Feedlot Starting Diets: Effects on Cattle Health & Performance

Fred Owens
Private Consultant
Professor Emeritus, Oklahoma State University
Consultant, University of Wisconsin at River Falls
Information Sources & Readings

2. Reviews by others (esp. Clint Krehbiel; Tod Milton; Duff & Galyean’s 2006 overview)
3. Research published in reviewed journals.
5. Personal unpublished observations.
Adaptation to Feedlots

Animal behavior and stress
- Transport stress; nutrient losses
- Metabolic acidosis

Effects on health – Morbidity, Mortality:
- Bovine Respiratory Disease

Animal changes
- Rumen microbial activity
- Diet changes
- Ruminal acidosis

Carryover effects on Animal performance
- ADG, F:G, Cost of gain, Profitability
Adaptation to Feedlots

Changes in animal behavior
- Stress and nutrient losses
- Metabolic acidosis

Effects on health – Morbidity, Mortality:
- Bovine Respiratory Disease

Animal changes
- Rumen microbial activity
- Diet changes
- Ruminal acidosis

Carryover effects on Animal performance
- ADG, F:G, Cost of gain, Profitability
Regional cattle flows

Selected annual flows
Million head

- 0.3 - 0.9
- 1 - 2

Intraregional flow

Source: State certificate data (generally 2001) compiled by Economic Research Service, USDA.
Typical Stressors for Calves

- Receiving Feedlot 30 d
- Farm
- PreConditioning 45 days
- Sale barn
- Retained ownership
- Farm
- Feedlot 100 head/pen
- Uniformity
- Feedlot to Feedlot.
- Vaccines
- Parasiticides
- Implants
- New feed/water
- New penmates & Pathogens

Stressors
- Weaning
- Castration
- Dehorning
- Transport
- Fasting
- New feed/water
- New penmates & Pathogens
Stress of Transport (Shrink)

3 to 15% weight loss in 24 hour trip. Rumen fill, urine, feces, fluids, tissues.

How can shrink be reduced or weight recovery be speeded?
- Restrict feed prior to transport
- Feed electrolytes in diet.
- Chromium & K supplements?
Stress hormones and immune system—Drains body’s antioxidant reserves (vitamin C, vitamin E).

Acute phase proteins – Inflammation response, drains protein reserves.

Endotoxins released by enteric bacteria. Endotoxins can cause “leaky gut” and permanent lesions.

Diarrhea - Reduced digestion & absorption of nutrients.
Stress = Adaptive response to an altered external environment.

- Weaning ✓ Early
- Crowding
- Transport
- Feed & water changes ✓ Early
- Pathogens & vaccines ✓ Early
- New surroundings
- Co-mingling ✓ Early
- Processing
- Extreme weather?

Stresses are additive. Spreading them over time can reduce severity.

Pre-Conditioning for 45 days?
What is preconditioning?

"Vaccination, nutritional, and management program designed to prepare young cattle to best withstand the stresses of adjustment when they leave the point of origin and enter the channels of trade"

... all three components are needed. *Early vitamin E particularly.*

Dan Hinman
Extension Animal Nutritionist
University of Idaho
Preconditioning Calves

**Advantages for feedlots:**
- Higher daily gain
- Higher gain:feed ratio
- Less morbidity, mortality
- Less labor at feedlot

**Disadvantages for calf producer:**
- Investments by calf producer
  - Facilities, feed, labor
- Depressed calf weights, risk, deaths
- Premium calf price needed

*Feedlots do not trust calf producers so they may pay no premium.*

Useful for “retained ownership” cattle
Importance of BRD in the US

Percent of Placements Affected*

BRD= Bovine Respiratory Disease Complex

*Animals that were treated, died without treatment, or were shipped prior to slaughter without BRD treatment.
## Causes of BRD

### Viral Agents

<table>
<thead>
<tr>
<th>PI3</th>
<th>IBR</th>
<th>BVD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRSV</td>
<td>Adenovirus</td>
<td>Rhinovirus</td>
</tr>
<tr>
<td>Herpesvirus IV</td>
<td>Enterovirus</td>
<td>MCF</td>
</tr>
<tr>
<td>Reovirus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Bacteria

- Pasteurella
- Hemophilus
- Other
Clinical Signs

• Nasal and eye discharges
• Coughing, fever, decreased appetite
• Varying degrees of breathing difficulty, depression, droopy ears
• Core (rectal) temperature $>40$ C

Feed Intake and Health

If feed intakes are low, one can supply needed nutrients in drinking water or by injection.

Sick calves eat less feed and/or are more likely to get sick.

If feed intakes are low, one can supply needed nutrients in drinking water or by injection.
DMI%BW (4 - 28 weeks) = 2.953 ± 0.006 -0.00039 ± 0.00008 x Initial weight -0.04776 ± 0.00001 x Week on feed. Within groups R² = 0.80.

Surprisingly consistent & linear DMI as a percentage of current shrunk body weight. DMI% decreased over time.

DM intake of feedlot calves usually peaks at 3 to 4 weeks on feed.

Initial weight, kg

DM intake of feedlot calves usually peaks at 3 to 4 weeks on feed.

2012-2014 Steers
Effects of BRSV on Blood Vitamin Levels

A viral infection can decrease blood levels of some B-vitamins. 

Dubeski et al., 1996
Stress and Vitamin E in Blood & Tissues

Effect of fed vitamin E (1000 IU/d for 28 days)

Blood and tissue E levels increase when vit E is fed.
Stress and Vitamin E in Blood & Tissues

Effect of stress on vitamin E level

Stress often decreases blood and tissue vit E levels.

Nockels et al., 1996
Impact of Injecting Dams with 3000 IU E on Newborn Calves 4 to 6 Weeks Later

Vitamin E injection of cows increased immunoglobulin levels of newborn calves.

Nockels et al., 1994
Preventing & Treating BRD

Management. Critical period = 3 weeks after weaning, shipping, starting on feed

Eliminate stress where possible

• Avoid co-mingling cattle from different sources during the critical 3-week period
• Keep new cattle close to feed and water
• Don’t over crowd (especially early in feeding period)
• Control dust and mud

Prevention with Vaccines

Treatment with Antibiotics, Vitamins? (31%)

Monitor & detect individual animals (rectal temp)

Mass medication for “high risk cattle.”

• Higher medical cost but less labor intensive
Balance

### Differences in the Ruminal Microflora for Cattle Fed High-Forage or High-Grain Diets for > 60 Days

<table>
<thead>
<tr>
<th>Item</th>
<th>Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High-roughage&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ruminal pH</td>
<td>6.5 to 6.8</td>
</tr>
<tr>
<td>Gram-negative bacteria</td>
<td>80 to 90%</td>
</tr>
<tr>
<td>Gram-positive bacteria</td>
<td>10 to 20%</td>
</tr>
<tr>
<td>Strict anaerobes</td>
<td>&gt; 80%</td>
</tr>
<tr>
<td>Facultative anaerobes</td>
<td>&lt; 20%</td>
</tr>
<tr>
<td>Total bacteria (culturable)</td>
<td>$5 \times 10^9$/g</td>
</tr>
<tr>
<td>Starch fermenters/Total bacteria</td>
<td>&lt; 50%</td>
</tr>
<tr>
<td>Of starch fermenters:</td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>14%</td>
</tr>
</tbody>
</table>

### Notes:
- **Huge shifts occur in the microbial population of the rumen with adaptation to a high-grain diet.**
- **Bacteria: Primarily a dilution effect. Population of cellulose digesting bacteria unchanged. Mainly due to dilution by starch fermenters.**

**Mackie et al., 1984**


<sup>b</sup> Leedle, J.A.Z., unpublished data.
ADG by Dry Matter Intake: Central Plains 700 to 899 lb Steers

Rate of gain increases as energy intake increases.

Vet Life Benchmark; 1.4 million cattle
Sale Weight by Dry Matter Intake:
Central Plains 700 to 899 lb Steers

With $85 cash market, cattle value increased $28/head for each 1 kg increased DMI.
ADG versus Dry Matter Intake: Within Feedyard (700 to 800 lb Steers)

As energy intake increases, rate of gain increases.

$R^2 = 0.6408$
Feed:Gain by Dry Matter Intake: Within Feedyard (700 to 800 lb Steers)

As energy intake increases, feed:gain ratio tends to decrease: [Less feed is needed per unit of gain.]

$R^2 = 0.0945$
DMI was lower for pens of Steers with a higher sickness incidence.

\[ y = -1.18x + 21.80 \]

2012-2014 Steers
2330 pens > 50/pen

\[ R^2 = 0.17 \]
DMI was lower for pens of Heifers with a higher sickness incidence

\[ y = -0.22x + 19.26 \]

\[ R^2 = 0.02 \]

2012-2014 Heifers
1360 pens >50/pen
First Day’s Ration & Management

1. Let cattle rest overnight after arrival.
2. Provide fresh, overflowing water.
3. Top-dress grass hay (4 d) on concentrate, so cattle “eat through” a familiar feed.
4. Use only highly palatable ingredients.
   Avoid silages and unfamiliar feeds, fines.
   Starter diets – Alfalfa hay; Delay corn silage.
5. Delay feeding of monensin (lower intake)
   Use palatable ionophore (not monensin)
   plus some other coccidiostat.
6. Provide “Mentor” cow or adapted animal to lead new calves to feed and water.
How are Feedyards Starting Cattle on Feed?

1. Forage:Concentrate 40% roughage
   - 3 to 6 transition diets within 21-28 days (56%)
   - 2 diets mixed to yield forage level desired (41%)

2. Multiples of maintenance (Limited maximum intake)

3. Restrict intake of the final diet

4. Free choice access to roughage

5. Programmed rate of gain

6. Intake limiting compounds
Method 1. Forage:Concentrate Ratios

Number of Rations

- 3 to 6 transition rations
- More transition rations
- Smaller changes in forage and energy
- Better adaptation to finish ration
- Theoretically = Higher dry matter consumption = improved performance
Problem using multiple transition rations

Inefficiency of feedyard operations
- Increased load number, smaller load size, increased feeding times

Compromise: Nutrition & Management
- Most common: 4 ration system

Milton, 2005
A gradual transition to a high grain diet helps to prevent digestion problems & acidosis.
Method 2. Two Ration Mixtures

Two rations: Starter and Finisher

- Various proportions of starter (40 to 45% forage) and finisher ration daily switching every 3 to 5 days
- Small increases in energy and small decreases in forage daily

Two approaches:
1. Feed different rations at different times of day
2. Mix two rations proportionally in feed truck.

Milton, 2005
Method 2:

- Feed starter ration for 3 to 5 days
- Feed a proportion of each ration (starter and finisher) on each round of feeding
- Feeding starter ration first
- Followed by finish ration within a set period of time.

Milton, 2005
Two Ration Systems $1=40\%R; 4=10\%R$

Method 1: 2 diets with 3 deliveries per day

<table>
<thead>
<tr>
<th>Feeding 1</th>
<th>Feeding 2</th>
<th>Feeding 3</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ration</td>
<td>%</td>
<td>Ration</td>
<td>%</td>
</tr>
<tr>
<td>1</td>
<td>33</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Advantages

- Feeding efficiencies
- Reduced milling of multiple rations
- Trucks always carry maximum load
- Reduced number of loads
- Feeding time should be much more consistent for each pen

Nutritionally: Small incremental changes in energy and forage content should promote smoother adaptation to the final ration

Milton, 2005
Disadvantages

- Feed distribution critical
- Coordination of feeding times = higher level of management

Assumption: All cattle consume equal proportions of each ration daily?

Milton, 2005
Rate of Grain Adaptation

• Incremental increases in dietary concentrate from 55 to 90% (DM basis) in less than 14 days with free choice access to feed generally decreases performance.

• Considerable animal-to-animal variation.

• Amylolytic microbes that produce lactate respond rapidly to an increased concentrate level; lactate using bacteria only increase when concentrate reaches 70% for some 2 to 7 days.

• Protozoal numbers generally peak between 60 and 70% concentrate.

Brown et al., 2006
Ruminal pH and Diet Adaptation

RA = Day 4 after feeding a 65% concentrate diet.
GA = Day 16 after feeding 48, 57, 65, 73, and 82% for 3 days each.

Bevans et al. 2005
Rapid Adaptation

• Did not influence ruminal variables greatly compared with gradual adaptation (GA).
• Variance in pH was greater for rapid adaptation (RA).
• Potential for acidosis varies among individual animals.
• Tailor adaptation time for the most susceptible individuals.
• Don’t get in a hurry!

(Bevans et al., 2005)
Method 3. Multiples of $\text{NE}_m$

- Establish an upper intake limit based on calculated maintenance requirement.
- Limit the DMI peaks to decrease daily intake variation, not to program intake for a given rate of gain.

(Xiong et al., 1991; Bartle and Preston, 1992)
# Feed Consumption Maximums

Predicted consumption as a Multiple of Maintenance

<table>
<thead>
<tr>
<th>INITIAL PAY WEIGHT</th>
<th>Rat 1 4 - 7 DAYS</th>
<th>Rat 2 4 - 7 DAYS</th>
<th>Rat 3 7 DAYS</th>
<th>Rat 4 7 - 10 DAYS</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>17.2</td>
<td>18.4</td>
<td>20.1</td>
<td>22.1</td>
<td>24.5</td>
</tr>
<tr>
<td>625</td>
<td>17.5</td>
<td>18.8</td>
<td>20.5</td>
<td>22.5</td>
<td>25.0</td>
</tr>
<tr>
<td>650</td>
<td>17.8</td>
<td>19.1</td>
<td>20.9</td>
<td>22.9</td>
<td>25.5</td>
</tr>
<tr>
<td>675</td>
<td>18.2</td>
<td>19.5</td>
<td>21.3</td>
<td>23.3</td>
<td>25.9</td>
</tr>
<tr>
<td>700</td>
<td>18.5</td>
<td>19.8</td>
<td>21.6</td>
<td>23.8</td>
<td>26.4</td>
</tr>
<tr>
<td>725</td>
<td>18.8</td>
<td>20.2</td>
<td>22.0</td>
<td>24.2</td>
<td>26.9</td>
</tr>
<tr>
<td>750</td>
<td>19.1</td>
<td>20.5</td>
<td>22.4</td>
<td>24.6</td>
<td>27.3</td>
</tr>
<tr>
<td>775</td>
<td>19.5</td>
<td>20.9</td>
<td>22.8</td>
<td>25.0</td>
<td>27.8</td>
</tr>
<tr>
<td>800</td>
<td>19.8</td>
<td>21.2</td>
<td>23.2</td>
<td>25.4</td>
<td>28.3</td>
</tr>
<tr>
<td>825</td>
<td>20.1</td>
<td>21.6</td>
<td>23.6</td>
<td>25.9</td>
<td>28.7</td>
</tr>
<tr>
<td>850</td>
<td>20.4</td>
<td>21.9</td>
<td>23.9</td>
<td>26.3</td>
<td>29.2</td>
</tr>
<tr>
<td>875</td>
<td>20.8</td>
<td>22.3</td>
<td>24.3</td>
<td>26.7</td>
<td>29.7</td>
</tr>
<tr>
<td>900</td>
<td>21.1</td>
<td>22.6</td>
<td>24.7</td>
<td>27.1</td>
<td>30.1</td>
</tr>
<tr>
<td>925</td>
<td>21.4</td>
<td>23.0</td>
<td>25.1</td>
<td>27.5</td>
<td>30.6</td>
</tr>
<tr>
<td>950</td>
<td>21.7</td>
<td>23.3</td>
<td>25.5</td>
<td>28.0</td>
<td>31.1</td>
</tr>
<tr>
<td>975</td>
<td>22.1%</td>
<td>23.7</td>
<td>25.9</td>
<td>28.4</td>
<td>31.5</td>
</tr>
<tr>
<td>1000</td>
<td>22.4%</td>
<td>24.0</td>
<td>28.2%</td>
<td>28.8</td>
<td>32.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% of Predicted Consumption</th>
<th>72%</th>
<th>82%</th>
<th>90%</th>
<th>95%</th>
<th>97%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milton, 2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Consumption Targets

Advantage - Gives inexperienced personnel a target.

Disadvantage - Tends to rely on target DMI, not an evaluation of each pen of cattle.

\[ y = 0.2038x - 1.131 \]
\[ R^2 = 0.6408 \]

Underpredicting the amount of feed to supply will reduce ADG and sale weight.

weight or .05 lb/hd/d gain

Milton, 2005
Tests of Multiples of $\text{NE}_m$

1. AL diet = Ad lib access to (30, 20, 10 [corn silage] + 10% [cottonseed hulls]) as roughage for 7 d each).

2. 2.7 diet = Limit feed supply to 2.1, 2.3, 2.5, and 2.7 $\times$ $\text{NE}_m$ from week 1 through 4.

3. 2.9 diet = Limit feed supply 2.3, 2.5, 2.7, and 2.9 $\times$ $\text{NE}_m$ from week 1 through 4.

(Bartle and Preston, 1992)
<table>
<thead>
<tr>
<th>Item</th>
<th>AD</th>
<th>2.9</th>
<th>2.7</th>
<th>SEM</th>
<th>2.7 vs AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>d 0 to 28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADG, kg</td>
<td>1.70</td>
<td>1.66</td>
<td>1.73</td>
<td>0.085</td>
<td>NS</td>
</tr>
<tr>
<td>DMI, kg/d</td>
<td>8.6</td>
<td>8.2</td>
<td>8.1</td>
<td>0.15</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Gain:Feed</td>
<td>0.197</td>
<td>0.201</td>
<td>0.214</td>
<td>0.008</td>
<td>0.14</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADG, kg</td>
<td>1.35</td>
<td>1.40</td>
<td>1.44</td>
<td>0.03</td>
<td>0.08</td>
</tr>
<tr>
<td>DMI, kg/d</td>
<td>8.3</td>
<td>8.3</td>
<td>8.5</td>
<td>0.13</td>
<td>NS</td>
</tr>
<tr>
<td>Gain:Feed</td>
<td>0.163</td>
<td>0.168</td>
<td>0.170</td>
<td>0.003</td>
<td>0.15</td>
</tr>
</tbody>
</table>

(Bartle and Preston, 1992)
Frequency that Intake *Actually* was Restricted for Steers fed at Max Intakes

(Bartle and Preston, 1992)
Interaction of Grain Source and Processing with Limited Intake

• Whole shelled corn vs. steam-flaked milo:
  ✓ 12% greater DMI
  ✓ 4% increase in ADG
  ✓ 7% lower gain efficiency

• Grain source and processing had a much greater effect than method of adaptation.

(Bartle and Preston, 1992)
Rate of Ruminal Fermentation and Rumen pH with Grains

FAST
- Wheat
- Barley
- High Moisture Corn (Bunker)
- Steam-Flaked Corn
- High Moisture Corn (Stored Whole, Fed Whole)
- Rolled corn, Reconstituted Milo, Steam-Flaked Milo
- Whole Shelled corn
- Dry Rolled Milo

SLOW

Low pH

Britton and Stock, 1987

High pH
Changes in Relative Feed Intake (DMI as a Percentage of BW) over Feeding Period for Flake Densities

Flakes:
- Thin (B22)
- Medium (B28)
- Coarse (B34)

SE = .04

(Xiong et al., 1991)
Frequency that Feed Supply was Restricted at various Flake Densities and Time on Feed

(Xiong et al., 1991)
Gain: Feed at Flake Densities and Times on Feed

Flakes:
- Thin: B22
- Medium: B28
- Coarse: B34

SE = .50

(Xiong et al., 1991)
Degree of Processing and DMI

• Larger potential impact on feeding period performance than grain adaptation method.

• Finding some way to ensure maximum feed intake while still minimizing risk of ruminal acidosis should benefit the feedlot industry.
Adapting to Processed Grains

• Greater DMI with 75% WSC:25% SFC to 25% WSC:75% SFC compared with 100% SFC (Lee et al., 1982).

• Supported by review by Zinn et al. (2002).

• To maximize feed intake, is it efficacious to slowly adapt cattle to more extensively processed grain?
4. Restricting Intake of the Final Diet

- ADG unchanged.
- Lower DMI.
- Improved feed efficiency.
- Less daily variation in feed intake and less acidosis?
Daily DM Intake Restriction

Days

kg/d

Limit-fed
Ad libitum
Performance of Yearling Steers Fed 121 Days

<table>
<thead>
<tr>
<th>Item</th>
<th>Ad libitum</th>
<th>Limit-fed</th>
<th>SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pens</td>
<td>5</td>
<td>5</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td>Number of steers</td>
<td>38</td>
<td>38</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td>Initial wt, lb</td>
<td>865</td>
<td>864</td>
<td>7</td>
<td>NS</td>
</tr>
<tr>
<td>Final wt, lb</td>
<td>1331</td>
<td>1328</td>
<td>12</td>
<td>NS</td>
</tr>
<tr>
<td>Daily gain, lb</td>
<td>3.85</td>
<td>3.84</td>
<td>0.11</td>
<td>NS</td>
</tr>
<tr>
<td>Intake, lb/d</td>
<td>26.4</td>
<td>23.6</td>
<td>0.58</td>
<td>0.01</td>
</tr>
<tr>
<td>Feed:gain</td>
<td>6.90</td>
<td>6.15</td>
<td>0.28</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Bierman and Pritchard, 1996
## Performance of Yearling Steers fed 123 Days

<table>
<thead>
<tr>
<th>Item</th>
<th>Ad libitum</th>
<th>Limit-fed</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial wt, lb</td>
<td>840</td>
<td>851</td>
<td>NS</td>
</tr>
<tr>
<td>Final wt, lb</td>
<td>1186</td>
<td>1203</td>
<td>NS</td>
</tr>
<tr>
<td>Daily gain, lb</td>
<td>2.91</td>
<td>2.95</td>
<td>NS</td>
</tr>
<tr>
<td>Intake, lb/d</td>
<td>20.6</td>
<td>19.4</td>
<td>0.06</td>
</tr>
<tr>
<td>Feed:gain</td>
<td>7.04</td>
<td>6.54</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Weichenthal et al., 1999
## Performance of Steers Fed 165 to 180 Days

<table>
<thead>
<tr>
<th>Item</th>
<th>Ad libitum</th>
<th>Limit-fed</th>
<th>SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pens</td>
<td>15</td>
<td>15</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Number of steers</td>
<td>75</td>
<td>73</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Final wt, lb</td>
<td>1250</td>
<td>1199</td>
<td>12</td>
<td>0.01</td>
</tr>
<tr>
<td>Daily gain, lb</td>
<td>3.64</td>
<td>3.33</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>Intake, lb/d</td>
<td>20.2</td>
<td>19.1</td>
<td>0.10</td>
<td>0.01</td>
</tr>
<tr>
<td>Feed:gain</td>
<td>5.84</td>
<td>6.06</td>
<td>0.32</td>
<td>0.19</td>
</tr>
</tbody>
</table>

*Excessive restriction reduces performance.*

Choat et al., 2002
Why does restricting DMI or a “slick bunk**” policy improve efficiency?

**Method: Check bunks often; let feedbunks remain empty for 1 to 3 hours each day.

1. Lower maintenance energy requirements.  
   *Less activity awaiting feed or after meals*
   *Smaller gut and liver size (high cost organs)*
2. Less feed waste.
3. Less feed sorting.  
   *Helps avoids nutrient or fiber shortages for slow eaters or timid cattle.*
4. Less feed engorgement and acidosis.

5. *BUT AVOID OVERLY RESTRICTING INTAKE!*
Conclusion – Intake Restriction

• For cattle adapted to the top high-grain diet, trial results indicate cattle will be more efficient in converting feed to gain when DM intake is restricted SLIGHTLY.

• If restricting intake reduces daily gain, it will NOT improve efficiency.

• Are calves and yearlings similar?
5. Provide Free Choice Roughage

1. Separate supply of roughage & concentrate
   Bunks or large bale feeders. Each must be adequate in nutrients.

2. Let each animal balance its own diet.
   Do cattle have as much nutritional sense as nutritionists?

3. Cattle gradually increase their grain intake.

4. Avoid feeds that spoil – silages, flaked grain

5. Avoid unpalatable feeds.
   Also could include an intake limiter in the concentrate.
5. Intake Limiters for “All Concentrate” diets

1. Formulate 100% concentrate diets.
2. Include appropriate level of unpalatable ingredient to limit feed intake.
3. Adjust level of ingredient over time to maintain intake level desired.
5. Downside: Increased excretion of certain limiters; legality.

Potential intake limiting ingredients:
- Salt, certain trace minerals,
- Fish oils, monensin
Overall Conclusions

• Different approaches can be used to start cattle “on feed” successfully.
• Establishing high DMI early in the finishing period is important for maximum performance and profitability.
Overall Conclusions

• Differences in performance due to grain (energy) source (byproducts?) and degree of grain processing generally remain evident throughout the entire feeding period regardless of adaptation method.

• Care during diet and feedlot adaptation is essential to reduce long-term adverse effects of acidosis on gut health and of respiratory disease on lung lesions that will depress performance and carcass quality.
Thank you! /Obrigado!

Fred Owens