Feeding for Health and Productivity:
Concepts for feeding high and low risk cattle in a feedlot environment - Challenges and Paradigms

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"Getting Them Started Right"

Dr. Glen Lofgreen, Professor,
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“It is impossible to describe the best receiving program for stressed calves, because such a program does not exist”.
What Does “Risk” Imply in Receiving / Starting Cattle

- Perception vs. Expectation vs. Reality
- Expected Risk Categories
  - Low
  - Moderate
  - High
- Expected Risk Perceptions / Expectations
  - Past experience
  - Current conditions
    - Weather
    - Labor
    - Number and type of cattle being received
    - Time frame in which they are being received
- Key Question: “Risk for what?”

What Does “Risk” Imply in Receiving / Starting Cattle

- **Reality**
  - Real Assessment of Risk is Always Made After the Fact
  - Feeding and Health Management of Starting Cattle is a Continuum of “Potential Risk” Factors and Exposure Within a Given Population of Cattle
  - Pre-arrival and Post-Arrival Conditions Will Combine to Determine the Actual Risk Assessment Experience
Stress in cattle is related to Transitions

- Pre-natal
- Pre-weaning
- Pre-receiving
  - Environmental
  - Dietary
  - Social
- Post-natal
- Post-weaning
- Post-arrival

Effects of Stress in Cattle Are a Function of Intensity and Duration

Intensity + Duration → (-) Consequences

- Increased Risk of Disease
- Inflammatory Response
- Decreased Intake
- Decreased Immune Function
- Oxidative Stress

Stress Can Predispose to Disease and Other Health Challenges That Will Compromise Productivity of the Animal
Transition Periods are Critical

- What happens to an animal before or after a transition can have a major impact on the overall health, performance and profitability.
- Management programs (nutrition and health) during this period can have significant affects on subsequent health, productivity, carcass quality and productivity.

Stress Events Alter All Aspects of Animal Physiology and Behavior

Commingling is stressful and exposes calves to many pathogens.
Other Stress-related effects

- **Physical stress effects**
  - Fatigue
  - Dehydration
  - Lack of adequate feed and / or water
  - Improper handling
- **Physiological stress effects**
  - Disruption in normal rumen function from transport and marketing processes.
  - Impaired gut motility and function
  - Impaired immune function
- **Psychological stress effects**
  - Cattle are social animals
  - Adequate “personal space”
  - Intimidation factor
- **Adverse Effects on Appetite and Intake and Health**

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Defining Risk in Cattle Based on Relative *Expected* Feed Intake

- **Low Risk** (Yearling)
  - High Expected DM Intake
  - Low Expected BRD Incidence
  - Higher Relative Risk for Metabolic Disease
  - Low mortality

- **Moderate Risk** (Calves or Yearlings)
  - Intermediate Response on DM intake, morbidity and mortality

- **High Risk** (SE sale barn calf)
  - Low Expected DM Intake
  - High Expected BRD Incidence
  - Higher risk for coccidiosis
  - Higher mortality
Feeding Programs for Starting Cattle

• Criteria to consider
  • Fit Program to Cattle type
    • Calves vs. yearlings
    • High vs. low stress (Expectations vs. Reality)
    • Expected DM intake (Diet composition and nutrient concentration)
  • Fit Program to the Season of the year
    • Precipitation
    • Temperature (Max & Min)
  • Fit Program to Feedlot Management and Logistics
    • Available labor to process and care for cattle
    • Feeding operations
      • Feed manufacture and delivery capacity
      • How many rations
      • Ration transitions (when and how)
      • Length of the starting period

DM Intake Patterns by Initial Weight
Cattle intake drives cattle performance and overall feedyard operations

- Feed Intake
  - Quantity
- Behavioral patterns of feeding
  - Stressed calves exhibit eating behavior which is opposite of normal, unstressed animals
  - Consume greater quantities of high-energy, nutrient dense diets than less energy / nutrient dense diets
  - Stressed calves select a diet higher in concentrates than non-stressed calves

Do cattle not eat because they are sick or are they sick because they do not eat?

Effect of health status on visits to feed bunk during initial 28 days in feedlot

Healthy

Morbid
### Time lapse for the percentage of calves deemed to be healthy or morbid to consume feed

<table>
<thead>
<tr>
<th>Day post arrival</th>
<th>Calves consuming feed that day</th>
<th>Cumulative % of calves consuming feed</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Non-morbid</td>
<td>Morbid</td>
</tr>
<tr>
<td>1</td>
<td>38.9</td>
<td>27.0</td>
</tr>
<tr>
<td>2</td>
<td>62.2</td>
<td>42.9</td>
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<tr>
<td>3</td>
<td>81.7</td>
<td>59.2</td>
</tr>
<tr>
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<td>66.5</td>
</tr>
<tr>
<td>7</td>
<td>88.1</td>
<td>70.0</td>
</tr>
</tbody>
</table>

Hutcheson and Cole, 1980

### Epidemic curve of BRD events:
(Reproduced from Loneragan: Dissertation, 2001)

![Graph showing the epidemic curve of BRD events with trend line for morbidity and mortality from 1980 to 2016.](#)

Addressing continuous disease challenge in the feedlot
Resilience

• Conceptual definitions:
  – Physiological and psychological resilience is defined as an individual's ability to properly adapt to stress and adversity.
  – Capacity to recover quickly from difficulties
  – Process of adapting well in the face of adversity

• Point to Consider: Determine factors that keep an animal healthy when confronted with stress

How Can We Build Resilience into Calves

Building resilience begins at the cow/calf level!

Optimal nutrition and proper management can help calves through periods of stress and assist in immune system development

Developing immunity is key
Length of Starting Period - Chronology vs. Biology

- Time is irrelevant to cattle (across vs within days)
- Nutritionist perspective:
  - Time to cattle are consuming finishing diet
  - Achieve target level of intake
  - Varies with cattle type, production system etc
- Veterinary perspective:
  - Immune response to vaccination or metaphylaxis
  - Resolution of primary disease challenges
  - Length of time required for adaptive response to the transition

Nutrients of Concern with Health/Immunity

- **WATER** – quality, quantity and availability are critical
- Energy (concentrate level)
  - Carbohydrate
  - Fat
  - Fiber
- Protein (level and source)
  - True protein (amino acid)
  - Non-protein nitrogen (urea)
- Vitamins
  - Fat soluble (A,D,E)
  - Water soluble (B vitamins)
- Minerals
  - Macro-minerals
  - Micro (Trace) - minerals

(Modified from Galyean, Duff and Perino)
Feeding Programs

- **General Objectives:**
  - Ameliorate the adverse effects of transitional stressors
  - Reduce incidence and severity of disease conditions
  - Restore nutrients lost during shipping, marketing and processing
  - Allow for adequate nutrient intake to meet both the demands for maintenance and a desired level of growth
  - Provide adequate time and conditions for a successful acclimation of rumen to novel diets
  - Successful integration of both dietary and feed intake management with the overall health program.
  - How an animal adapts to the “Transition” during the first 45 – 60 d in the feedlot will determine the productivity and ultimately profitability for the entire feeding period

DM Intake vs. Nutrient Intake

- **DM Intake (Quantity consumed)**
  - What are the DM intake targets for each ration in starting phase
  - What is the PEAK intake for the cattle
  - What is the proper head count in pen
    - Any pulls
    - Any additions to the lot
  - Frequency and timing of feed delivery
DM Intake vs. Nutrient Intake

• Nutrient Intake (DM Intake x Nutrient Density)
  • Proper level and source of nutrients
  • Knowing and managing intake to provide proper nutrient levels
  • Proper feed and bunk management (consistent, high quality feed at the right amount, at the right time to provide adequate intake)
  • Selection of optimum feed additive program
  • GOAL: Matching nutrient demand with nutrient supply

Designing a Feeding Program to get Consistent Intakes for Consistent Feed Deliveries?

• Starting Program
  • Ration changes
  • Intake levels
  • Know what cattle should eat over a feeding period
    • Use your closeouts to create a database
    • Equation In-weight *.014 + (10 - 20) = predicted intake
    • Graphing intakes of each pen to look for performance problems before they are permanent
  • Key Point:
    • Use starting period to teach cattle how you want them to eat
Targeting DM Intake

Days post-arrival in feedlot

Feeding Systems for Starting Cattle

- **One Ration Feeding System (Lofgreen)**
  - High stress calves
  - Low intake expectation with preference for higher energy diets
  - Moderate energy diet for 28 d with hay first 7 days
- **Sequential Transition System**
  - 3 or 4 ration step-up
    - Progressive increase in dietary energy (grain) level
    - More abrupt transitions in dietary energy level at ration changes
    - Complicates feeding milling and delivery logistics
  - **Two ration system**
    - Use starting and finishing diets fed in sequential order within and across days
    - Smoother transition in dietary energy levels
    - Improves efficiency of feed milling and delivery
    - Requires increased monitoring attention to bunk conditions and cattle behavior
    - May increase flexibility of starting diet ingredient inclusion
    - Decreases flexibility for inclusion of medicated feed additives
Example: Feeding Program Using Two-Ration System for High Risk Calves Fed Three Times Daily

Feeding Phase
Duration: ≈ 18 - 40 days

Percentage of Starting and Finishing Diets in a Two-Ration System for High Risk Calves

Feeding Phase
Hypothetical Comparison of Two-Ration Transition Program to 4 Ration Step Up Program for Low Risk Steers

Days post-arrival in feedlot

Starting Period is a Critical Point of Intersection

Success requires a team effort
Summary

• Stress adversely affects all aspects of the animal’s physiology and behavior
• Managing Transition Periods are Critical
• Restore and replete nutrients lost during transition stress and build intake
• Allow Adequate Time for Adaptive Response
• Better to prevent disease than treat
• Starting Period is a Critical Point of Intersection for animal health, nutrition and management
• Well designed and implemented starting programs can allow animal to make a successful transition and help insure a healthy and productive time in the feedyard

Feeding for health

The individual animal is consuming the proper nutrients at the proper units / levels for the promotion of healthy, cost efficient growth (M.E. Hubbert)

Total Quality Animal Care
Management of the whole, Mind, Body and Environment

- Healthy Rumen
- Healthy Gut
- Healthy Lungs
- Healthy Feet / Limbs