feed intake.

itself. Similar roller coaster intake patterns have been observed in lactating dairy diets containing in excess of 50 to 60 percent concentrate. We should remember that, in feedlots, pen feed sheets are really the average intakes of all the cattle in the pen. There may be cattle experiencing wide daily-intake fluctuation even though pen means are not changing.

This data emphasizes that looking at average intakes can be misleading. Intake patterns of these cattle changed drastically over the 24-hour period within each concentrate level (Fig. 4).

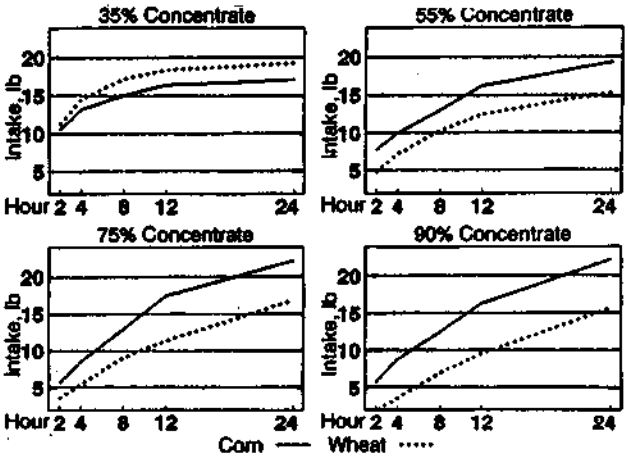

Fig. 4. Intake of grain by hour and concentrate level.

Cattle fed the corn diet consumed a meal when the diet was offered and their meal size decreased as concentrate level increased; but they, nevertheless, would eat a meal when feed was offered to them. The cattle fed the wheat, however, did not eat a meal when fed the 55 or 75 percent concentrate levels. Once the feeds were increased to 55 percent concentrate, the cattle fed wheat tended to partition their intake over a longer period of time and ate more during the last 12 hours of the day than during the first 12 hours. This effect is indicative of changing intake patterns because of subacute acidosis. This altering of intake pattern must occur so that the cattle will adapt to high-grain finishing rations.

One misconception that many feeders have is that if they limit feed offered to a pen of cattle, they can prevent the up and down swings in feed intake and thus minimize acidosis. The feed records will show that intake variation is small; however, this is an artificial situation and does not reflect true feed intakes to two reasons. Firstly, since bunk space is limited in most feedlots, the dominant cattle will consume all the feed they want. The more timid cattle will be limit-fed. Thus, limiting feed will only limit-feed for the timid cattle and not all the cattle. Secondly, if feed intake is limited for all cattle, the cattle will be hungry. Rate of feed consumption will be increased at the next feeding, and this change may alter their intake pattern and create additional acidosis resulting in the roller coaster intake patterns previously described. Thus, it is best not to restrict feed intake of finishing cattle in order to prevent acidosis.

When large changes in the amount of feed offered per pen are required, it usually indicates that the feed intakes of the cattle are moving in unison (all cattle are increasing or decreasing feed intake) and that previous errors in judgment were probably made concerning the amount of feed offered to the pen.

Ionophores (Rumensin, Bovatec) increase efficiency of digestion in the rumen. In addition, Rumensin has been shown to reduce variation in feed consumption of feedlot cattle and to prevent the roller coaster intake patterns previously described. Feedlots have observed fewer deaths related to digestive disorders when rumensin was fed at 25 to 30 grams/ton of ration.

Economics

Overall, subacute acidosis probably costs the feeder more money than acute acidosis because of the unobserved reduction in performance of the cattle. We have measured nearly $10 to $13/head advantage by reducing the effects of acidosis in a wheat diet with the addition of roughage or replacement with corn (Table 1). If one simply evaluated the effect of feed intake alone, a .25 to 1.0 pound reduction in daily feed intake can drastically reduce overall feedlot profit (Table 2). In addition, severe (A+, one or more large, active abscesses present along with inflammation of liver tissue surrounding the abscess) liver abscesses, which were the result of acidosis, may reduce daily gain by 11 percent and feed efficiency by 9 percent. Extra trimming of the carcass may also be required in addition to the lost value of the condemned livers. The lost value caused by liver abcesses in a pen of cattle (15 percent incidence rate) may be $3/head.

Solutions

Cattle experiencing acute acidosis should be treated immediately. One possible treatment suggested by Oklahoma State is as follows:

Combine 500 grams sodium bicarbonate (baking soda); 850 cc 12% formaldehyde; 20 grams magnesium oxide; 40 grams charcoal. Bring to 2 liters with water in a plastic container.

Table 1. Effect of Subacute Acidosis on Finishing Cattle Performance.

Treatment	Daily gain, lb.	Dry matter intake lb./day	Feed/ gain	Cost/ gain $/cwt.
Dry-rolled wheat	3.43	20.86	6.10	38.88
0% roughage (high acidosis)				
Dry-rolled wheat	3.76	21.62	5.77	36.32
10% roughage (Savings $2.56/cwt. or $10.24)				
Dry-rolled corn	4.01	22.61	5.64	35.02
0% roughage (Additional savings $.76/cwt. or $3.04)				

Table 2. Subacute (Off-feed) Acidosis

	Reduction in feed intake				
Measurement	0	.25 lb.	.50 lb.	.75 lb.	1.0 lb.
Daily gain, lb.	3.31	3.26	3.20	3.14	3.09
Cost/gaina, $/cwt.	48.94	49.29	49.81	50.58	52.82
Profit, $/head	16.23	14.52	12.75	10.92	9.02
Lost profit, $/head	——	1.71	3.48	5.31	7.21
Lost profitb, $/yr	——	20,525	41,755	63,728	86,483

[a]Ration price $5.20/cwt. b$.25/day yardage, $.20/day interest, $10/head processing

Instructions:

1. Mix well.
2. Administer 100 ml/100 lb. body weight in 1 gallon of water via tube.
3. Supplement with 20 ml dipyrone.

Shelf life is 30 days. The formaldehyde kills the rapidly dividing bacteria (Oklahoma State University Capsules, Apr. 89). Work with a local veterinarian for additional treatments.

If an animal has symptoms of brain disorder, an accurate diagnosis should be made. If the diagnosis is polioencephalomalacia (polio) an injection of thiamine hydrochloride (10 mg/kg intravenous and repeat for 2 to 3 days in the muscle) should be administered. Recovery should be seen in 1 to 3 days. If TEME (hemophilus somnus) is diagnosed, oxytetracycline should be given (5 mg/kg intravenous and 5 mg/kg in the muscle). The animal should be treated in the muscle for 3 days following initial treatment.

Most cattle will recover on their own from subacute acidosis without any medical treatment. Several management tips should be followed:

1. Feed complete-mixed diets. Don't feed grain and hay separately if possible.
2. Minimize sorting of ration ingredients by the use of a limited amount of silage, molasses or liquid supplements or fat.
3. Feed slowly fermenting grains.
4. Make sure feed intake is not increasing or decreasing before switching cattle to the next ration.
5. Feed bunks should contain a sprinkle of feed (approximately 1 lb./head) or be slicked clean, but still wet with saliva. Never allow the cattle to be without feed for more than 30 minutes.
6. Feed cattle at the same time daily.
7. Feed two or more times a day if possible.
8. Use an ionophore (Rumensin or Bovatec) to increase feed efficiency and reduce variation in feed consumption.
9. Balance feedlot rations for.5 to.7 percent calcium and consider using sodium bicarbonate in dairy diets containing greater than 50 percent concentrate.
10. Keep daily records of dry matter feed intake.
11. Keep all waterers clean and fresh.

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This publication was prepared in cooperation with the Extension Beef Cattle Resource Committee and its member states and produced in an electronic format by the University of Wisconsin-Extension, Cooperative Extension. Issued in furtherance of Cooperative Extension work, ACTS of May 8 and June 30, 1914.

BCH-3500 Acidosis