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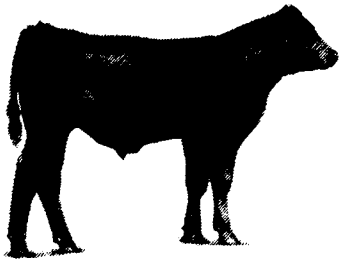

Beef Cattle Management Update

FEEDBUNK MANAGEMENT FOR MAXIMUM CONSISTENT INTAKE[1]

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INTRODUCTION

Managing feed intake is critical for successful cattle feeding. The goal of every cattle feeder should be attaining maximum consistent intake. Feedbunk management, or the broader area of intake management, is a critical part of this.

INTAKE MANAGEMENT INCLUDES:

Diet formulation	Starting on feed
Ingredient quality	Managing stress
Ingredient variation	Reacting to weather changes
Ingredient processing	Feeding frequency
Diet conditioners	Waterer management
Diet mixing (time, process)	Time of day fed
Quantity offered	Bunk space

Other considerations

The benefit of maximizing intake is obvious, more feed consumption means more performance. Increased feed consumption above maintenance will increase energy available for growth and maximize gain. Table 1 shows that increasing feed intake by only .5 lb DM/d can reduce a feeding period by as much as 10 days.

Benefits of consistent intake are less obvious but just as important. Reduced day-to-day variation in feed intake will result in minimal ruminal pH variation. As a result, long-term rumen health is improved. Problems such as acidosis, sudden death, bloat, liver abscesses and founder are reduced.

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[1] Prepared for University of Minnesota Cattle Feeders Days, December 4-6, 1990.

To understand this, remember that rumen bacteria ferment various types of starch and sugar to volatile fatty acids (VFA). VFA diffuse through the rumen wall into the bloodstream and are used by cattle as a source of energy. Acid production in the rumen is an important, beneficial process. Indeed, the ability to turn forage carbohydrates into a useful source of energy is the primary advantage of digestion and fermentation by rumen bacteria. However, when high energy diets are fed, too much (or too rapid) VFA production can cause problems because the pH of the rumen and/or the bloodstream decreases too far. If intake of high energy diets is consistent from day to day, and well spaced throughout the day, cattle will adjust to the quantity of acid produced and rumen health will be maintained. If intake is variable, high levels of acid production following rapid consumption of a large quantity of feed could exceed the buffering capacity of the rumen. This could lower rumen pH to dangerous levels. Since acid simply diffuses through the rumen wall into the bloodstream, blood pH could be lowered dramatically. In addition, this drop in pH favors bacteria that produce lactic acid, which is less useful as an energy source and is the compound that actually causes acidosis. While variation in acid production and rumen pH is unavoidable, training cattle to handle these changes, and minimizing their magnitude is essential. Figure 1 illustrates typical and hazardous changes in rumen pH, based on evenly spaced, consistent consumption or inconsistent consumption.

Inconsistent intake can be magnified by inconsistent ionophore consumption. Since ionophore use can reduce feed intake, over or underconsumption of the ionophore can affect subsequent feed consumption.

Consistent intake can easily be obtained at low levels of feed intake, but this would result in poor growth. The challenge is to obtain consistent intake at high levels of consumption. If this challenge can be met, cattle performance will be high and incidence of rumen disorders low. Preventing rumen disorders altogether is possible but may not be the best alternative. Regardless of consistency, maintaining a high level of feed intake will induce some subacute acidosis and liver abscesses. Indeed, those cattle with no liver abscesses usually perform no better than, and may perform poorer than cattle with a low level of liver abscesses (table 2), which are apparently being challenged metabolically. The job of the cattle feeder is to walk the fine line between reducing rumen disorders at the expense of performance, and maximizing performance while risking acidosis, bloat, liver abscesses and sudden death. Thus the goals of maximum intake and consistent intake must both be met for optimum performance and health.

FEEDBUNK MANAGEMENT = INTAKE MANAGEMENT

Achieving these goals requires proper feedbunk management, which actually means managing the intake of the cattle. Every day is important because consumption one day often reflects the previous days consumption. For instance, if a steer reduces his feed consumption by 50% for one day, he is likely to be hungry and overeat the next day. This overeating will result in increased acid production, which will cause the steer to feel sick and reduce consumption on the third day. This up and down "roller coaster" pattern of inconsistent feed intake is easily started and difficult to break. The key is to prevent it, rather than hoping to cure it. Preventing inconsistent feed intake involves starting cattle on feed properly and keeping them

on feed. Researchers at Oklahoma State University analyzed close outs and feed sheets describing the performance of 38,614 cattle in 331 pens in a commercial feedyard and observed that feed consumption during days 8 to 28 was a useful predictor of performance for the entire feeding period. An effective strategy is to "stay ahead of the cattle", meaning that cattle are offered feed so that they are hungry and approach the bunk aggressively when the next feeding occurs. Doing this properly requires multiple feeding throughout the day but will improve rumen health and enhance performance and efficiency over the entire feeding period. Proper starting on feed procedures will be a topic for another Update; however, the importance of starting cattle properly, and the contribution of bunk/intake management to proper starting cannot be overstated.

INTAKE MANAGEMENT INCLUDES: WHAT, HOW MUCH, HOW AND WHEN CATTLE ARE FED

Intake management includes **what** cattle are fed (ingredient quality and diet formulation and mixing), **how much** cattle are fed (feed calling), **how** (feed delivery) and **when** cattle are fed.

WHAT: Ingredient quality, diet formulation and mixing. The importance of ingredient quality and consistency cannot be overstated. If identical diet composition could be guaranteed from one day to the next, other aspects of intake management would become much easier. Daily variations in dry matter, contaminant and nutrient content of feedstuffs, as well as variation in mixing, contribute to dietary changes that can affect intake. While daily analysis of feed is impractical, and variation is unavoidable, some steps can be taken to minimize variation. Forage feeds are more variable than grain. Much of the variation can be avoided by harvesting and storing corn silage, hay or haylage at the proper stage. There is no substitute for quality forage preparation.

Forage must be properly processed and mixed. Chopping or grinding hay too fine will defeat the purpose of adding it to the diet and can contribute to bloat problems. Although diets containing 2- to 3-in. hay are more difficult to feed than those with shorter cuts, this length provides optimal rumen stimulation and digestibility with minimal sorting.

The quantity of forage in the diet is another consideration. Reducing forage increases the energy density of the diet, increasing performance at any level of intake, but also increasing the risk of metabolic disorders. Table 3 includes data that describe performance of cattle fed diets with 0, 5, 10 or 15% forage. In this study, inclusion of 5 or 10% forage produced the most rapid gains and the greatest energy intake. Inclusion of forage did not decrease liver abscesses; in fact, condemned livers increased as feed consumption, which was greatest for the high forage diet, increased.

Some Minnesota cattle feeders place round bale feeders in feedlot pens, away from the bunk, with no forage placed in the bunk. This allows timid cattle or those not interested in grain to consume hay away from the bunk. However, there is no way to know if all cattle are consuming forage, or how much any of them are consuming. Leaving forage out of the bunk promotes digestive disorders because forage intake will not be consistent; some cattle will consume little or no hay under this system. Also, some cattle will consume little of the grain component of the diet and their performance will be poor. Roughage is not included as a

nutrient in feedlot diets, rather it is used for rumen stimulation and health. It is important that all cattle consume the proper amount of forage and including it in the bunk, mixed in the total diet, is the only way to guarantee this.

If by-products such as sweet corn silage, bakery waste, etc. are used, variation is unavoidable. The keys to making these feedstuffs work are fine tuning diets daily so that variation is minimized, and including them in the diet at a rate low enough that expected variation will not throw cattle completely off feed. These feedstuffs are more suited to growing or backgrounding diets than to finishing diets.

Proper diet mixing is essential. All too often the time allotted for mixing is based on the time required to drive to the bunk. Mixing should be complete, so that every mouthful of feed is as uniform as possible. Mixing for too long, in some types of mixers, can result in finer particles sifting to the bottom. Remember that the most expensive components of the diet (medication, ionophores, vitamins, etc.) may have the smallest particle size. Order of addition is also important. The smallest component of the diet (volume basis) should not be added first or last. Any liquid components should be added before dry supplements are added. The effects of ionophores on feed intake make proper mixing even more critical when cattle are fed ionophores.

Diet conditioners, such as fat or molasses, which reduce dustiness in low moisture diets, should be mixed long enough to ensure that wetting of dry ingredients occurs. Fat and molasses serve several purposes including increasing the energy density of the diet and improving palatability due to flavor (Table 4). Inclusion of up to 4% of fat and/or molasses is common in some commercial feedyards. If a diet with less than 20% moisture is used, especially if highly processed grains are fed, inclusion of fat or molasses is probably a good idea.

Use of high moisture grains or silage increases the importance of proper bunk management since these feeds have limited bunk life, especially in extreme weather. Mixtures of high moisture and dry grain offer the palatability and starch availability advantages of high moisture grain, along with improved bunk stability. Performance of cattle fed a mixture of dry and high moisture grain will exceed that of cattle fed dry or high moisture grain alone (Table 5).

HOW MUCH: Feed calling. One of the most important decisions that a cattle feeder makes each day is how much feed should be placed in the bunk. If that decision is not carefully considered, it is likely that problems will occur. If daily feed offering is not recorded accurately, or records are not used, problems will likely not be noticed. The most effective way to induce long-term rumen health disorders is to repeatedly offer the wrong quantity of feed.

Feed offered must be matched to feed consumed. If cattle are overfed slightly on consecutive days, they will likely increase consumption briefly to match feed offered (sort of like Thanksgiving weekend for you or me) but will then reduce consumption to a greater extent after two or three days. The net effect is reduced consumption over a period of several days, along with increased potential for rumen disorders. This also results in eventual bunk build-up of leftover or stale feed, which reduced diet palatability. If cattle are underfed slightly

for several consecutive days, some may gorge themselves when re-fed. If bunk space is limited, the timid cattle in a pen may have consumption reduced by 50% while others are not affected by inadequate feed offering. Consider the effects of weather and other possible stresses when determining how much feed should be offered.

Although few things are as important as getting cattle on full feed of the finishing diet rapidly, increases in feed offered and changes in the diet must be made gradually. Abrupt changes in the quantity or type of feed offered will almost surely throw cattle off feed and start the roller coaster consumption pattern. While each situation differs, some general rules of thumb can be considered. Feed offered should not be increased on consecutive days -- 3-day intervals may be safest, but will slow progress toward full feed. Feed (DM basis) offered should never be increased by more than .4% of body weight (2 lb of DM/d for 500 lb caves) at any one time; use of .2% may be safer. If quantity offered is increased, the diet should not be changed at the same time, and vice versa. After changing the diet or quantity offered, observe cattle closely.

Every cattle feeder has a different system of determining how much feed should be fed. Some like to see bunks empty just prior to feeding while others look for a consistent, low level of leftover feed. Either way can work. If bunks are empty just prior to feeding and cattle are quiet, feed offered is probably about right. This is a low risk, high reward system. On the other hand, if bunks are empty and wet from licking and cattle are restless and appear hungry, feed should probably be increased. Determining how much feed should be fed is a job for the most experienced employee or family member in the operation. This determination should be made at the same time (or better yet, the same times) each day by the same person.

HOW: Feed delivery. Whether using feed trucks, feed wagons or conveyor-type feed delivery systems, delivering feed properly is essential. Feed should be placed evenly throughout the bunk -- avoid piles or bare spots. Use the entire bunk, do not leave the first few feet empty or run out of feed a few feet before the end of the bunk. Cattle become accustomed to eating in the same space in the bunk each time. If their space is empty, they may choose not to eat instead of eating in another space. This is especially true of timid cattle. If a group is to be uniform when marketed, the challenge is to get the timid cattle to eat as much as the bold ones.

Use of conveyor-type feeding systems can be easier than use of trucks or wagons but it is just as critical that even distribution throughout the bunk be maintained. A system that is not distributing feed evenly should be overhauled so that it does.

WHEN: Timing of feeding. Cattle are creatures of habit, they enjoy doing the same thing at the same time every day, without changes in their schedule. Feeding groups of cattle at the same time(s) each day can make eating a habit and help to maintain consistency in feed consumption. In a once-per-day feeding program, full-fed cattle will eat when feed is offered. Then, after several hours of rumination and digestion, they will eat again. In between two or three major meals, cattle will eat small meals, perhaps at 90-minute intervals. If the initial feed delivery is earlier than usual, cattle may not be hungry enough to consume typical amounts. Since feed is freshest when first offered, they will eat less later in the day, after the feed has been in the bunk for some time. Thus, offering feed earlier than usual will

reduce intake for the day. If feed is offered later than usual, cattle may overeat at the first meal due to hunger, resulting in the problems described previously.

Cattle fed two or three times daily become even more creatures of habit than those fed once daily. These cattle are likely to consume 75 to 100% of their daily feed in the two or three meals associated with feed delivery. With this type of feed consumption pattern, changes in rumen pH during a day are more dramatic than with once a day feeding. In this case, offering feed at the same time each day, and to appetite, becomes even more critical.

BUNK SPACE

Ideal bunk space varies with type of facility, cattle and diet, as well as season and feeding frequency. If calves with no horns are fed a low moisture diet two or three times per day, 6 to 8 in. of bunk space per head are adequate. If yearlings with horns are fed predominately silage diets once daily, 15 to 18 in. may be more appropriate. For typical situations, 9 to 12 in. are adequate. If bunk space is limited, timid cattle will be unable to eat when feed in presented. Intake and performance of these cattle will suffer and uniformity of the group will become poorer.

CLEANING BUNKS AND WATERERS

Sometimes the most mundane jobs are the most important; cleaning bunks and waterers fits that description. Cattle simply will not consume maximum levels of feed if the bunk is dirty. Never expect cattle to clean their own bunks by eating feed that they have refused once. Stale or moldy feed should be removed daily and should not be re-fed. Offering fresh feed on top of old feed will result in reduced consumption and feed wastage. Feed should never be placed on top of standing rain water or snow. Silage cobs or other types of feed that have been sorted should be removed. Cattle can be forced to clean up these types of feed, but consumption of the desired diet will be reduced. If high moisture diets are fed, bunk life of the diet can be short. These diets may freeze in cold weather or in hot weather, secondary fermentation can result in heating and spoilage in these diets are left in the bunk too long. These feeds will become stale and less palatable prior to onset of spoilage. Bunks should be checked daily and cleaned if necessary. If cattle are limit-fed (see below) bunks will remain relatively clean and may only require cleaning when feeding after rain or snow.

Cleaning waterers can be just as important. Cattle need unlimited access to clean, fresh water. It is important to scrub waterers with a brush to remove the build-up of green slimy stuff that can occur, simply draining them is not enough. A dirty waterer will reduce appetite for feed as quickly as a dirty bunk. Also, stray voltage around waterers can reduce intake. This should be considered whenever reductions in intake occur that cannot be explained by disease, weather, etc.

FEEDING FREQUENCY

Most feedlots in Minnesota feed once daily but two or three times a day feeding should be considered. Frequency of feeding is a significant difference between small and large feedlots. Feeding more than once will increase feed intake by 2 to 5% and reduce rumen health

problems. If feeds with short bunk life are fed, or in bad weather, increased feeding frequency may help keep fresh feed in front of cattle. Starting cattle on feed, especially highly stressed calves, is another situation in which feeding more than once daily is highly recommended. While feeding two or three times per day will likely improve performance and feed conversion, costs such as repair and depreciation of equipment, energy and labor may limit practicality.

LIMIT (CONTROLLED) FEEDING

Research at the University of Minnesota (table 6) has shown that limit feeding can improve efficiency. Offering cattle up to 8% less than ad libitum consumption improves feed conversion. While limit feeding is an interesting concept, it may have limited practical value. The difficulty lies in determining what 92 or 96% of ad libitum consumption is, if no group is fed to appetite. In a research atmosphere, control pens can be used to determine appetite and experimental pens fed accordingly. On the farm, however, this is impractical, or even impossible. Researchers at Oklahoma State University have devised a means to get the advantages of limit feeding that can be applied to production situations. The solution is programmed feeding. Feeding cattle for a specific, less than maximum rate of gain is programmed feeding. Use of programmed feeding strategies requires understanding of the Net Energy System, precise diet formulation, consistent feedstuffs, precise weighing and accurate records. Advantages are shown below.

ADVANTAGES OF CONTROLLED FEED INTAKE

Improved feed conversion	Reduced feed wastage
Easier bunk management, cleaning	Reduced feed delivery
Reduced labor cost	Reduced manure
Greater control of feed inventory	Improved projections

From Hicks et. 1990 (JAS 68:233).

A possible advantage not listed by these authors is increased use of forage or by-products in some situations.

An easier method of obtaining some advantages of limit feeding would be delivering quantities of feed that result in bunks being clean prior to feeding. This strategy should only be used when cattle are fed high energy finishing diets and requires that bunks be carefully examined several times per day. The benefit is that this strategy will probably provide the best possible feed conversion.

SELF FEEDERS

Self feeding systems are common in Minnesota, especially among feeders of dairy breed steers. Use of a self feeder does not make bunk management less important. In fact, managing intake properly is more important when self feeders are used than in other situations. It is also more difficult. To manage intake with a self feeder, feed consumption must be estimated on a daily basis and measures must be taken to ensure that all cattle are eating every day. If these steps

are not taken, fluctuations in intake cannot be prevented and will not be observed. Proper management is possible with a self feeder, but a self feeder is not a substitute for proper management.

Use of a self feeder limits the types of diets that can be fed. Bulky, high moisture or high roughage diets will not work well. All concentrate diets with pelleted supplements are most suited to self feeder use. The importance of intake management is magnified when all concentrate diets are used.

INTAKE MANAGEMENT SUGGESTIONS

Maintain adequate bunk space.
Match feed offered to feed consumed.
Increase feed offered gradually.
Do not increase feed offered on consecutive days.
Do not increase and change diet on the same day.
KEEP AND USE ACCURATE RECORDS.
Match diet type to season and cattle type.
Include all roughage in the bunk.
Pay attention to changes in ingredients.
Process feed similarly each day.
Choose optimum particle size.
Mix feed completely but do not overmix.
Add ingredients in proper order.
Use the entire bunk.
Clean bunks frequently.
Feed at the same time each day.
Consider effects of weather on feed in bunks.
Keep waterers clean and thawed.

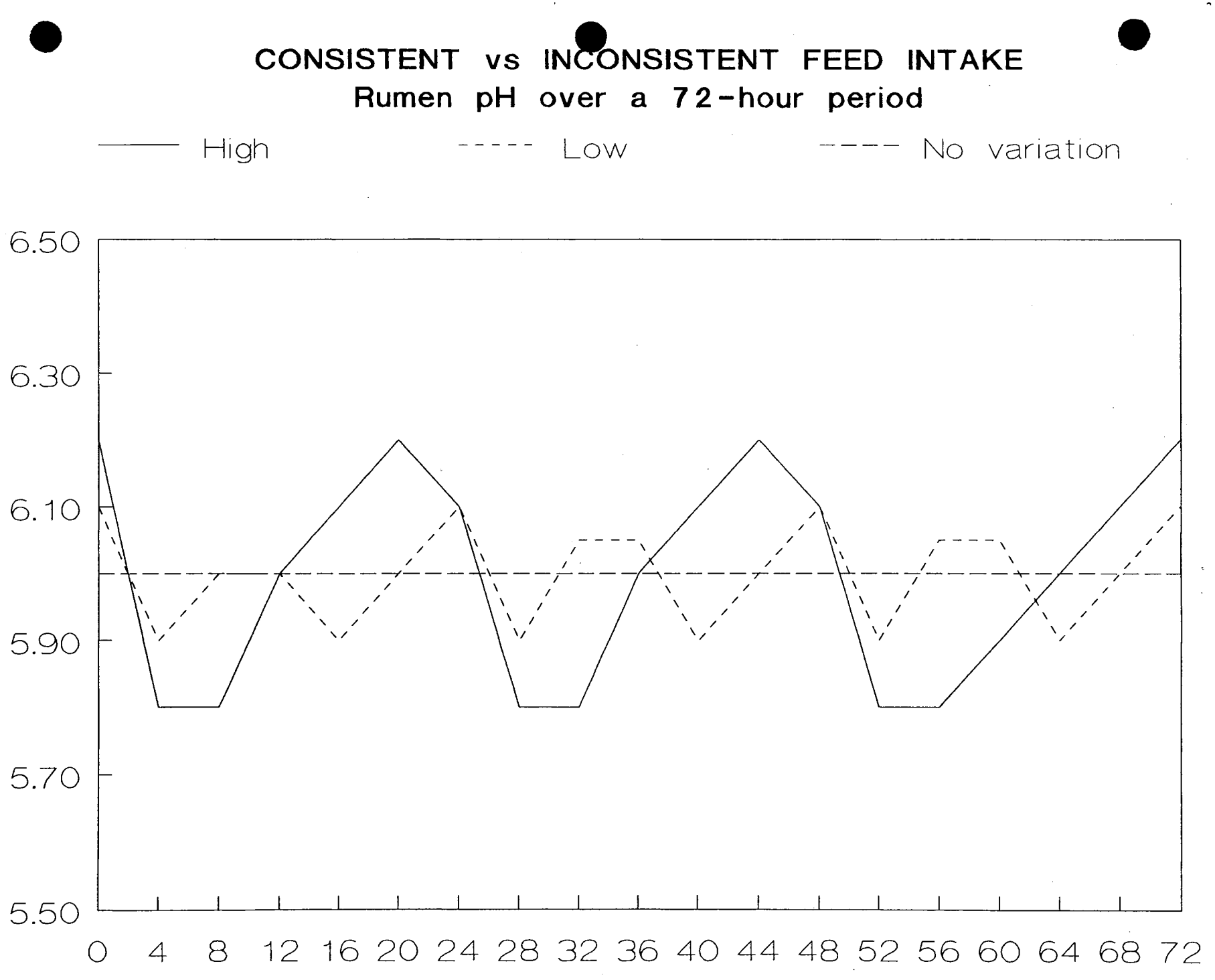
CONSISTENT vs INCONSISTENT FEED INTAKE
Rumen pH over a 72-hour period
High
Low
No variation
6.50
6.30
6.10
5.90
5.70
5.50
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72

TABLE 1. EFFECT OF INCREASING ADFI BY .5 LB

	Typical	Increased
ADFI, lb	17.0	17.5
NEm, Mcal/d	6.89	6.89
NEg, Mcal/d	6.62	6.95
ADG, lb	2.75	2.89
F/G	6.18	6.05
Fed from 600 to 1200 lb		
Days on feed	218	208
Total feed, lb	3709	3633

TABLE 2. RELATIONSHIP BETWEEN PERFORMANCE AND LIVER ABSCESS SCORE

	Experiment 1			
	Liver abscess severity[a]			
	0	A-	A	A+
No. of steers	131	18	15	9
Days on feed	134	130	129	133
ADFI, lb	17.6	18.2	17.6	17.5
ADG, lb	2.95	3.13	2.95	3.02
Adj. ADG, lb[b]	2.91	3.11	2.82	2.93
F/G	5.9	5.7	6.0	5.7
Adj. F/G[b]	6.0	5.8	6.2	6.0
	Experiment 2			
No. of steers	139	29	17	62
Days on feed	127	135	129	130
ADFI, lb	18.7	18.4	18.3	17.8
ADG, lb	2.62	2.75	2.73	2.49
Adj. ADG, lb[b]	2.60	2.69	2.64	2.25
F/G	7.0	6.6	6.8	7.1
Adj. F/G[b]	7.1	6.8	6.9	8.0

[a]0 = unabscessed liver; A- = 1 or 2 small abscesses; A = 2 to 4 small, active abscesses; A+ = 1 or more large, active abscesses.
[b]Calculated from carcass weight.
Brink et al. 1990 (JAS 68:1201).

TABLE 3. EFFECT OF ROUGHAGE LEVEL ON PERFORMANCE OF STEERS

	Roughage, %			
	0	5	10	15
ADG, lb	2.95	3.35	3.46	3.37
ADFI, lb	18.9	19.8	20.1	20.4
F/G	6.4	5.9	5.8	6.1
Liver abscesses, %	58	55	63	71
A+ livers, %	32	42	38	52
Maintenance	---------- Dietary NE, Mcal/lb ----------			
Calculated	.96	.94	.92	.90
Observed	.86	.90	.91	.88
Percentage	90	96	99	97
Gain				
Calculated	.66	.64	.62	.60
Observed	.59	.61	.61	.59
Percentage	90	95	99	98

Crossbred steers (736 lb) fed 120 days.
Steam-rolled wheat diets.
Roughage source was 50% corn silage, 50% alfalfa hay.
A+ liver = 3 or more active abscesses.
Kreikmeier et al. 1990 (JAS 68:2130).

TABLE 4. EFFECT OF SUPPLEMENTAL FAT SOURCE ON PERFORMANCE OF STEERS

	Supplemental fat source			
	Control	Soy oil	Tallow	Y. grease
ADG, lb	3.13	3.39	3.30	3.50
ADFI, lb	19.6	19.6	19.1	20.1
F/G	6.3	5.8	5.7	5.7
Dietary NE				
NEm, Mcal/lb	.93	.97	.98	.98
NEg, Mcal/lb	.63	.66	.67	.67

Milo (80%) diets contained 6% added fat or molasses.
Crossbred steers (806 lb) fed 117 or 127 days.
Brandt and Anderson, 1990 (JAS 68:2208).

TABLE 5. EFFECT OF MIXING HIGH MOISTURE AND DRY GRAIN

	HMC:DRC or DRGS			
	100:0	75:25	50:50	0:100
First 28 d				
ADFI, lb	20.7	20.2	20.6	20.7
ADG, lb	3.24	3.37	3.33	3.11
F/G	6.3	5.9	6.1	6.5
To slaughter				
ADFI, lb	20.5	20.5	21.0	22.2
ADG, lb	2.91	3.00	3.00	2.84
F/G	7.0	6.7	7.0	7.8
Associative effect, %		7.4	5.5	

Stock et al. 1987 (JAS 65:290).

TABLE 6. EFFECTS OF LIMIT FEEDING ON FEEDLOT PERFORMANCE OF CROSSBRED YEARLING STEERS (average of two trials)

	Feed offered		
	Ad libitum	96% of Ad libitum	92% of Ad libitum
ADG, lb	3.40	3.32	3.26
ADFI, lb DM	19.4	18.6	17.9
DM/gain	5.74	5.58	5.53

Plegge et al. 1986 (MN Cattle Feeders Report p 1).