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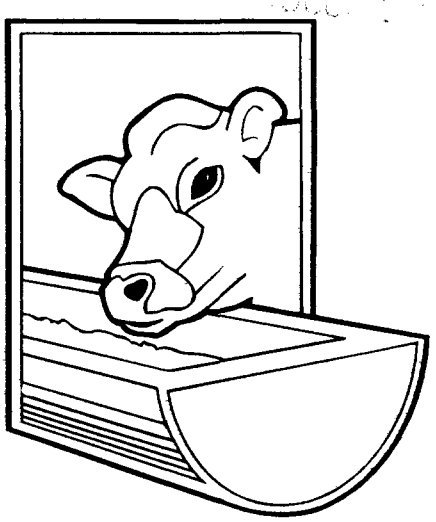

Preconditioning Programs:

Vaccination, Nutrition, and Management

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Preconditioning, by definition, is a vaccination, nutrition, and management program designed to prepare young cattle to withstand the stress associated with weaning and shipment to a backgrounding yard or feedlot. It is unfortunate that preconditioning is a term that has been loosely applied in the beef industry.

The lack of standardization has led to confusion, and in some cases abuses, by owners, buyers, and veterinarians. Part of the problem lies in a lack of communication between the buyer and seller. For any preconditioning program to be effective, the seller must communicate to the buyer what program was followed.

The objective of a preconditioning program is to prepare the calf for entry into a backgrounding yard or feedlot. This is accomplished by exposing the calf to the stresses of weaning, vaccination, and other common processing procedures (castration, dehorning, treatment with systemic parasiticides, and implanting) well in advance of its entry into the backgrounding yard or the feedlot. Preconditioning vaccinations, nutrition, and parasite control are three areas which can help prevent or reduce problems with morbidity and mortality in the backgrounding yard or feedlot.

Vaccinations alone do not constitute a preconditioning program. A beef cattle producer should develop a preconditioning program which encompasses vaccination, nutrition, weaning, and other management items which are essential for the success of any preconditioning program. This publication will offer suggestions and guidelines producers should follow for a successful preconditioning program.

Bovine Respiratory Disease

The main cause of illness in freshly weaned calves is the tremendous exposure to infectious agents and stress associated with weaning, commingling, and transportation. When compared to other ages and classes of cattle, newly weaned beef calves and stocker calves have

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the highest levels of morbidity (sickness) and mortality (death). Bovine respiratory disease (BRD) accounts for a significant portion of cattle/calf losses in the beef industry. In one study, over 30% of these death losses were attributable to BRD. Although mortality (death) is often the most visible problem, morbidity (sickness) accounts for most production losses. Estimates of the cost of clinical diseases for backgrounded or feedlot cattle are quite variable, but one occurrence of respiratory disease in a feedlot animal costs almost $90 per head.

Strategies to Keep Calves Healthy

There are three strategies designed to prevent disease from entering or occurring in a backgrounding yard or feedlot:

- **Prevent or limit the introduction of infected cattle.**

  Buy calves from verified sources with a proven record of healthy animals.

- **Minimize exposure to infectious disease.**

  Maintain records of order buyers and transportation companies that promptly fill and ship orders. Require trucks to be cleaned and disinfected. Keep facilities clean and free of contamination from manure, rodents and other disease vectors.

- **Raise overall level of the animal's resistance to infectious disease.**

  Develop sound vaccination programs at the farm or ranch of origin. Reduce environmental stress by providing proper shelter and ensuring that pens and lots are free of mud. Use balanced starter rations which ensure good feed intake and minimize stress during initial handling and processing procedures.

Bacterial and Viral Agents Which Cause Bovine Respiratory Disease

The agents responsible for producing respiratory disease in beef cattle are both viral and bacterial. Viruses rely on the animal's own cells to produce more virus whereas bacteria have all the cellular functions necessary to reproduce without the aid of an animal's cell. Antibiotics can be used for fighting bacterial infections but are ineffective at fighting viral infections. The viral and bacterial agents most commonly associated with BRD are shown in the chart below.

Of all the viral agents, IBR, BVD, BRSV, and PI_3 are the only viruses which cause acute respiratory disease by themselves. All the other viruses require significant interaction with other pathogens. Of the bacterial pathogens, neither *Mycoplasma* spp. nor *Chlamydia* spp. are considered primary pathogens in weaned or yearling cattle.

A pathogen causes disease. Rarely is only one pathogen responsible for BRD. Two or more pathogens work in concert with each other to bring about morbidity and mortality. Respiratory viruses compromise the animal's respiratory defense mechanisms to allow bacterial pathogens access to the lower respiratory tract. This is what causes the pneumonia commonly associated with BRD.

Viral Agents	Bacterial Agents
Infectious bovine rhinotracheitis (IBR)	*Pasteurella hemolytica*
Bovine viral diarrhea (BVD)	*Pasteurella multocida*
Bovine respiratory syncitial virus (BRSV)	*Hemophilus somnus*
Bovine parainfluenza 3 virus (PI_3)	*Mycoplasma* spp.
Bovine adenovirus	*Chlamydia* spp.
Bovine rhinovirus	
Bovine reovirus	
Bovine enterovirus	
Bovine coronavirus	

Prevention

Three keys to a successful vaccination program are effective vaccines, animal response, and proper timing of the vaccination.

Vaccines

A vaccine is a suspension of attenuated or killed microorganisms, or the antigenic proteins derived from them. Two key components are required for successful vaccination. They are an efficacious vaccine and a functioning immune system within the animal. Furthermore, for a vaccine to work, the immune response that it elicits must occur prior to the challenge of the infectious agent. In other words, the vaccine must be administered before the animal becomes exposed to the disease to be truly effective. If a vaccine is used in any fashion other than prior to exposure, vaccine efficacy will be suboptimal or negligible.

Vaccines are not always 100% effective. There can be many reasons for vaccine failure which include:

- The animal may have been incubating the disease when it was vaccinated.
- Something may have happened to the vaccine to make it ineffective, such as mishandling (ie exposure to sunlight, heat, adverse climatic conditions).
- The immune status of the animal may make it unresponsive to the vaccine. The immune system of the calf may not be fully functional, antibodies derived from the colostrum of the cow may still be present and inactivate the vaccine, or the nutritional program may be inadequate and not allow an immune response to occur.
- The animal may be exposed to an overwhelming dose of the infectious agent.
- The duration of immunity after vaccination was not adequate.
- A booster may be required for proper vaccine response. Be sure to read and follow the label.
- Important antigenic differences exist between the vaccine and field strains.

There are two categories of vaccines, killed and modified-live. A killed vaccine is just that, killed. No self-replicating microorganisms are present in the suspension. The advantages of a killed vaccine are:

- More stable in storage.
- Unlikely to cause disease due to residual virulence or reversion to virulence.

Modified-live vaccines contain microorganisms which have been made attenuated through culturing and laboratory procedures. The advantages of a modified-live vaccine are:

- Stronger immune response achieved with fewer doses.
- Possible stimulation of interferon production.
- Microorganism contained in the vaccine resembles the pathogenic form of microorganism more closely.

An important point must be made regarding modified-live vaccines. Some modified-live vaccines are capable of inducing disease in the immunosuppressed animal. They are not recommended for use in animals with compromised immune systems (very young animals, animals already battling an infectious disease, or pregnant animals).

What to Vaccinate for in a Preconditioning Program

Backgrounding yards and feedlots are in the best position to determine if preconditioning vaccination programs are effective in decreasing the morbidity and mortality of BRD. Table 1 lists the vaccines requested by stocker and feedlot operators.

Table 1. Preconditioning vaccination preferences of stocker cattle and feedlot industry.

Antigen	Stocker	Feedlot
IBR	69%	70%
BVD	60%	58%
PI_3	63%	56%
BRSV	57%	48%
Clostridials	64%	46%
H. somnus	42%	34%
Pasturella	9%	16%

Adapted from NCA/IRM Calf Information Task Force Calf History Information Survey. 1995.

According to Table 1, IBR, BVD, and PI_3 were the most important viral pathogens to be included in a vaccination program. However, the use of the bacterial vaccines was not as universally accepted. This is true in part because **no one vaccine program or preconditioning program will meet the needs of all backgrounding or feedlot operations.**

Table 2 shows examples of vaccination and preconditioning programs which producers can use. Producers should work with their local veterinarian for programs specific to each farm or ranch.

Beef Quality Assurance

Remember to follow all label directions pertaining to injection site, amount, and withdrawal times (if necessary). Injections should be given in the neck, in front of the point of the shoulder, to minimize damage due to injection site lesions.

Calf Nutrition During the Preconditioning Period

From the standpoint of calf nutrition, the goal of any preconditioning program should be to acclimate calves to eating processed feeds rather than relying on their mother's milk and grass. Calves will adjust to drylot feeding more easily if they have been exposed to processed feeds before weaning.

Creep Feeding

A short period of creep feeding (30 days) prior to weaning allows calves to become "bunk broke" or accustomed to eating dry, processed feeds prior to the stresses of weaning. Bringing the creep feeder from the pasture into the backgrounding lot will help the calves adjust to a drylot feeding situation rapidly.

Ensuring Calves Get Off to a Fast Start

If it is not possible to "bunk break" calves prior to weaning, it is important to make their adjustment to life in the feedlot or backgrounding yard as stress-free as possible. Inadequate nutrient intake can be a major problem during the weaning period if calves are not accustomed to eating from a bunk. Stresses associated with weaning and transit cause feed intakes to be depressed. Table 3 shows the percentage of calves which ate during the first 10 days after arrival at the feedlot.

Ensuring the calves eat quickly after weaning is critical, not only for the calf to grow, but also to ensure a successful health and vaccination program. Undernourished calves have poorer responses to vaccinations and are more susceptible to disease.

Preconditioning feeds should be palatable, dust-free, and nutritious. Feeds which are unpalatable, dusty, or moldy will result in low feed intakes and a poor start for the calves.

Several management practices can be employed in an attempt to get calves to eat quickly following arrival at the backgrounding yard. Some cattleman will place an older calf or dry cow with the calves in order to train the newly weaned

Table 2. Calf health programs for preconditioning calves.

Health Program	Required Management Procedures	Timing of Administration
Vac 24	Vaccinated Against: • IBR (chemically altered modified live) • PI_3 (chemically altered modified live) • BVD (killed) • BRSV (modified live or killed) • 7-way Blackleg • *Pasteurella haemolytica* (with leukotoxoid component)	2 to 4 months of age
Vac 34	Vaccinated Against • 7-way Blackleg	At branding or turnout.
	• IBR (chemically altered modified live) • PI_3 (chemically altered modified live) • BVD (killed) • BRSV (modified live or killed) • *Pasteurella haemolytica* (with leukotoxoid component)	At least 3-4 weeks prior to weaning.
Vac 45 Pre-weaning Option	Vaccinated Against: • IBR (chemically altered modified live) • PI_3 (chemically altered modified live) • BVD (killed) • BRSV (modified live or killed) • 7-way Blackleg • *Pasteurella haemolytica* (with leukotoxoid component)	At 2 to 4 months of age or at least 3 to 4 weeks prior to weaning.
	Revaccinated Against: • IBR (modified live or chemically altered modified live) • PI_3 (modified live or chemically altered modified live) • BVD (modified live or killed) • BRSV (modified live or killed) • *Pasteurella haemolytica* (with leukotoxoid component)	At weaning.
	Weaned at least 45 days prior to shipment.	Beginning at weaning.
Vac 45 Weaning Option	Vaccinated Against • 7-way Blackleg	At branding.
	• IBR (modified live or chemically altered modified live) • PI_3 (modified live or chemically altered modified live) • BVD (modified live or killed) • BRSV (modified live or killed) • *Pasteurella haemolytica* (with leukotoxoid component)	At weaning and revaccinated 14 to 21 days later.
	Weaned at least 45 days prior to shipment.	Beginning at weaning.
Vac Pre Con[1]	Vaccinated Against • 7-way Blackleg	Upon arrival.
	• IBR (modified live or chemically altered modified live) • PI_3 (modified live or chemically altered modified live) • BVD (modified live or killed) • BRSV (modified live or killed) • *Pasteurella haemolytica* (with leukotoxoid component)	Upon arrival and revaccinated 14 to 21 days later.
	Backgrounded for at least 60 days.	Beginning at purchase.

[1] The Vac Pre Con program was designed for producers who purchase weaned calves and background them in drylot or on pasture.

Adapted from King (1998).

Table 3. The percentage of calves eating during the first ten days after arrival.

Day	Calves Eating	Range
	(%)	(%)
1	21.7	0-50
2	36.7	10-60
3	56.7	30-90
4	61.7	30-90
5	66.7	40-90
6	68.3	40-90
7	70.0	60-90
8	71.7	60-90
9	73.3	60-90
10	85.0	60-100

Adapted from Hutcheson, 1980. Proceedings of the Texas Beef Conference.

calves. The leader calf or cow knows the location of feedbunks and water in the pen and can train the new cattle to eat and drink a bit sooner. Success with this methodology can vary, however.

Placing feed bunks and waterers along the fence line will help calves find feed and water faster since most freshly weaned calves will pace back and forth along the fence line for a few days following weaning. Allowing waterers to run over for a few days may also help attract calves to water since the sound of running water may be familiar to them.

Good quality, long stem grass hay should be fed for the first four to seven days after calves arrive at the feedlot. This feedstuff most closely resembles what the calf is used to seeing on pasture. Once calves are accustomed to eating from feed bunks, hay can be ground and mixed in a total mixed ration.

The receiving ration should be top dressed on the long stem hay in order to acquaint the cattle with the taste and texture of grains and other ration ingredients. As a general guideline, start out feeding 0.5 to 0.75% of body weight of the receiving ration per day top dressed on the hay.

Corn silage, haylages, and other fermented feed should not be used during the initial receiving period since the fermented smell and flavor of these feeds are not familiar to most calves. Introduce these feeds once calves are acclimated to eating from the feedbunk.

Since intakes are generally quite low during the initial receiving period, it is important that the ration be high in protein, energy, vitamins, and minerals. Table 4 gives suggested nutrient recommendations for newly received calves.

Be sure that calves are eating 2% of body weight or more of hay before introducing medicating feed or water. Some medications are unpalatable. Feed additives are described in more detail in a companion publication, Feed Additives for Backgrounding Calves, AS-1159.

Table 4. Suggested nutrient recommendations for newly received calves.

Dry Matter, %	80-85
Concentrate, %	50-75
NE_m, Mcal/lb[a]	.82-.90
Ne_g, Mcal/lb[b]	.46-.56
CP, %	12.5-14.5
Calcium, %	.60-.80
Phosphorus, %	.40-.50
Potassium[c], %	.80-1.40
Magnesium, %	.20-.30
Sodium, %	.20-.30
Copper, ppm	10-15
Iron, ppm	100-200
Manganese, ppm	20-40
Zinc, ppm	75-100
Cobalt, ppm	.10-.20
Selenium, ppm	.10-.20
Iodine, ppm	.30-.60
Vitamin A, IU/lb	2500
Vitamin E, IU/lb	50-100

Adapted from Hutcheson, 1990. Proceedings of the Liquid Feed Symposium.

[a] Net energy for maintenance.
[b] Net energy for gain.
[c] Higher levels for stressed calves.

Rations

Table 5 gives some suggested starter rations for newly received calves. Remember to introduce alfalfa hay and corn silage gradually to calves. Grains should be coarsely ground or rolled. Oats can be fed whole. Rations should be palatable and not be dusty or moldy.

Use caution when feeding rations with high levels of grain or other concentrate ingredients. Calves can experience acidosis, founder, and bloat when high levels of grain are fed to calves not acclimated to eating high

Table 5. Suggested starter diets for newly received calves.

Ingredient	50% Concentrate					60% Concentrate					70% Concentrate				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
	%, as fed basis														
Oats					21.9					26.5					30.9
Barley				22.1					26.7					31.2	
Corn	43.2	15.4		22.9	22.7	51.9	25.7		27.4	27.3	60.7	37.5		32.3	32.0
Ear Corn			50.5					61.6					72.0		
Grass Hay[a]	24.6	11.0	19.8	24.8	24.8	19.7	9.4	13.4	19.8	19.8	14.8	7.6	7.4	14.9	14.9
Alfalfa Hay[b]	25.4	11.4	20.5	25.6	25.6	20.4	9.8	13.8	20.5	20.5	15.2	7.9	7.7	15.4	15.4
Corn Silage[c]		55.4					47.4					38.2			
Supplement[d]	6.8	6.8	9.2	4.6	5.0	8.0	7.7	11.2	5.6	5.9	9.3	8.8	12.9	6.2	6.8

Adapted from Great Plains Beef Cattle Handbook, GPE-1608.

[a] 88% dry matter, 11% crude protein.

[b] 85% dry matter, 17% crude protein.

[c] 35% dry matter, 8% crude protein, 50% concentrate.

[d] Supplements for oats and barley diets contain 32% crude protein, 5.0% calcium, 2.5% phosphorus, 1.5% potassium, 1.2% magnesium, 9.0% salt and 48,000 IU/lb vitamin A. Supplements for the other diets contain 36% crude protein, 3.6% calcium, 2.0% phosphorus, 1.7% potassium, .8% magnesium, 6.3% salt and 32,000 IU/lb vitamin A.

grain diets. High concentrate diets may be necessary to ensure adequate energy intake in highly stressed cattle but these rations require a higher degree of management.

Parasite Control

Controlling internal and external parasites is an important part of any preconditioning program. Virtually all stocker and feedlot operations desire some type of parasite control in a preconditioning program. However, there is little agreement among them as to which is best.

As a general recommendation, all calves should receive a systemic anthelmintic (dewormer) according to labeled instructions prior to or at weaning. If these animals remain in a drylot environment throughout the entire feeding period, they should not have to be treated again for internal parasites. However, if these animals are placed back on grass for any reason, they will need to be treated again for internal parasites, primarily *Ostertagia ostertagi.*

Depending on degree of infestation, calves may require further treatment for lice later in the feeding period. University of Nebraska studies indicate that heavy infestations can decrease weight gains by as much as 0.2 pounds per head per day.

The newer systemic anthelmintics are labeled to control lice for 240 to 365 days depending on product and type of animal treated. Always read and follow the label to determine correct dosage and application procedure.

Summary

Development of an effective vaccination, nutrition, and parasite control program during the preconditioning period should result in lower incidence of morbidity and mortality when calves are placed in a backgrounding yard or a feedlot. Vaccinations needed may vary from herd to herd. An effective nutrition program will enhance calf performance and get cattle adjusted to a drylot quickly. Consult your veterinarian for help in developing a specific preconditioning vaccination and parasite control program tailored to your operation.

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