MAKING RATIONAL PRODUCT CHOICES

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Introduction

Feedyard managers and feedyard veterinarians are faced with a wide array of health care products today. Most are detailed as the "product of choice" to prevent or treat diseases. Due to the large volume and the complexity of health care products used in a feedyard, the veterinarian must serve as an advisor to management to assess the value using various products.

Cost of health care products is always a consideration. However, cost must be evaluated in respect to risk of disease, cost of the disease and the impact of disease on production. Efficacy of the product in question must also be carefully evaluated.

It is important to remember that vaccines, bacterins, antibiotics and anthelmintics are only management tools. Commercial products will not eliminate or cure diseases by themselves, but instead must be critically implemented into a comprehensive, planned management program.

In this paper, considerations for making rational product choices will be discussed. The selection considerations for anthelmintics, antibiotics and vaccines will be emphasized.

Making Anthelmintic Choices

Routine deworming of newly received feeder cattle has been a common practice for many years. Cattle do not acquire nematode infections in the feedyard. The parasite burden of feedlot cattle correlates to exposure prior to arrival and to prior *anthelmintic* treatment. In past years, southeastern cattle were stereotyped as heavily parasitized and northern and western cattle were considered to have low levels of infection; this assumption is not always correct.

Risk. Heavy parasite loads can reduce feeding performance. Accurately determining risk is difficult. The origin of the cattle has historically been a risk determinant, but is certainly not accurate. Risk assessment is best done utilizing fecal egg counts. This method is most useful on one source cattle. Five to ten samples are sufficient if the cattle are from one source, while 10 to 20 may be required if the cattle originate from two or three sources.

The Modified Stoll technique has been suggested as an effective means of determining fecal egg counts. Egg count examination should be done on feces from individual animals, not on composite samples. Results should be recorded in eggs per gram of feces. When using the Modified Stoll technique, Cheney (1990) suggests the following criteria for feedlot cattle.

- Eggs per gram counts below 100, no treatment.
- If any egg per gram count in one of the samples is between 100 and 300, treat the cattle. If two dosages are recommended, treat at the lower dosage or the cattle can be dewormed in the feed.
- If there is any egg per gram of feces count in any of the samples that is 300 or greater, the cattle should be treated with the higher anthelmintic dose and they should be treated individually.

Efficacy. Fortunately the efficacy of anthelmintics is easier to ascertain and is more predictable than biologicals. Efficacy data is readily available in the literature and is included in Table 1 for your convenience.

After first determining the risk, the veterinarian can select an anthelmintic that will effectively treat the parasite present in that group of cattle. The prevalence of the parasite and its impact on production are also considered. There is no anthelmintic marketed which will treat the adult and larval stages of all bovine internal parasites in the United States.

Economic Return. Using a 650 pound feeder calf as an example, the cost of parasite control during processing ranges from $1.61 to $3.22 per head (Table 2). The selection of an anthelmintic must not be based upon cost alone. Other considerations include the type of parasites present, risk of inhibited Ostertagia larvae, product efficacy, safety and route of administration.

TABLE 1

Efficacy of Various Anthelmintics

Parasite	Anthelmintic				
	Safeguard®/ Panacur®	Ivomec® Injectable[a]	Valbazen®[a]	Synanthic®	Levamisole
Ostertagia ostertagia					
Adult	yes	yes	yes	yes	yes
Inhibited L_4	yes[b]	yes	yes	yes	no
Haemonchus sp.					
Adult	yes	yes	yes	yes	yes
L_4	yes	yes	yes	no	no
T. axei					
Adult	yes	yes	yes	yes	yes
L_4	yes	yes	yes	no	no
T. colubriformis					
Adult	yes	yes	yes	no	yes
L_4	yes	yes	no	no	no
Cooperia sp					
Adult	yes	yes	yes	yes	yes
L_4	yes	yes	yes	yes	no
Nematodirus					
Adult	yes	yes	yes	no	yes
L_4	yes	no	yes	no	no
Bunostomum					
Adult	yes	yes	yes	yes	yes
L_4	yes	yes	no	no	no
Oesophagostomum radiatum					
Adult	yes	yes	yes	yes	yes
L_4	yes	yes	no	no	no
Dictyocaulus viviparus					
Adult	yes	yes	yes	yes	yes
L_4	no	yes	yes	yes	no
Monezia benedeni					
Adult	yes[b]	no	yes	yes	no

[a] Ivomec-F® and Valbazen® are labeled for treatment of the adult liver fluke, *Fasciola hepatica*.

[b] Requires a dosage of 10 mg/kg.

TABLE 2

Comparative Cost of Parasite

Treatment[a] of 650 lb. Feeder

Product	Internal Parasites	External[b] Parasites	Total Cost
Ivomec®	$3.22	---	$3.22
Levamisole	$2.21	.40	$1.61
Safeguard®	$1.37[c]	.40	$1.77
Synanthic®	$1.51	.40	$1.92
Valbazen®	$1.80	.40	$2.20

[a] Prices calculated on feedlot cost, direct from wholesaler. Prices may vary due to mark-up, region, quantity purchased and promotionals.

[b] Tiguvon® calculated at .06/cwt.

[c] Treatment of inhibited ostertagia fourth stage larvae would require a 2x dose of fenbendazole (Panacur®), therefore the cost would approximate $2.70 for a 650 lb. feeder calf.

Finally, the economic (production improvement vs. cost of product) impact of deworming or not deworming must be considered. The economic value of deworming feedlot cattle is variable;[1,2,3,4,5] some favoring deworming, some showing no economic advantage and some suggesting that newer, broader spectrum anthelmintics are not always cost effective.

In summary, the goal should be the control of parasite infections that will reduce performance and to provide the necessary control as inexpensively as possible.

Making Vaccine Choices

Making rational vaccine choices is not as clear-cut as making choices for parasite control. Variances in stress, previous vaccinations, age of the cattle and the role of specific etiologic agents in the Bovine Respiratory Disease Complex (BRDC) add confusion when deciding upon a particular vaccination program. The efficacy of many vaccines and bacterins has been questioned.

Risk. Feedlot cattle are at risk for respiratory, enteric, central nervous system, musculoskeletal and urinary tract infectious diseases. Factors altering the level of risk are numerous. Season of the year, commingling, age, previous vaccinations, nutrition, including vitamin and mineral deficiencies, distance shipped, level of exposure and management, past and present, influence risk.

Determination of risk of various diseases for a particular feedyard is possible if good records are available and if an ongoing diagnostic program has been utilized. Current and past vaccination programs may lower the incidence of most diseases and may mask the true threat.

Some practices utilized in feedyards may increase the risk of certain diseases. An example is the use of banding to castrate bulls, which substantially increases the risk of tetanus when compared to open castration. Feedyards that feed yearlings are generally at less risk for Clostridial diseases. In fact, several feedyard veterinarians have deleted seven-way Clostridial products from their receiving program, with no increase in death loss due to Clostridial diseases.

Efficacy. Efficacy of vaccines and bacterins is more difficult to determine than anthelmintics. The interaction of multiple pathogens, stress, age and management conditions tends to mask the true effects of the vaccine.

Properly designed and conducted field trials provide valuable information about the value and efficacy of various vaccine products. The feedyard practitioner must evaluate the results of field trials critically, paying particular attention to the presence or absence of statistically significant differences. In addition, the results should be somewhat repeatable, or in other words, don't become too excited over the results of one trial when several others show conflicting results.

The debate over the advantages and disadvantages of modified-live and inactivated viral vaccines continues. There appears to be considerable misunderstanding of the merits of each type product among veterinarians and producers alike. The feedyard veterinarians should be thoroughly familiar with the pluses and minuses of each type of product in order to serve as an information resource for the feedyard. A complete

discussion of bovine vaccines has recently been published.[6]

Economic Return. Unlike implants, ionophores or anthelmintics, the economic return from using vaccines is difficult to measure. Many, such as IBR vaccine, must be viewed as insurance because of the high risk involved. When using an IBR vaccine, the risk of IBR infection is high, efficacy is good and the vaccine is inexpensive, which makes the decision to use the vaccine quite easy.

The decision is not as easy to make when risk if lower, efficacy is questionable or the product is expensive. Let's use an example. If a particular bacterial agent is responsible for 10% of the respiratory morbidity and mortality, and if the product will reduce the disease incidence by 75%, what is the impact?

20% morbidity x 10% incidence of disease^ = 2% morbidity due to disease^.
2% disease^ x 75% reduction = 1.5% reduction in respiratory disease.

Now we have 18.5% morbidity rather than 20%. Will the cost of the product in question cost more or less than the disease? Is there any impact, positive or negative, on cost of production?

In summary, the choice of vaccine products is not an easy one. The practitioner must make recommendations based upon controlled field trial data, risk of disease, product efficacy, the condition and age of the cattle and management conditions.

Making Antibiotic Choices

The choice of antibiotics used to treat BRD is the most critical antibiotic decision. BRD accounts for 65-75% of feedlot morbidity and mortality. Tremendous economic returns are realized when the proper antibacterial products are selected and utilized in an organized treatment program.

Methods to Select Antibiotics. Initial selection of antibiotics is based upon cost of treatments, history of successful use in past BRD episodes, successful usage in field trials and culture and sensitivity results. Let's examine some of these criteria and discuss their relevancy in the feedyard treatment program.

Culture sensitivity testing, and more recently Minimum Inhibitory Concentration (MIC) testing, are laboratory tools used to determine which antibiotics to use in the treatment of BRD. A review of the validity of culture sensitivity testing has been reported.[7] It was concluded that in vitro sensitivity results should not be used as specific and direct predictors of in vivo efficacy under most circumstances.

MIC data can be useful in a treatment plan if the following are considered: antibacterial susceptibility of the isolate, drug disposition and the disease condition of the patient.[7] MIC data provides a guide for selecting a dosage that achieves the necessary concentration of the drug, rather than the simple sensitive or resistant classification reported when using culture sensitivity testing. Published reports suggest that microbiological findings and pharmacokinetics considerations do not necessarily correlate with therapeutic outcome.[8] Sensitivity data obtained from dead calves is questionable since these samples are obtained from "treatment failures".[9] Samples obtained from non-treated calves in the acute phase of respiratory disease are likely more useful than those taken during necropsy of treated calves.

Laboratory results only serve as a guide for antibiotic selection and usage. The next step is an analysis of records. Useful information obtained from treatment records includes response rate, relapse rate, case fatality rate and the percentage that become chronics. These data must be compared with goals established for the treatment program in the feedyard to determine whether or not the use of selected antimicrobial agents results in achieving those goals. Promptness of detection of sick calves and hospital management cannot be ignored when evaluating the success or failure of the treatment program.

Finally, published field trial data comparing various antibiotics serve as a guide for the selection of antibiotics. The design of the research trials should be critically evaluated. Evaluation of antimicrobials should be determined by utilizing spontaneously occurring cases of BRD in properly designed field trials.[8]

Cost Benefits. Cost of treatment is influenced by the cost of the drug, mortality rates, chronic rates and impact on production. The feedyard practitioner must evaluate the cost of treating sick calves in respect to the impact of treatment costs on total cost of gain, which is calculated when the cattle are sold.

Regulatory and Social Implications. In the 1990's, it is imperative that we strive to use approved products according to label directions when possible. When necessary to use products off-label, it is imperative that this be done within the confines of the Extra-label Use of Drugs policy.

Residue avoidance is a must. A detailed Residue Avoidance Policy should be

established in writing by the feedyard veterinarian. All personnel involved in cattle health care should be familiar with this policy, and it must have the support of management. Our society is demanding that we use drugs and chemicals properly, and it is the consumers perception of food products that drives their buying habits.

When selecting antimicrobials for use in beef cattle, the avoidance of injection site lesions must also be considered. The presence of injection site lesions, estimated to be present in 14 percent of carcasses, results in costly trim losses when primal cuts are processed into steaks and roasts. In addition, these lesions are viewed as defects by the consumer and increases the fear of residues and contamination by "dangerous substances".

Making Choices of Other Products.

The practitioner is faced with the decision to select many miscellaneous products. These products include such things as growth implants, products used as supportive therapy, probiotics, ionophores and other feed additives.

Growth implants and ionophores have been extensively researched in well-controlled feeding trials. The most cost-effective ways to use these products can be found in the literature. In addition, most nutritionists can serve as an information resource for these products as the use of these products impacts performance.

The use of many miscellaneous products, such as those used as supportive care when treating BRD, is not always supported by well controlled field trials. Many supportive care products have questionable cost-effectiveness and efficacy.

The decision process is similar to that described earlier. Look for well controlled data. If the data are beneficial and repeatable, determine the cost benefits for the cattle owner.

Summary

The feedyard veterinarian must critically evaluate the risk, efficacy, cost and production impact of all products being considered for use. It is necessary to evaluate available data scientifically, paying particular attention to experimental design and statistical analysis. In the final analysis, it must be determined that the use of the products in question are going to provide economic benefit to the feedyard.

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