Feedlot Production and Health Management Manual

This manual is made possible by the support of the American People through the United States Agency for International Development (USAID). The contents of this manual are the sole responsibility of the author and do not necessarily reflect the views of USAID or the United States Government.

Feedlot Production and Health Management Manual

This Publication was authored by

Grant Dewell, DVM, MS, PhD

Beef Extension Veterinarian

Iowa State University

College of Veterinary Medicine

HISTORY OF BEEF FEEDLOTS IN THE US

In the 1860's, following the American Civil War numerous cattle herds, consisting mostly of five to six year old grass fed animals, were gathered in Texas and driven to railroads in Kansas. From there, live cattle were shipped east to population centers. Eventually, to shorten the time to market, grain was introduced as a finishing diet. Cattle were then sent from the Western US to the Corn Belt region: Iowa, Illinois and Eastern Nebraska. This strategy decreased the age at harvest age down to four years and then three. Chicago and Omaha became leading processing sites because they were on the edge of the Corn Belt and had adequate railroad facilities. Traditional farmer feeders in the Corn Belt grew their own feed and cattle were fed in barns and paved feedlots. After the conclusion of World War II, beef consumption expanded and so did the feedlot industry. Irrigation allowed corn and sorghum to be raised further west in the Great Plains. The drier climate allowed cattle to be fed without barns and paved lots. By the late 1960's, feedlots on Great Plains had expanded from small farmer feeders to large custom feedlots. Today, custom yards range in cattle capacity from 10,000 to 100,000 head. These large feedlots custom feed cattle for the individual cattle owners and purchase most of their feed instead of growing it. The advancement of animal science and ruminant nutrition has allowed cattle to be fattened by approximately 18 months of age. Two classes of cattle are most commonly fed: traditional and calf fed. Traditional feeding programs focus on feeding yearling cattle that have come off grass after weaning and are fed high concentrate rations for 100 – 120 days to finish at (1200-1300 lbs). Calf feds go straight from weaning to the feedlot and finish in 180 to 200 days.

Production Practices

Designs of feedlots vary depending upon region of the country. The majority of cattle feeding still occurs in the Great Plains in open air dirt floor lots. Although severe weather can affect performance, cattle deal with cold weather very efficiently as long as they have solid ground. Most open air lots have implemented the use of mounds in the feedlot pens. Building a tall mound in the pen gives cattle a dry place to lie down and can help block wind. In addition, cattle can keep cool in hot weather by taking advantage of breezes when they climb to the top of the mounds. Many large pens are typically designed to hold 200 to 400 head of cattle per pen. Some feedlots in the Corn Belt area have tried open air lots but sometimes experience excessive mud which had negative effects on the health and performance of cattle. A few North American feedlots still rely on indoor facilities where cattle are maintained on slats. Many feedlots in this region have maintained a barn with attached open lots. Recently, feedlots located in the Corn Belt have adopted either monoslope or hoop style barns. These barns rely on deep bedding that is routinely cleaned instead of slate floors. This style of feedlot usually has smaller pen sizes of around 100 head.

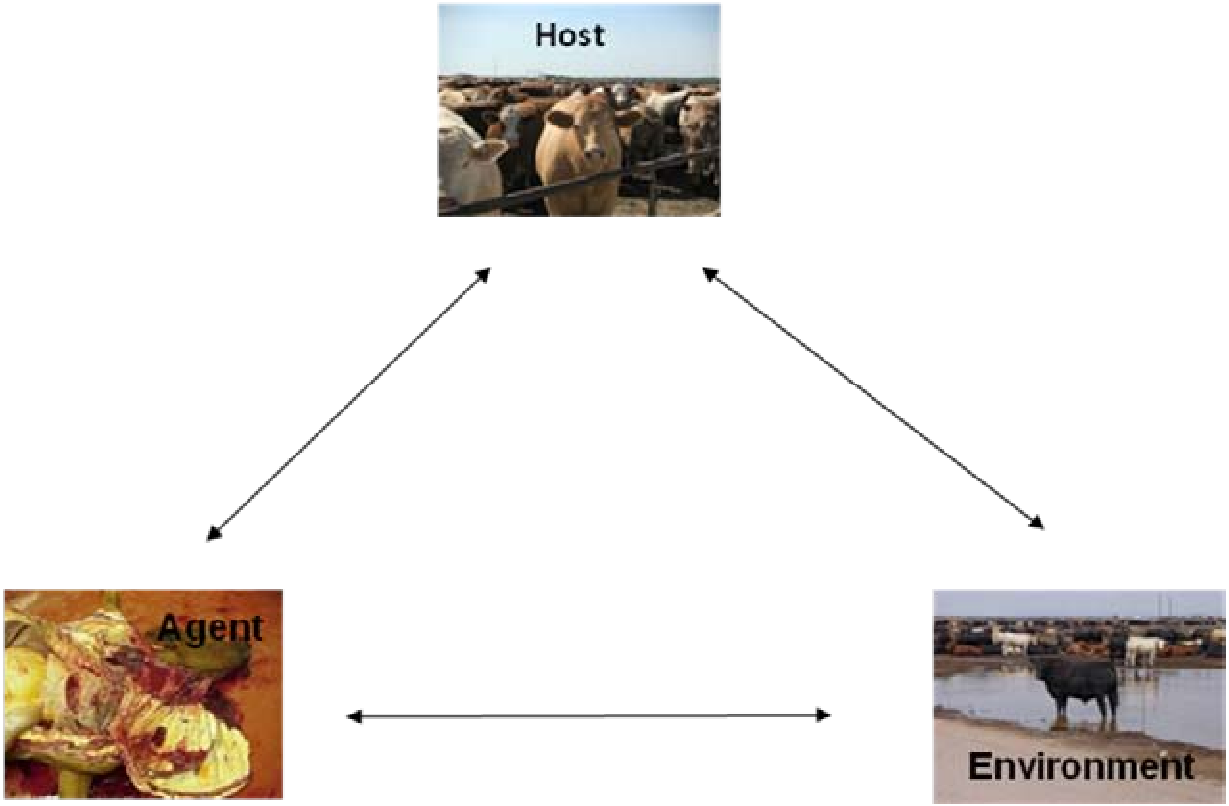
The predominate breed in the US is Black Angus although other British breeds are common and Black Baldy (Herford Angus cross) is a common mature cow. Many cow-calf producers utilize terminal cross breeding with Charolais, Limousine, Simmental or Gelbvieh sires. These cross bred calves are popular as they will marble readily but have increased frame and muscle growth compared to straight British bred cattle.

The diets that cattle are fed transitions during the feeding period from a high roughage diet fed when cattle enter the feedlot to a 90% concentrate diet at finish. Corn is still the predominant concentrate component of the feedlot diet but its form varies. In the Corn Belt region of the US, whole dry corn has been the traditional ingredient. In the Great Plains region, where corn is more expensive compared to the Corn Belt, the corn is usually further processed (steam flaked most common) to increase nutrient availability. Another common corn type is high moisture. High moisture corn is harvested at about 32% moisture and then stored in a bunker silo or piled. Recently, with the promotion and production of ethanol as a motor fuel ingredient, the cost of corn has increased. However, many feedlots have taken advantage of the by-product resulting from the ethanol production—termed distiller's grains. Feeders have added distiller's grains to the rations and cattle have performed well. Although the starch has been fermented off during the distilling process, the resulting by-product is a high fat and protein feed. Typically, feedlots will include distiller's grains up to about 50% of the diet. If distiller's grains exceed 50% of the diet, problems are sometimes encountered with polio due to excessive sulfate levels often present in this by-product.

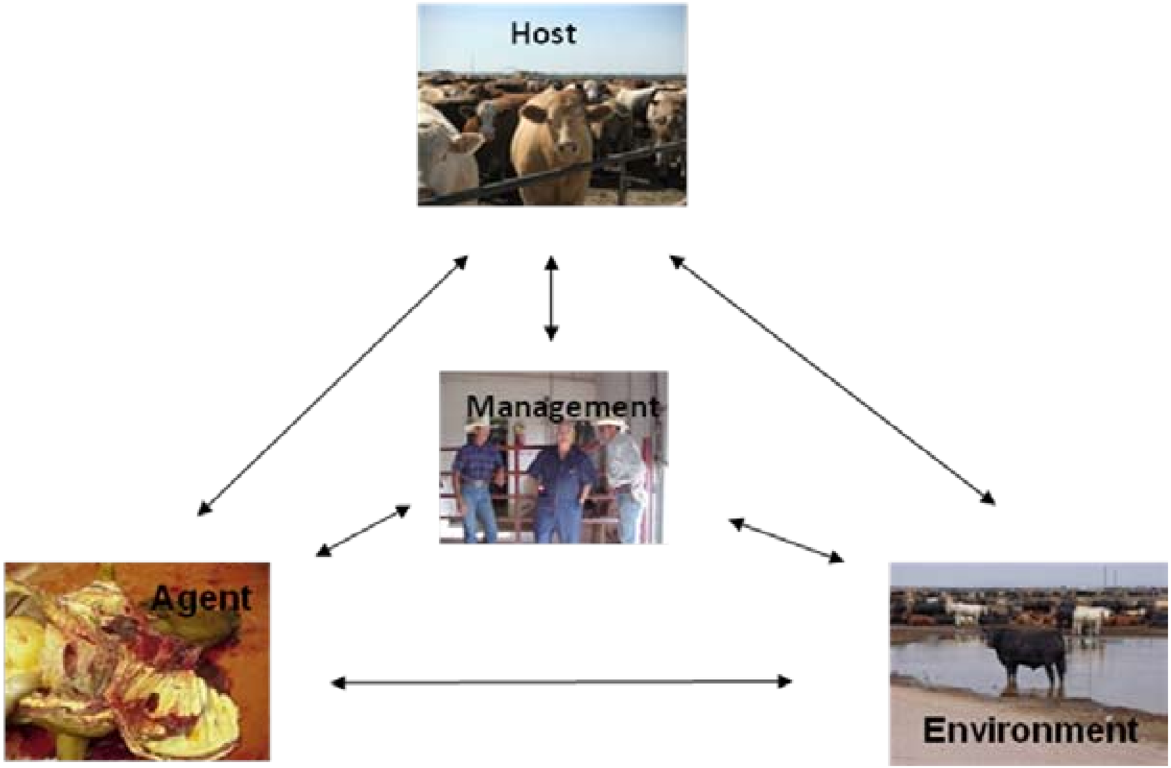
Other production practices that are common in the U.S. feeding industry are growth promotants and antibiotics in feed. Growth promotants are usually composed of an estrogen along with trembolone acetate compound that is implanted in ear. When implanted and managed correctly, these compounds significantly increase lean muscle mass and improve feed efficiency. Another promotant, termed beta-agonist compounds, have recently been approved for use in the U.S. and are included in the diet the last 30 to 45 days on feed. Ionophores are a type of antibiotic fed at very low levels that are routinely fed to prevent coccidia, increase feed efficiency, and decrease bloat by modifying the rumenal microflora. Other antibiotics, such as tylosin or tetracycline can be included in the diet to prevent liver abscesses sometimes associated with high concentrate diets. .Improved understanding and manipulation of nutrition, crossbreeding and technology has allowed the US beef industry to increase beef production from 18 billion pounds in 1964 to 24.7 billion pounds in 2005. During that time, the number of calves decreased from 43 million head to 37.8 million head. Thus, these improvement have resulted in fewer calves producing more pounds of beef.

RESPIRATORY DISEASE

Similar to the majority of confinement feeding operations around the world, respiratory disease is cited as the most common health problem encountered in U.S. feedlots. Bovine Respiratory Disease (BRD) is a multi-factorial disease that affects the lower respiratory system. There are a multitude of viruses and bacteria that can potentially contribute to BRD. However, there are typically one or more predisposing factors that allow pathogens optimal access to the lower respiratory tract. Stress from weaning, transportation, castration and/or dehorning, nutrition and ration changes, enteric disease, immunity, ventilation and weather changes contribute to the onset of BRD . Understanding the interactions between respiratory pathogens and underlying factors for each operation is critical to develop successful health programs. It is important to remember the traditional epidemiological model for disease causation- the epidemiological triad. The three points of the triangle are: agent, host and environment. Together, these three factors combine to produce clinical disease. Most BRD is experienced in the first 30 days on feed when the 3 factors are most apt to combine to produce disease.


Host
Agent
Environment

The main point to remember is that these individual points of the triad are not static. Management can influence all portions of the triad to mitigate the disease complex. The goal of a feedlot health program is to enhance the individual immunity of the calf and minimize BRD pre-cursers.



Host factors such as immunity can enhanced by optimizing management practices. US feedlot operations typically vaccinate cattle with a modified live viral vaccine that includes Infection Bovine Rhinotracheitis (IBR), Bovine Viral Diarrhea (BVD), Parainfluenza-3 (PI-3) and Bovine Respiratory Syncytial virus (BRSV) within 24-48 hours of arrival at the feedlot. Ideally, cattle arriving at the feedlot should have received a previous dose of this vaccine, but in many cases the vaccine initially administered at the feedlot is their first vaccine. A good pre-conditioning program prepares young calves for finishing at the feedlot and includes proper vaccination, weaning before shipping, acclimation to eating from a feed bunk, and castration and dehorning of calves prior to entry at the feedlot. Calves that have been pre-conditioned are more apt to remain healthy while in the feedlot. These calves will not have to endure the stress of being newly weaned etc. at the same time that they are being confined and exposed to additional disease agents. Some calves will be re-vaccinated with a modified live vaccine 14 days after arrival at the feedlot. It is less common for U.S. feedlots to include a bacterial vaccine against common respiratory pathogens such as Mannheimia, Pasturella or Histophilus species. Most feedlots will include a 7-way clostridial vaccine that includes C. perfringes types C&D if calves have not been recently vaccinated or if vaccination history is unknown.

Calves should receive a high roughage diet when they first arrive and then slowly be stepped up to a higher concentrate diet. Calves must slowly adjust to this new diet and subsequent increases in concentrate without adding to their immunological stress. Respiratory research trials have demonstrated that a sudden increase in concentrate levels will precipitate respiratory disease Changes in ruminal gases that can be inhaled and oxidative insults from the portal circulation on pulmonary epithelium can predispose cattle to respiratory disease.

Agents can be affected primarily by appropriate antibiotic protocols. Although all bacteria can develop antimicrobial resistance, bovine respiratory pathogens such as M. haemolytica or H. somni are not known for acquiring resistance like other bacteria such as Escherichia coli, Salmonella enterica or Streptococcus. What is more important is timely intervention to prevent extensive pulmonary disease. Antimicrobial intervention can take many forms.

Metaphalactic treatment protocols are used for "high risk" calves during initial processing upon arrival at the feedlot. A typical pen of high risk calves in the U.S. are Southeastern calves who have originated from multiple herds, have no prior vaccination history, and have been shipped a long distance to the feedlot. The Southeastern U.S. has a large population of beef calves but the average herd size is less than 30 head. Many of these producers will only sell a few calves at a time. In order to put a 100 to 200 head pen together, calves from multiple operations that were bought at several different sale barns are comingled. These calves will be held for several days until enough cattle are put together to make a shipment to the feedlot. Calves will also be castrated and dehorned before being loaded on a semi-trailer and transported close to 1000 miles to a large feedlot on the Great Plains or in the Corn Belt. Often these stressed calves will already be in initial stages of BRD during transit to the feedlot. Other high risk calves might include groups of calves that might have been transported in severe weather or have some other high level of stress prior to arrival.

Historically, antibiotics such as tetracycline, penicillins or sulfas were added to the feed or water of calves to prevent/treat respiratory disease. This practice is uncommon now as most feedlots rely on better vaccination protocols, optimized management, and parental antibiotics when clinically necessary. Some pens that were not considered high risk will be mass medicated with a parental antibiotic if morbidity becomes excessive (usually over 30% pen pulled) in the pen.

Otherwise, calves are pulled as they are identified to be morbid and treated with a parental antibiotic. Ancillary treatments such as vitamins or anti-inflammatories are rarely used as there is no evidence that they decrease treatment success or performance. With the advent of long acting antibiotic formulations, most cattle are returned to their pen immediately after treatment instead of convalescing in a hospital pen. Many veterinarians are now recommending treatment moratoriums with antibiotic formulations of 3 to 8 days depending upon drug. Since antimicrobial resistance is not as critical as the antibiotic being able to adequately penetrate diseased lung, treating with more or different drugs following initial treatment is often not beneficial. The stress of pulling from pen and treating is probably worse than benefit of treating with additional drugs. Remember that the primary goal of any respiratory treatment program is to keep the calf alive long enough for the calf's immune system to clear the infection with the assistance of targeted and appropriate antibiotics.

Treatment protocols are usually tailored to fit the needs of type cattle and the requirements of management and cattle owners. Low-risk cattle can often be treated with tetracyclines as a first line treatment when they originate from pens of cattle where cost is a concern. These low-risk cattle should have an immune system capable of handling respiratory disease and a broad spectrum antibiotic like tetracycline is sufficient. Cattle that fail to respond to initial therapy will be given another antibiotic such as Enrofloxacine or Florfenicol. A third treatment with one of these newer antibiotics will be given if necessary. If cattle do not respond after a third treatment they are classified as a "chronic" and removed from the pen. Treatment protocols for higher risk cattle may incorporate one of the newer antibiotics as the first and second therapy since the immune system is not as capable of responding the bacterial insult. However, if calves require a third treatment, tetracycline is usually used. These calves have already had potentially more powerful antibiotics. Since these were higher risk cattle, there is a increased probability that they have some significant pulmonary damage such as excessive lung consolidation, micro abscesses, pleuritis and/or pleural adhesions that will negatively affect their performance in the feedlot. Traditionally, treatment protocols switched antibiotics for second and third treatments. However, since it is less a question of efficacy of antibiotic and more related to severity of insult and time for recovery, more veterinarians are using the same antibiotics for their 1st and 2nd therapies.

More important than which antibiotic is administered is when therapy is instituted. The earlier calves are identified and treated the less lung damage which leads to consolidated and necrotic areas of lung with limited blood supply to deliver antibiotic therapy. Calves should be observed daily for signs of respiratory disease. Initial signs of respiratory disease are more easily identified as subtle changes of behavior instead of obvious respiratory signs. Calves should be assessed on both their overall attitude and specific signs of respiratory disease. It is sometimes beneficial to use a scoring system until personnel are comfortable assessing cattle and can reliably identify sick cattle. A typical scoring system would be:

Attitude:

0 – Normal, cattle are bright and alert, hold their head up and readily move away from the observer

1 – Mild depression, cattle's attitude is slightly depressed but respond quickly to observer and appear normal

2 – Moderate depression, cattle stand with head down, ears droop, abdomen lack of fill and may appear floppy, cattle move away slowly from observer

3 – Severe depression, cattle stand with head down and very reluctant to move, very noticeable gauntness of abdomen

Respiratory:

0 – Normal, eyes clear, nose is clean with no discharge, normal breathing

1 – Mild Respiratory, serous discharge from eyes and\or nose, slight cough

2 – Moderate Respiratory, mucco-purulent discharge, cough, increased respiratory rate

3 – Severe Respiratory, excessive mucco-purulent discharge, harsh cough, open mouth breathing

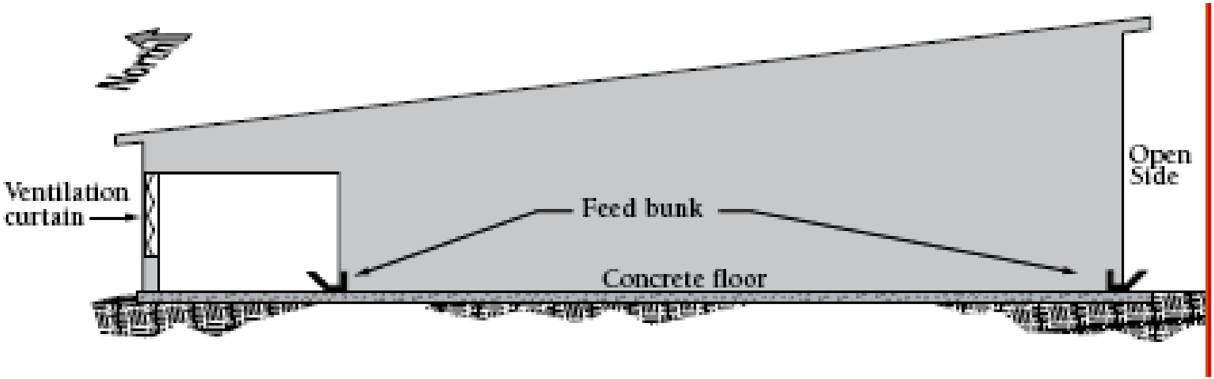
Typically, cattle are not pulled until they are at least a 2 for either attitude or respiratory symptoms. Remember that cattle will show attitude symptoms before respiratory symptoms so most cattle will be pulled with an attitude score of 2 and a respiratory score of 1. If morbidity is high in the pen or cattle have not been responding to initial therapy satisfactorily, it may be prudent to pull deeper and select cattle that have an attitude score of 1. It is usually best to observe cattle in the morning at approximately the same time each day. Personnel should make sure that they move and observe all of the cattle. Cattle are a prey animal and will try to hide when they are sick. These sick animals will hide behind other cattle when moving and often stand beside healthy cattle at the bunk but will often not eat. Cattle that have been pulled will then be evaluated. Rectal temperature greater than 104° F is primary tool used to determine if treatment is necessary. If temperature is below 104° F, then evaluate to determine the presence or absence of other important disease entities such as sub-clinical acidosis.

Environmental

conditions can play an important role in BRD. Although external climate conditions can't be modified, facilities can be designed to alleviate climatic conditions and lessen negative effects associated with sub-optimal environmental conditions. Cattle thrive in outdoor open lots if excessive mud can be prevented. Research has shown that rour to six inches of mud can decrease average daily gain (ADG) by 14%. If annual precipitation is not excessive, dirt or composted manure mounds can be built within the pen to provide dry areas for cattle. Ideally these mounds are built right up to the concrete feed apron so that cattle can move from their bedding areas directly to the feed bunk without wading in mud. Additionally, windbreaks can be used to provide additional comfort to cattle. If permanent metal or wood structures are not feasible, then stacking hay or straw strategically around the feedlot perimeter can provide temporary windbreaks. The main effect of mud and extreme weather is on the cattle's ability to gain weight. However, these environmental stresses can precipitate respiratory disease in at-risk cattle.

Total confinement feedlots have important advantages and disadvantages. Although total confinement can alleviate external climate conditions, there are some inherent issues that can lead to increased respiratory disease. Adequate ventilation is critical to provide clean fresh air for cattle. Cattle have poorer respiratory function when compared to horses or pigs. Confinement not only increases potential for transmission of pathogens, air quality can negatively impact respiratory function and allow pathogens access to the lower respiratory tract.

Confinement buildings with solid floor may have potential for minimizing climate affects with less impact on health and general public perception. Raising beef under a roof can increase higher rate of gain and better feed efficiency. A typical U.S. total confinement facility uses a 100 foot wide Mono-slope building with two sets of fence-line bunks and provides 12 inches bunk space per head and 40 square feet pen space per head. The solid concrete floor is bedded to create manure-bedding pack in middle of pens. Wet manure is removed weekly in areas along feedbunk. A high open wall on the south side and a ventilation curtain on the north wall provide natural ventilation. Also, these can built as a narrower building with single bunk. Protecting feedbunks from precipitation can decrease fluctuations in dry matter (DM) intake due to aversion to wet feed and prevent subsequent gastro-intestinal diseases.

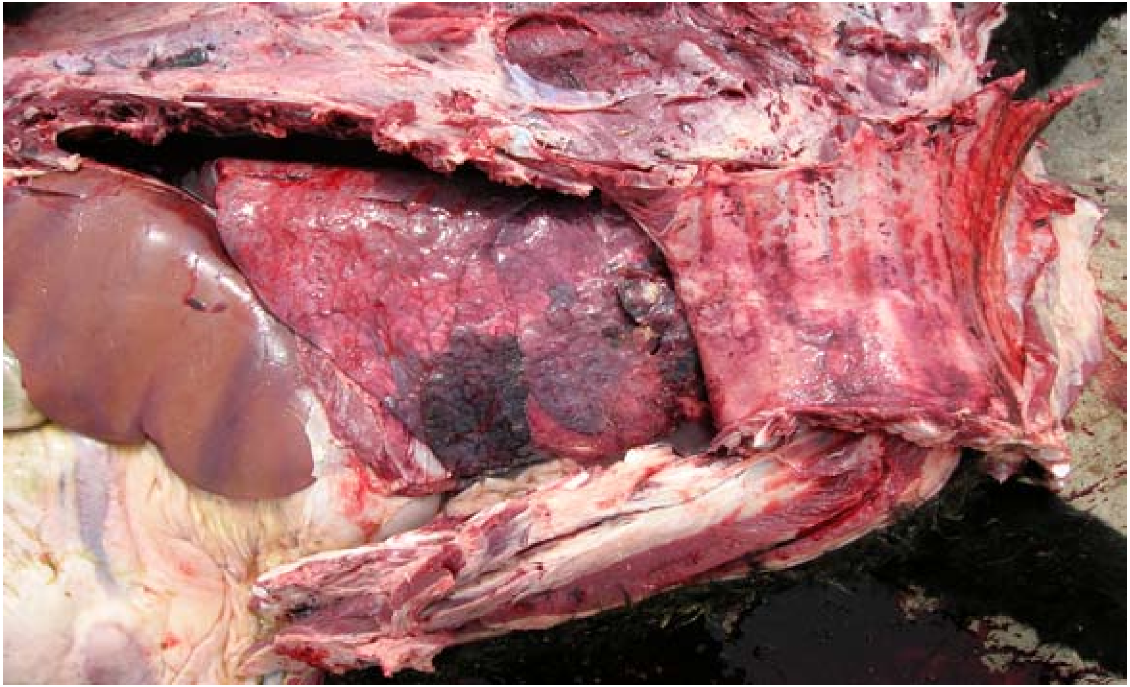

North
Ventilation curtain
Feed bunk
Open Side
Concrete floor

Diagnosis of Respiratory Disease

It is critical to confirm diagnosis of BRD with a necropsy on animals that die. There are other disease entities that sometimes get mistaken for BRD because clinical symptoms are vague. A complete necropsy that evaluates the different organ systems can be quick and informative. Additionally, understanding stage of disease is important in targeting intervention. A calf that has extensive pulmonary consolidation and/or fibrous adhesions that has only been treated once is different than a calf that has similar gross pathology but has been treated three times. The latter is a chronic pneumonia that failed treatment while the first one is a chronic pneumonia that was not identified in a timely manner. Samples can be collected for further diagnostic such as culture and sensitivity. However, samples collected from chronic cases are not as valuable as those collected from animals that were only treated once before dying. Secondary infections are often present in chronics and the increased antimicrobial resistance sometimes seen in these animals may not reflect the initial scenario.

Equally important to determining reasons for deaths, is tracking respiratory pull, treatment success and fatality rates over time. Cattle with BRD within the first 1 to 2 days of arrival were probably already experiencing initial respiratory disease before they arrived at the feedlot.

Necropsy results of fatalities within this time frame will usually reveal that lesions are older. Evaluation of herd of origin or pre-feedlot management would be indicated if BRD on arrival is an issue. Treatment success and case fatality rates are important more for management than on evaluating efficacy of drug therapy. Cattle that are not identified as having BRD at initial onset are more apt to develop chronic lesions and become treatment failures.



Evaluating Morbidity and Mortality Data

There are several key parameters that can be tracked to evaluate health program.

Mortality will reflect the quality of cattle that are being brought into the feedlot and how well they are cared for while in the feedlot. If different types (calves vs yearling) of cattle are being fed, it can be tracked for specific types. Mortality is calculated for a specific time period as total number of dead cattle divided by total number of cattle on feed multiplied by 100. Typically expect mortality rates to be less than 1% for calf fed cattle and less than 0.5% for yearling fed cattle. Mortality= (Total number of dead cattle/total number of cattle on feed) x 100

Case fatality rate (CFR) provides information on timely identification of pulls, antimicrobial selection and overall health of the pen. A case fatality rate between 5 and 10% is acceptable. An eleveated CFR can indicate either that cattle are not being treated promptly enough or treatment is not working. A low CFR may indicate that cattle are being pulled and treated that were not really sick. CFR= (Total number treated deads divided by total number head treated multiplied by 100)

Percent first-treatment response gives some indication of antimicrobial performance. However, timely identification of sick cattle will also have a lot of influence on this parameter. Low-risk cattle should have a first treatment response greater than 80% while higher risk cattle should be greater than 70%. %FTR= (Total number 1st treatments minus total number 1st treatment failures) divided by total number 1st treatments multiplied by 100.

Morbidity calculations give a general overview of pen health and can be calculated for each disease entity. Typically expect respiratory morbidity to be less than 10% for low risk calves. If 5-10% of cattle are being pulled over a short 2-3 day time interval than it may be beneficial to treat entire pen. Morbidity = (total number head treated for disease divided by total number cattle in group multiplied by 100)

Chronic rate indicates how well cattle were treated. The chronic rate should not be more than half of the mortality rate. Chronic Rate= (total head determined chronic divided by total number head treated multiplied by 100)

Missed opportunities provides valuable information on case definition and sick cattle identification. To calculate missed opportunities add total number cattle died from BRD in the pen without treatment and the number that died from BRD within 48 hours of treatment divided the total number of cattle died from BRD multiplied by 100.

Percent pull > 104 F can indicate if cattle are being pulled properly or if cattle are being over treated. If greater than 70% of cattle pulled for respiratory disease have a temperature greater than 104 F then may want to consider going back to pen and pulling more cattle. If the percent pull is low then may indicate digestive disease, or cattle are being pulled too late.

Month-to-date mortality can be used to monitor if health management is acceptable. To calculate divide total month to date mortalities by number of days in month so far multiplied by total number of days in month, then divide by total number of cattle in feedlot and multiply by 100. Expect total month-to-date mortality to be 0.22-0.24%, month-to-date respiratory should be 0.12-0.14%, digestive 0.06-0.08% and other 0.02-0.04%.

Impact of Respiratory Disease

The cost of labor, pharmaceutical drugs to treat respiratory disease and death loss is easy to calculate for an individual pen of cattle. However, the decrease in performance can have a bigger impact. Several studies have demonstrated that a BRD episode decreases ADG. Logically calves that have more severe lesions will be more adversely affected. Identifying respiratory disease early and treating effectively is key to minimizing performance losses.

BEEF QUALITY ASSURANCE (BQA)

The goal of a feedlot operation is to produce beef for human consumption. American beef producers have developed basic guidelines to assure that beef is a safe, wholesome product. These guidelines cover feed ingredients, drug therapy, welfare and bio-security.

Quality feed control program – It is important to remember that everything that enters the animal through feed sources has the potential to show up in retail product. Herbicides or insecticides that were used on grow crops or fluids leaked from feed processing equipment. Incoming feed ingredients should be evaluated for moisture, color, odor, presence of foreign material, heat damage and spoilage. Feed should be stored where it is protected from contamination. Any feed additives should be used according to directions. Pesticides and other compounds should not be stored in the vicinity of feed ingredients.

Drug therapy program – Cattle should be treated as necessary to maintain health and prevent suffering. All treated cattle should be identified and records maintained. Established withdrawals should be followed to prevent violative residues in retail product. Drugs should be stored according to label directions. Syringes and needles should be clean and sharp. Bent or burred needles should not be used. All injections should be given in the neck area to prevent damage to more valuable cuts of meat. An injection of sterile saline will leave a scar that can result in an unsatisfactory eating experience.

Welfare program – Cattle should be provided clean environment with adequate clean water and food. Cattle should be handled/transported to minimize stress and injury. Ill or injured cattle should be treated appropriately to minimize pain and suffering. Debilitated animals should be humanely euthanized.

Bio-security program – A good bio-security program can help prevent the accidental or intentional

NOTES:

NOTES:

USAID Agribusiness Project
Internacionalnih brigada 57
11000 Belgrade, Serbia
tel +381 11 243 66 11
fax +381 11 344 53 63
www.agrobiznis.net
e-mail: office@agrobiznis.net