Effect of Pre-Weaning and/or Pre-Vaccination on Weight Change During the Weaning Process[1]

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Story in Brief

One hundred forty-four fall-born calves (444 lb initial body weight [BW]) were used in a two-year study to evaluate the impact of pre-shipment vaccination and/or weaning on weight change of calves at different times during the weaning process. Calves were allocated randomly by weight and sex into eight groups each year. Half of the calves within each group received vaccinations against infectious bovine rhinotracheitis (IBR), bovine virus diarrhea (BVD), parainfluenza (PI_3), bovine respiratory syncytial virus (BRSV), five strains of *Leptospira* sp., *H. somnus*, and *Pasturella haemolytica* on day 0 (EV) and half were not vaccinated until day 29 (LV). Half of the groups of calves were weaned on day 14 of the study (EW), and half of the groups were weaned on day 28 (LW). All calves were loaded and transported to a local auction barn on day 28 and brought back to the station and vaccinated on the morning of day 29. Early-weaned calves that were not vaccinated prior to shipping had lower ($P < .05$) gain from day 0 until the morning of shipping than calves on the other treatments in year one. Those calves (EW-LV in year one) also gained less from day 0 until weighing at the auction barn than EV calves that were either late or early weaned. No differences in weight gain were detected ($P > .10$) in year 2. Early-weaned calves lost more ($P < .10$) weight between being weighed at the auction barn and return to the research station and required more ($P < .05$) days to regain transit weight loss than late-weaned calves. Therefore, weaning calves two weeks prior to shipping them to an auction barn appears to provide little benefit, but vaccinations four weeks prior to shipping could result in extra weight for calves sold.

Introduction

In a recent survey of cattlemen from 25 different states, animal health was rated as the most important criteria in determining profitability of stocker or feeder cattle (Neal et al., 1998). Numerous pre-weaning vaccination programs have been established in different states to encourage producers to produce healthier calves for buyers. Acceptance of these programs by cow-calf producers has been less than desirable because of lack of a perceived premium for preconditioned calves. The purpose of this study is to evaluate calf management methods to 1) reduce weight loss during weaning, 2) to reduce stresses associated with weaning, and 3) to increase animal resistance to foreign pathogens contacted at an auction barn environment.

Experimental Procedures

A total of 144 fall-born suckling calves grazed with their dams in eight groups of eight (1998) or 10 (1999) head each on eight different pastures of *Neotyphodium coenophialum*-infected fescue. Calves were allocated randomly to four treatments in a 2 x 2 factorial arrangement of a split-plot experiment to compare early (EW) with late weaning (LW) and pre-weaning vaccination (EV) with no pre-weaning vaccination (LV). Half of the calves within each group were dewormed and vaccinated against infectious bovine rhinotracheitis (IBR), bovine virus diarrhea (BVD), parainfluenza (PI_3), bovine respiratory syncytial virus (BRSV), five strains of *Leptospira* sp., *H. somnus*, and *Pasturella haemolytica* on day 0 (28 days prior to shipping all calves to a local auction barn) of the study and half of the calves were not vaccinated against these organisms until they returned from an auction barn on day 29. All calves were vaccinated against clostridial infections on day 0.

Four groups of calves each year were weaned in a drylot on day 14 and fed bermudagrass hay with 4 lb/day of a rice bran supplement. At 7:00 am on day 28, all calves were gathered, weighed, transported approximately 10 miles to an auction barn, and placed in pens without feed and water. Calves were weighed at approximately 8:30 pm then placed in pens with access to water only.

[1] Appreciation is expressed to Boehringer Ingelheim Vetmedica, Inc. for providing vaccines.

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Calves were returned to the research facility on the morning of day 29. Calves previously dewormed and vaccinated received a booster vaccination against the previously-mentioned organisms. Those calves that were not vaccinated previously were dewormed and received their first vaccination against the aforementioned organisms. All calves were weighed and placed in eight drylot pens by treatment group. Calves were fed hay to appetite and fed a supplement of rice bran and minerals at a level of 4 lb/head daily.

All calves were weighed on day 32 and moved to pastures of common bermudagrass overseeded with rye and annual ryegrass (1998) or orchardgrass (1999). Rice bran and mineral supplementation was continued for 21 days. Calves were observed daily for 21 days for signs of illness and treated when their temperature reached or exceeded 104° F. Calves receiving their first vaccination on day 29 received a booster vaccination on day 50 of the study.

Weight data were analyzed by analysis of variance (PROC MIXED; SAS, 1990) using initial weight as a covariate. Morbidity data were analyzed by Chi-Square analysis.

Results and Discussion

A year x weaning treatment x vaccination treatment interaction was detected ($P < .10$) for most of the weight and gain variables. In 1998, auction-barn weights and weights when the calves returned to the station were lower ($P < .05$) from EW-LV than for the other treatments (Table 1). Those calves also weighed less ($P < .05$) than EW-EV and LW-EV calves prior to shipping them to the auction barn. No differences in calf weights were detected ($P > .10$) in 1999.

Gain data (Table 2) followed similar patterns as were observed for animal weight. In 1998, calves weaned early and not vaccinated until day 29 (EW-LV) gained 17, 11, and 15 lb less ($P < .05$) prior to shipping than EW-EV, LW-LV, and LW-EV calves, respectively. Weight gain from day 0 until day 50 was greater ($P < .05$) from LW-LV and LW-EV compared with EW-LV.

The 3-way interaction was not detected ($P > .10$) for weight losses resulting from transportation to and from the auction barn (Table 3). Calves not weaned prior to transport lost 3 lb less weight ($P < .10$), shrank .6% less ($P < .10$) and required 2.9 fewer ($P < .05$) day to regain weight lost during transportation than calves weaned two weeks prior to transportation, regardless of vaccination treatment. Vaccine treatment did not impact weight loss during transit to, during, and from the auction barn.

Morbidity rate did not differ ($P > .10$) among treatments (Table 4). In 1998, EV calves numerically had lower morbidity than LV calves, but these trends did not hold in 1999. Early weaned calves had numerically higher morbidity in 1998 and numerically lower morbidity in 1999.

When averaged across years, the results in this study show some benefits of early vaccination but not of weaning calves two weeks prior to transporting them to an auction facility. It also shows that response to these programs varies under different circumstances. Calves were weaned in mid-May in 1998. During that time, ambient temperatures were high and animals displayed symptoms of heat stress during the weaning process. In 1999, calves were weaned in mid-April during more moderate temperatures. It is possible that less environmental stress in 1999 negated treatment differences. It is also possible that two weeks is insufficient time to allow calves to recover prior to additional stresses of transport to an auction facility. If this is the case, calves that are early weaned are subjected to multiple stressors over an extended period rather than one stress over a shorter period.

Calves in this study were exposed to some but not all of the stresses normally presented to weaned calves. Although calves were transported to an auction facility, they were exposed only to calves on either side of the pen they were housed in. In many situations, calves are commingled with calves from numerous locations, thereby exposing them to multiple organisms. This reduced exposure is the probable reason for a somewhat lower morbidity than expected in these studies. With reduced morbidity, response to treatments would be expected to also be reduced.

Implications

Producing healthy calves should be a high priority for Arkansas producers based on recent surveys. Responses to pre-weaning vaccination programs will probably be based on the level of stress and disease exposure to which calves are subjected. Weaning calves two weeks prior to shipping will probably provide little additional benefit to the seller other than their cattle might spend less time bawling at the auction barn. However, vaccination against respiratory infection prior to transport may improve weight gain and should provide immunity when calves are exposed to stressful situations.

Literature Cited

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Table 1. Weight (lb) of stocker calves at various times during the weaning process that were vaccinated early or late and weaned early or late.

	Early wean		Late wean		
	Early vac	Late vac	Early vac	Late vac	SE
1998					
day 14	486[a]	477[b]	484[ab]	482[ab]	4.3
day 28 (7 am pre-ship)	500[a]	483[b]	498[a]	494[ab]	5.2
day 28 (8 pm at salebarn)	489[a]	475[b]	489[a]	484[a]	4.5
day 29 (at research station)	472[a]	457[b]	474[a]	471[a]	4.3
day 50	521[bc]	512[c]	540[ab]	550[a]	8.0
1999					
day 14	475	480	477	475	3.9
day 28 (7 am pre-ship)	506	513	513	509	4.9
day 28 (8 pm at salebarn)	490	496	495	491	4.3
day 29 (at research station)	468	473	475	471	4.0
day 50	541	548	543	532	7.6

[a,b,c]Means within a row without a common superscript letter differ (P < .05).

Table 2. Gain (lb) by stocker calves at various times during the weaning process that were vaccinated early or late and weaned early or late.

	Early wean		Late wean		
	Early vac	Late vac.	Early vac	Late vac	SE
1998					
day 0-14	42[a]	33[b]	40[ab]	38[ab]	4.1
day 0 - pre-ship	55[a]	38[b]	53[a]	49[a]	5.2
day 0 - salebarn	44[a]	30[b]	44[a]	39[ab]	4.5
day 0 - 50	76[bc]	67[c]	95[ab]	105[a]	8.0
1999					
day 0-14	31	36	33	31	3.9
day 0 - pre-ship	61	68	68	64	4.9
day 0 - salebarn	45	51	50	46	4.3
day 0 - 50	96	103	98	87	7.6

[a,b,c]Means within a row without a common superscript letter differ (P < .05).

Table 3. Weight loss, percentage shrink, and time required to regain lost weight by stocker calves at various times during the weaning process that were vaccinated early or late and weaned early or late.

	Wean treatment		Vaccine treatment		
	Early wean	Late wean	Early vac	Late vac	SE
Weight loss, lb					
Pre-ship – salebarn	14	13	14	13	1.0
Salebarn – station	20[a]	17[b]	19	18	1.0
Pre-ship – station	33	31	32	32	1.2
% Shrink					
Pre-ship – salebarn	2.7	2.8	2.8	2.7	.20
Salebarn – station	4.1[a]	3.5[b]	3.8	3.9	.20
Pre-ship – station	6.7	6.2	6.7	6.2	.22
Shrink recovery time, days	8.1[c]	5.2[d]	6.3	6.9	.77

[a,b]Means within a row and main effect of wean or vaccination treatment without a common superscript letter differ ($P < .10$).
[c,d]Means within a row and main effect of wean or vaccination treatment without a common superscript letter differ ($P < .05$).

Table 4. Morbidity (%) of stocker calves at various times during the weaning process that were vaccinated early or late and weaned early or late[a].

	Wean treatment		Vaccine treatment	
	Early wean	Late wean	Early vac	Late vac
1998	21.9	9.4	9.4	21.9
1999	12.5	37.5	27.5	22.5
Total	16.7	25.0	19.4	22.2

[a]No significant differences were detected ($P < .10$) by Chi-Square analysis.