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Animal Health Fact Sheet

VACCINATING TO PREVENT PNEUMONIA

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Bovine Respiratory Disease (BRD) is a major problem for cattle and it continues to cause serious economic losses. Pneumonia is its most serious form. BRD causes increased death losses, higher medication and labor costs, and lost production. It occurs most commonly within a few weeks of weaning and is especially troublesome then. BRD is more serious in calves which are shipped long distances right after weaning and is often referred to as shipping fever.

Many vaccine products and some vaccine programs have been advocated as THE way to prevent BRD. Vaccines can be of some help, but since BRD is caused by a wide variety of agents and vaccines are not even available for some of them, management must be used as the main preventive measure.

The causes of BRD are multiple and complex, but the three factors of stress, viral infection and bacterial infection are almost always involved in cases of severe disease. Examples of the most common of these are listed in Table 1.

Table 1. Factors Involved in BRD

Stress Factors	Viral Agents	Bacteria
Heat	PI3	Pasteurella
Cold	IB	Hemophilus
Dust	BVD	Other
Dampness	BRSV	
Injury	Adenovirus	
Fatigue	Rhinovirus	
Dehydration	Herpesvirus IV	
Hunger	Enterovirus	
Anxiety	MCF	
Irritant gases	Reovirus	
Nutritional deficiencies		
Surgery		

Some of the viral agents produce only mild clinical signs by themselves, but when combined with other viral or bacterial agents and stress they may cause severe illness and death. Many normal cattle carry one or more of the bacterial and viral agents in their upper respiratory tract with no ill effects. These may enter the lungs, but are usually expelled or inactivated.

However, when under stress the animal's defense mechanisms may be overcome and the infection established, resulting in BRD. The mixing of cattle from different sources and wide environmental temperature fluctuations have been identified as major factors in the initiation of disease outbreaks in feedlots.

Major advances have been made in vaccine production in recent years and better products are now available to prevent BRD. Animal disease models have also been developed so better testing of the vaccines can be carried out before they are released. However, we still do not have a simple solution for the BRD problem available in a bottle, and probably never will.

A vaccine trial was conducted in two feedlots with one new product in the fall of 1992.(1) The "ONE-SHOT" pasteurella vaccine produced by SmithKline Beecham was used in this trial. Specific results are briefly reported below. All calves were vaccinated with the usual products used in that herd. The "vaccinated" group in each herd was given the "ONE-SHOT" as an additional vaccine.

HERD A:

Heifer calves were processed, weighed, and vaccinated on September 24 and 25 and returned to their dams. On October 2, they were weaned, transported 90 miles and placed in a feedlot. The weather was very good as they entered the feedlot and good weather continued for three weeks. They were reweighed on December 11, and the project terminated.

HERD B:

Steer and heifer calves from mixed age and breed dams were processed, vaccinated and weighed October 12. On October 28 they were weaned, transported 25 miles and placed in a feedlot. It rained two inches on October 30. They were reweighed on December 17, and the project terminated.

The treatment rates, death rates and weight gains are summarized in Tables 2 and 3 for both herds.

(1) Funding for these trials was provided by the Utah Department of Agriculture.

Table 2. Illness Rate (BRD)

Group	Number	Treated for BRD	Died
Herd A:			
Controls	179	28 (15.6%)	0
Vaccinates	152	14 (9.2%)	0
Herd B:			
Controls	87	4 (4.6%)	1
Vaccinates	84	5 (6.0%)	1

Table 3. Weight Gains

Group	Number	Begin. Wt.	End Wt.	Gain
Herd A:				
Controls	179	350.6	466.5	115.9
Vaccinates	152	349.1	466.7	117.6
Herd B:				
Controls	87	492.0	593.1	101.2
Vaccinates	84	478.6	578.2	99.6

There was no difference in death rate for the groups in either herd. This outcome is as expected since good feedlot management practices dictate early treatment intervention. Treatment interferes with the usual disease process, so a difference in death rate would not be expected. Hence, any economic benefit from vaccination would of necessity have to come from reduced illness via decreased treatment costs and increased gains.

There was no significant difference in weight gains for the vaccinated versus the control groups in either herd. Both herds had a low rate of illness compared to many other herds and there was no difference between the groups in Herd B. There was a statistical difference (P = 0.09) between the groups in Herd A. The efficacy of the vaccine was calculated to be 41% in Herd A by use of the following formula:

$$\text{\% Vaccine efficacy} = \frac{\text{illness rate of controls} - \text{illness rate of vaccinates}}{\text{illness rate of controls}} \times 100$$

Use of the vaccine was not of economic benefit in either of these herds, but it could be of benefit in herds suffering a higher rate of illness and a greater weight loss per head. The data from herd A can be used to construct a “What if . . .” graph depicting the potential cost/benefit outcome at various levels of illness reduction (vaccine efficacy). On the graph, a cost/benefit value of 1.0 would indicate that the costs and benefits are equal; values above that level would be of economic benefit and those below would not. This type of table is very helpful for use with a computer because one or more factors can be changed as though you were asking, “What if the illness rate were changed, etc. . . .” The computer can immediately calculate the final effects of those changes, in this case, economics. Other data used in the calculations are included in Table 4.

Table 4. Benefit/Cost Calculations for a “What If . . .” Table and Graph

Farm Data (From Herd A	Expense	Item	Units	Total
Calves Weaned	331	Vaccine	$ 160	$529.60
Average Calf Weight	350	Labor	$ 0.40	$132.40
Value/Pound	$ 0.93	Interest	6 mo @ 12%	$ 39.72
Death Rate		0.75%	Total Cost	$701.72
Illness Rate		15.60%		
Treatment Cost/Calf $5.00 Benefits from Reducing Infection (By Vaccination)				
Average Weight Diff.	1.71lb	Death	0%	$ 0.00
Total Cost Illness	$781.49	Illness	41%	$320.41
Total Cost Death	$808.05	Total Benefit		$320.41
Benefit/Cost Ratio .46				

The “Farm Data” comes from Herd A, along with an estimated value per pound and an estimated cost for treating each ill calf. The “Expense Items” listed are the estimated costs incurred to administer the “One-Shot” vaccine. For this “What if . . .” situation it was not anticipated that the death loss would be reduced at all. It was calculated that the illness rate would be reduced by 41%, as occurred with vaccination in Herd A. This would reduce the cost of illness ($781.49) by 41% or $320.41. Any number of other “What if . . .” scenarios could be calculated.

The efficacy rate at which the vaccine would be cost effective at the various levels of weight differences listed can be displayed in a computer graph. With a two pound difference in gain for the vaccinated versus the non-vaccinated calves, there would have to be an efficacy rate of 80% for the cost/benefit value to break even (equal 1). The values in Herd A were a 1.7 pound gain difference and 41% efficacy. But, in a herd with a high illness rate there would be more opportunity for the vaccine to be of benefit and the weight difference could be greater. Sensitivity analysis performed on the benefit/cost calculation suggests that a graph like this is quite representative of a wide range of prices and weights and can be used to reflect a broad range of circumstances.

As producers and their veterinarians develop plans to prevent BRD in specific herds, it is important to look at past history and procedures for that herd. If there have been problems, it is important to consider changes that would reduce the losses. The two major areas to emphasize for prevention are management and vaccination. Of the two, management is usually much more important. Evaluate all the possible causes of stress on the calves and determine which ones can reasonably be eliminated or at least reduced. Look carefully at alternative methods of operation and at specific timing of processing, vaccinating, etc.

Vaccines are available for several of the infectious causes of BRD. However, timing is critical and vaccines are often administered so as to be of no benefit until after the time of greatest risk has passed. Allow sufficient time between vaccination and weaning stress for the vaccine products to stimulate immunity. Plan ahead with your veterinarian so you have the desired products on hand at the time of cattle processing. It often takes a few days to obtain the specific products you may want to use. When vaccinating calves that will remain on their pregnant dams, you must select products that are safe for use around pregnant cows.

Some general rules for weaning would include: 1) Recognize that the three weeks immediately following weaning are critical for early disease detection; 2) Avoid co-mingling cattle from different sources; 3) Arrange the pens and mangers so as to keep new cattle close to the feed and water; 4) Don’t overcrowd, especially early in the feeding period; and 5) Control the dust and mud.

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