Health and nutritional strategies for managing incoming feedlot cattle
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Managing newly received cattle presents challenges from both a nutritional and health standpoint; however, information about pre-arrival management of incoming feeder cattle has become increasingly available and can be utilized to refine arrival processing protocols. Previous management, nutrition and vaccination history impacts newly arrived cattle’s capabilities of coping with the stress associated with feedlot entry. Utilizing the available information to more precisely identify the disease-risk of incoming groups of cattle will assist in determining expected investments in disease prevention and intervention as well as the associated labor involved.

Morbidity
The level of morbidity in the feedlot is a strong driver of profitability due to the cumulative costs of treatment, reductions in performance during and following sickness as well as reduced carcass quality (Smith, 1998; Reinhardt et al., 2012). Bovine Respiratory Disease (BRD) is the most common cause of sickness in the feedlot and is attributed to complex interactions between viral and bacterial pathogens. The 2011 USDA Veterinary Services Feedlot Survey estimated that 16.2% of cattle placed in feedlots show signs of BRD at some point during the feeding period (USDA, 2013). In a study of morbidity from BRD from 102 reporting feedlots, with a total of 20,136 heifers and steers, a 5.9% incidence of morbidity was reported; however, cumulative pen incidence ranged from 0 to 80% (Sanderson et al., 2008). Decreases in performance and carcass merit have been associated with reductions in carcass values of $23.23, $30.15, and $54.01 per head for cattle treated for BRD once, twice, or 3 or more times, respectively (Schneider et al., 2009).

The majority of sickness in receiving cattle is typically observed during the first 21 days following feedlot arrival (Sanderson et al., 2008). The high rate of sickness during this period is attributed to the stress associated with transport, comingling and increased exposure to pathogens. Additionally, cattle are also challenged with adapting to a new environment, social hierarchy, and diet. Minimizing the risk of BRD during receiving is critical for maximizing the productivity and profitability throughout the entire finishing phase.

Disease risk
Although it would be ideal to implement health management strategies on an individual basis, this is simply not feasible due to the intensive nature of maintaining precise records on individual animals as they move through the production chain and implementing multiple protocols when processing large numbers of cattle. Instead, loads of cattle are designated by disease-risk; typically, into low and high-risk groups and processing procedures are adjusted accordingly.

A number of factors contribute to the potential disease-risk of a population of cattle and include source, age, distance transported, previous health management, amount of comingling, shrink and weather conditions. Typically, cattle that have been freshly weaned, transported long distances, assembled from multiple small lots from an auction barn, or simply have inadequate information available about their history are considered high-risk. Calves that have been preconditioned and yearling cattle that originate from a single source are often treated as low-risk populations. Oftentimes groups of cattle may present factors from both high and low-risk characterizations. For example, a load of cattle may originate from a certified preconditioned sale, which suggests low-risk, however they may also be hauled a long distance and have been assembled from several smaller lots of preconditioned cattle. Table 1 gives an example of an expanded disease-risk classification based on various factors. Additional factors, such as distance cattle have been transported and the potential for large changes in weather conditions during receiving may necessitate moving a group up a level in disease-risk. Furthermore, receiving protocols for low-risk calves may differ from low-risk yearlings and so forth.
Table 1. Example disease-risk classifications for incoming feedlot cattle

<table>
<thead>
<tr>
<th>Disease - risk</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Preconditioned, single source</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Preconditioned, comiled</td>
</tr>
<tr>
<td>High</td>
<td>Freshly weaned, auction sourced</td>
</tr>
<tr>
<td>High</td>
<td>No information available</td>
</tr>
<tr>
<td>Yearlings</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Yearling, single source w/ health information</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Yearling, single source</td>
</tr>
<tr>
<td>High</td>
<td>Yearling, comingled</td>
</tr>
<tr>
<td>High</td>
<td>No information available</td>
</tr>
</tbody>
</table>

Receiving protocols

Basic considerations for receiving protocols include duration of time between arrival and processing, vaccination program, metaphylactic treatment, and parasite prevention. Increased likelihood of sickness warrants greater investments in preventative measures; however, tight margins necessitate reducing unnecessary expenditures.

The duration of rest following transportation varies greatly between feedlots, ranging anywhere from 0 to 72 hours. Transportation has been shown to cause immunosuppression (Carroll and Forsberg, 2007) which may impact an animal's ability to acquire adaptive immunity in response to a vaccination (Kehrli et al., 1999). As such, it may be advantageous to allow cattle traveling longer distances a greater duration of time between arrival and processing. Additionally, when the information is available, it is important to consider the total duration of travel and not simply the final shipment to the feedlot.

The development of a successful vaccination program is dependent on both the efficacy of vaccines and timing of vaccination. Unfortunately, feedlot arrival is a less than desirable time for vaccination. Immunosuppressed cattle will not respond as favorably to vaccines and may be unable to develop the full immunity normally afforded by vaccination. Additionally, time is required to build adaptive immunity in response to vaccination and cattle will be immediately challenged with new and increased pathogen loads upon arrival. Ultimately, pre-arrival management is the best tool for developing immunity. Preconditioning programs, which aim to increase an animal's health status before they are shipped from the ranch of origin through more intensive health and nutritional management, have been shown to decrease the likelihood of BRD during receiving (Step et al., 2008). As such, preconditioned cattle are less likely to receive as many vaccinations at feedlot arrival, although most protocols call for all cattle to be vaccinated against IBR and oftentimes BVD type I and II. Recommendations for moderate to high-risk cattle are a 5 way respiratory vaccines (IBR, BVD type I and II, BRSV, PI3) as well as a clostridial vaccination, and vaccinations for Mannheimia haemolytica and Pasteurella multocida.

A lot of emphasis is placed on the vaccination history of cattle prior to feedlot entry; however, the question should not simply be whether or not cattle were vaccinated but instead focus on the effectiveness of the vaccination program. Vaccine handling, time of administration, nutritional status of calves at time of vaccination as well as the amount of stress at time of vaccination all contribute to the effectiveness of a vaccination program. Oftentimes cattle that come through the sale barn are marketed as “having their shots”; however, these cattle are still typically classified as moderate to high-risk.

Metaphylaxis, mass treatment of cattle to prevent an expected disease outbreak, through both long-acting injectables and feed grade antibiotics has been shown to decrease respiratory disease and improve growth performance in groups of high-risk cattle (Nickell and White, 2010). Metaphylaxis is very frequently recommended for high risk cattle but generally not recommended for low risk cattle (Terrell, 2012). The decision to include a metaphylactic treatment for intermediate risk cattle will be dependent on their risk factors. Returning to the example of preconditioned, comiled cattle, transported a long distance, it may be beneficial to consider including a metaphylactic treatment especially if large changes in weather are anticipated.

Interaction of nutrition and health

The nutrition and health status of feeder cattle are very closely inter-related. Poor nutritional status will impact an animal's ability to mount an immune response and sick cattle typically have reduced feed intakes. When first arriving at the feedlot,
cattle will have been withheld from feed and water for varying durations of time dependent on the marketing channels and shipping distance. Even short periods of feed restriction negatively impact ruminal fermentation and ruminal capacity for nutrient absorption (Zhang et al., 2013). Stimulating intake is the main priority for newly arrived cattle; oftentimes, this is accomplished through provision of long stem highly-palatable hay at arrival. Although hay will serve to stimulate intake and establish normal gut fill, it is not nutrient dense enough to provide adequate nutrition. A number of various “step-up” programs, which transition cattle from high-roughage low-energy diets to concentrate-based high-energy diets, have been implemented successfully. Special considerations should be given to ensuring vitamin and mineral requirements of receiving cattle with low feed intakes are met.

**Conclusion**

Ultimately, the development of receiving protocols is a complex and individualized process that requires close communication between feedlot operators, consulting veterinarians and nutritionists. The ability to vary receiving protocols will vary by feedlot and is highly dependent on good record keeping practices and well-trained personnel.

**References**