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Case Report – Veterinary Farm Specific Employee Training to Manage Dairy Cows at Calving Time

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Abstract

This case report illustrates how a farm-specific training program aimed at teaching employees to properly manage the cow at parturition can improve animal health on the dairy. Numerous primiparous cows on a 700-cow Holstein dairy farm were reported by the herd veterinarian to have severe intra-pelvic inflammation and uterine infection after calving, requiring extended systemic antibiotic therapy. The farm's previous maternity protocol called for moving cows directly to the maternity pen from the close-up dry cow group when parturition was imminent. Cows were generally moved to the calving pen during the first stage labor. Farm employees were subsequently provided a review of obstetrics principles, and the maternity protocol was revised to move cows to the maternity pen upon reaching second stage labor. Following implementation of the new protocol, average calving ease scores and outcome variables of proportion of cows with veterinary diagnosed metritis, veterinary prescribed penicillin for puerperal metritis, and stillborn calves in 2009 were compared to the herd's previous records from 2008. Average calving ease scores were lower for multiparous cows having heifer calves, and fewer heifer calves required delivery assistance. There were no differences in the other outcome variables, suggesting that multiparous cows could be moved to the maternity pen in either stage 1 or stage 2 labor. In primiparous cows in 2009 compared to 2008, there was a significant decrease in the proportion of primiparous cows delivering bull calves that received veterinary prescribed penicillin treatment for puerperal metritis. In addition, there was a significant decrease in both average calving ease scores and percent of either heifer or bull calves delivered requiring assistance in 2009, suggesting an advantage to waiting until stage 2 labor to move primiparous cows to the maternity pen. Overall, moving cows directly to the maternity pen in stage 2 labor from the close-up pen was an acceptable cow movement strategy on this dairy. Results from this study show that the veterinarian is ideally suited to provide farm-specific employee training, and well trained employees managing dairy cows at calving time will improve postpartum dairy cow health and welfare.

Keywords: calving protocols, employee training

Résumé

Ce rapport de cas illustre comment un programme de formation à la ferme, pour enseigner aux employés comment prendre soin des vaches en période périnatale, peut améliorer la santé animale dans une ferme laitière. Plusieurs vaches primipares dans une ferme laitière de 700 vaches Holstein avaient, selon le vétérinaire du troupeau, une inflammation pelvienne et une infection utérine sévères après le vêlage qui nécessitèrent une thérapie antibiotique systémique de longue haleine. Dans le protocole de préparation de la vache avant le vêlage de la ferme, les vaches étaient déplacées directement des enclos de tarissement vers les enclos de vêlage lorsque le vêlage était imminent. Les vaches étaient généralement déplacées dans les enclos de vêlage durant la première étape de la parturition. Les employés de la ferme ont reçu par la suite une formation sur les principes de l'obstétrique et le protocole de préparation de la vache avant le vêlage de la ferme a été modifié de sorte que les vaches n'étaient déplacées que dans la seconde étape de la parturition. Après la mise en place du nouveau protocole, les scores moyens de facilité au vêlage et les résultats cliniques en 2009, dont la proportion de vaches avec métrite diagnostiquée par le vétérinaire, l'utilisation de pénicilline prescrite par le vétérinaire pour la métrite puerpérale et le nombre de veaux morts à la naissance, ont été comparés aux données du même troupeau en 2008. Le score moyen de facilité au vêlage était plus bas chez les vaches multipares donnant naissance à des veaux femelles et moins de veaux femelles ont nécessité une assistance à la naissance avec le nouveau protocole. Il n'y avait pas de différence au niveau des résultats cliniques, suggérant que les vaches multipares pourraient être déplacées soit dans la première ou soit dans la seconde étape de la parturition. Chez les vaches primipares en 2009, par rapport à celles en

2008, il y avait une réduction significative de la proportion de vaches donnant naissance à des veaux mâles qui ont nécessité une assistance à la naissance, suggérant un avantage à ne déplacer les vaches primipares vers l'enclos de vêlage qu'à la seconde étape de la parturition. Dans son ensemble, le déplacement des vaches directement de l'enclos de tarissement à l'enclos de vêlage à la seconde étape de la parturition s'est révélé une stratégie acceptable de déplacement des vaches dans cette ferme laitière. Les résultats de cette étude indiquent que le vétérinaire est très bien placé pour la formation des employés à la ferme et qu'avoir des employés bien formés au moment du vêlage a des conséquences positives pour la santé et le bien-être des vaches en post-partum.

Introduction

As dairy herds have become larger, the trend has been to hire lay employees to provide the primary health care to the cows. On these farms, the role of the veterinarian has evolved to developing health programs and protocols, training farm employees, and monitoring results. Effective employee training programs should result in measurable improvement in animal health and/or production metrics. The following case report illustrates how a veterinary farm-specific training program aimed at teaching employees to properly manage the cow at parturition can result in improved cow health on the dairy.

A 700-cow Holstein dairy in Pennsylvania had numerous primiparous cows with intra-pelvic inflammation (IPI) and uterine infections after calving requiring extended systemic antimicrobial therapy. The concern was that calvings that required assistance by employees were resulting in too many injuries and postpartum complications, either due to calves being pulled too soon or the fetal extractor being used incorrectly. The farm was not large enough to dedicate any employees full time to the maternity pen, but all current employees had received previous obstetrics classroom training provided by a bilingual veterinarian, and some had attended a practical laboratory on obstetrics taught at the University of Pennsylvania in 2007. The employees were assigned on an hourly basis to check the close-up dry cow pen that housed both primiparous and multiparous cows, and to move cows showing signs of impending labor to a communal sand calving pen. They had been instructed to assist multiparous cows not making progress after one hour and primiparous cows after two hours. Employees said they moved cows to the calving pen based on any of the following signs: isolation and restless behavior, tail elevation, mucus strands from the vulva, or appearance of the water bag or feet. The herd manager added that primiparous cows often stopped making progress once they were moved to the communal calving pen. Based on these discussions, it was determined that most cows were generally moved to the calving pen during the early stages of labor.

Previous studies indicated that the duration of calving is associated with dystocia and stillbirths.[2] Mee speculated that moving cows, particularly primiparous cows, in first stage labor could cause a longer psychogenic-induced uterine atony than waiting to move cows until they reach second stage labor.[8]

The decision was made to revise the maternity protocol to wait to move cows to the maternity pen until they were in second stage labor, and to review basic obstetrics principles with the employees. The purpose of this study was to compare calving outcomes in 2008 before the maternity pen protocol modification and employee re-training to outcomes in 2009 after training.

Materials and Methods

A bilingual training review of basic obstetrics (English and Spanish) was provided in a classroom setting to the herd manager and employees using a PowerPoint presentation of visual aids as suggested by Roman-Muniz.[11] Participants received the PowerPoint notes in either Spanish or English, depending on the training session they attended. The principles covered in the obstetrics trainings were:

1. The three stages of labor:
   Stage 1 – defined by the beginning of uterine contractions and ending when the cervix is dilated.
   Stage 2 – defined by the calf entering the birth canal and either the amnionic sac (water bag) or feet becoming visible.
   Stage 3 – defined by the passing of the placenta.
2. Common dystocia presentations
3. When and how to provide assistance to the cow
4. When to seek professional veterinary assistance

A previous paper by Mee gives an excellent review on veterinarian-led education to herd personnel on basic principles of managing the cow at calving time.[8]

Employees were instructed to wait to move cows from the close-up dry group to the maternity pen until they reached stage 2 labor. This part of the training session was aimed at engaging dairy workers by having active two-way discussions.[11] We emphasized that adherence to this protocol was a win-win proposition as delivering calves should be easier and cow health should improve. Employees were instructed to move cows to the calving pen only after the water bag or feet were visible. We emphasized a rule of steady progression in 45-minute increments after each cow was moved to the maternity pen. Instructions given to the employees was that after they saw the water bag, 45 minutes later they should see the feet and nose; in another 45 minutes they should see the legs and face; in another 45 minutes they

should see the legs and head. Once the legs and head were visible, they could assist and pull the calf. If any disruption occurred in the progression sequence using the 45-minute rule, they were instructed to examine and assist the cow.

Calving outcomes before re-training and maternity pen protocol revision were compared in 2008 (January 06, 2008 through December 31, 2008) to post-training outcomes in 2009 (January 06, 2009 through December 31, 2009) after training and maternity pen protocol revisions in primiparous (Table 1) and multiparous cows (Table 2). Chi-square[a] analysis was used to compare proportions of the outcomes in 2008 and 2009. Implementation of the maternity protocol by the employees was monitored actively by the herd manager on a cowside basis. Employees were instructed to call the herd manager first if the employee needed assistance delivering a calf so that the manager could observe and help the employee. The manager observed cows during the first 10 days postpartum for vaginal tearing and inflammation, and would talk to the employee who delivered the calf if a cow was found to have vaginal tearing or veterinary diagnosed IPI. The herd manager trained new employees on the maternity pen protocol.

The farm's postpartum protocol (FPP) called for cows with a temperature of greater than 103.5°F (39.7°C) for two days in a row during the first 10 days postpartum to receive a single subcutaneous dose of 4 g of ceftiofur crystalline free acid[b] (CCFA) at the base of the ear.[6] Only postpartum sick cows (including some cows that received CCFA according to the FPP) with anorexia, low milk production, abnormal vulvar discharge or persistent high rectal temperature were examined by the herd veterinarian on either Tuesday or Friday of each week. Low milk production was defined as only a modest rise in milk production of less than 2 lb (0.9 kg) per day during the first 20 days-in-milk or a drop of 10 lb (4.5 kg) in daily milk production. A primary diagnosis of metritis by the veterinarian was made based on abnormal findings, such as a foul vulvar discharge, enlarged uterus or swelling in the pelvic area. A secondary diagnosis of puerperal metritis was made based on abnormal findings of a large gas or fluid-distended uterus with a flaccid uterine wall which was located within the abdomen, and a copious amount of foul watery, discolored vulvar discharge or severe IPI. All cows diagnosed with puerperal metritis were prescribed penicillin[c] (15 million units, IM, SID for 7 days).

The following outcome variables were defined based on whether or not a sick cow was presented to the herd veterinarian for a physical examination and received a primary diagnosis of metritis (which included all cows that had a secondary diagnosis of puerperal metritis), or just cows that had secondary diagnosis of puerperal metritis:

Table 1. Calving outcome variables in 2008 and 2009 for primiparous cows.

	2008			2009			
	MET[a]	NMET[b]	%MET[g]	MET[a]	NMET[b]	%MET[g]	*P**
	56	226	19.9	29	168	14.7	0.15
	PMET[c]	NP[d]	%PMET[h]	PMET[c]	NP[d]	%PMET[h]	*P**
All	37	245	13.1	13	184	6.6	0.02
Bulls	26	126	17.1	5	63	7.4	0.05
Heifers	11	119	8.5	8	121	6.2	0.49
	SB[e]	Alive[f]	%SB[i]	SB[e]	Alive[f]	%SB[i]	*P**
All	41	245	14.3	25	174	12.6	0.58
Bulls	22	132	14.3	9	61	12.9	0.77
Heifers	19	113	14.4	16	113	12.4	0.63

[a]MET – a sick cow diagnosed by a veterinarian with metritis
[b]NMET – a cow not diagnosed by a veterinarian with metritis or culled in the first 1-10 days-in-milk
[c]PMET – a sick cow diagnosed by a veterinarian with puerperal metritis and prescribed penicillin
[d]NP – a cow not diagnosed by a veterinarian with puerperal metritis and prescribed penicillin or culled in the first 1-10 days-in-milk
[e]SB – stillborn calves
[f]Alive – calves born alive
[g]%MET = MET/(MET+NMET)
[h]% PMET = PMET/(PMET+NP)
[i]%SB = stillborn/(stillborn+alive)
*P** value – based on chi-square

Table 2. Calving outcome variables in 2008 and 2009 for multiparous cows.

	2008			2009			
	METa	NMETb	%METg	METa	NMETb	%METg	P*
	47	442	9.6	56	475	10.5	0.62
	PMETc	NPd	%PMETh	PMETc	NPd	%PMETh	P*
All	30	459	6.1	33	498	6.2	0.96
	SBe	Alivef	%SBi	SBe	Alivef	%SBi	P*
All	20	495	3.9	19	553	3.3	0.62
Bulls	13	258	4.8	11	288	3.7	0.51
Heifers	7	237	2.9	8	265	2.9	0.97

[a]MET – a sick cow diagnosed by a veterinarian with metritis
[b]NMET – a cow not diagnosed by a veterinarian with metritis or culled in the first 1-10 days-in-milk
[c]PMET – a sick cow diagnosed by a veterinarian with puerperal metritis and prescribed penicillin
[d]NP – a cow not diagnosed by a veterinarian with puerperal metritis and prescribed penicillin or culled in the first 1-10 days-in-milk
[e]SB – stillborn calves
[f]Alive – calves born alive
[g]%MET = MET/(MET+NMET)
[h]% PMET = PMET/(PMET+NP)
[i]%SB = stillborn/(stillborn+alive)
*P** value – based on chi-square

MET – a sick cow diagnosed by a veterinarian with metritis

NMET – a cow not diagnosed by a veterinarian with metritis or culled in the first 1-10 days-in-milk

PMET – a sick cow diagnosed by a veterinarian with puerperal metritis and prescribed penicillin[c]

NP – a cow not diagnosed by a veterinarian with puerperal metritis and prescribed penicillin[c] or culled in the first 1-10 DIM.

Stillborn calves – stillborn calves were calves that were either born dead or died shortly after birth prior to being entered in the farm's Dairy Comp 305[d] records on a daily basis (up to 24 hours) by the manager.

Proportions were calculated as follows:

%MET=(MET/MET+NMET)

%PMET=(PMET/PMET+NP)

% stillborn calves=(stillborn/stillborn+alive)

Calving ease scores from 2008 (January 06, 2008 through December 31, 2008) before training and maternity pen protocol revision were compared to post-training outcomes in 2009 (January 06, 2009 through December 31, 2009) after training and maternity pen protocol revision. This data set included all cows where calving ease scores had been assigned that had either calved or aborted (started a new lactation) in 2008 and 2009, but excluded cows having twins. T-test[e] (two tailed with equal variance) analysis was used to compare average calving ease scores. Average calving ease scores were compared between 2008 and 2009 in primiparous cows (Table 3) and multiparous cows (Table 4) and sorted by whether they had bull or heifer calves. Average calving ease scores were compared within 2008 and 2009 for primiparous cows (Table 5) and multiparous cows (Table 6) delivering either bull or heifer calves or having received or not received systemic penicillin[c] for puerperal metritis. The percentage of primiparous and multiparous cows requiring assistance delivering either heifer or bull calves were compared between 2008 and 2009 (Table 7) and within 2008 and 2009 (Table 8) using chi-square statistic.

The following calving ease scores were defined:

1 – calving event that required no assistance
2 – calving event that required one person to assist
3 – calving event that required two or more people to assist
4 – calving event when the fetal extractor was used
5 – calving event when surgery or a fetotomy was done by the veterinarian

All health events were recorded in the cow's Dairy Comp 305[d] record. Daily milk production was obtained from Dairy Comp 305[d] records. Farm records were updated on a daily basis (24 hour period) by the herd manager.

Results

After implementation of the new maternity protocol, the herd veterinarian reported the number of new primiparous cows presenting with IPI immediately

Table 3. Comparison between 2008 and 2009 of average calving ease scores[a] in primiparous cows.

	2008		2009		
	Number	Calving ease	Number	Calving ease	*P**
Bulls	155	2.17	71	1.73	*P*<0.01
Heifers	138	1.84	130	1.60	*P*=0.02
All	293	2.02	201	1.65	*P*<0.0001

[a]Calving ease scores: 1 – calving event that required no assistance; 2 – calving event that required one person to assist; 3 – calving event that required two or more people to assist; 4 – calving event when the fetal extractor was used; 5 – calving event when surgery or a fetotomy was done by the veterinarian
*P** value – based on T-test

Table 4. Comparison between 2008 and 2009 of average calving ease scores[a] in multiparous cows.

	2008		2009		
	Number	Calving ease	Number	Calving ease	*P**
Bulls	240	1.42	266	1.34	*P*=0.22
Heifers	212	1.37	244	1.16	*P*<0.0001
All	500	1.42	559	1.27	*P*<0.001

[a]Calving ease scores: 1 – calving event that required no assistance; 2 – calving event that required one person to assist; 3 – calving event that required two or more people to assist; 4 – calving event when the fetal extractor was used; 5 – calving event when surgery or a fetotomy was done by the veterinarian
*P** value – based on T-test

decreased. Follow-up discussions with employees confirmed that particularly in primiparous cows, waiting until stage 2 to deliver calves was helpful and they were assisting less.

Primiparous Cows

Outcome variables from 282 calvings in 2008 were compared to outcomes of 197 calvings in 2009 in primiparous cows (Table 1). Four primiparous cows in 2008 and two primiparous cows in 2009 were culled in the first 10 days without a diagnosis of MET or PMET, and were excluded from the data set. No difference was found in the proportion of primiparous cows with MET in 2008 compared to 2009 (19.9% versus 14.7%). More primiparous cows were PMET in 2008 compared to 2009 (13.1% versus 6.6%), and fewer primiparous cows that had bull calves were PMET in 2009 versus 2008 (7.4% versus 17.1%). The proportion of stillborn calves in 2008 was no different compared to 2009.

In 2008, primiparous cows delivering heifer calves had significantly lower average calving ease scores than those delivering bull calves (1.86 versus 2.17; Table 5), although there was not a significant difference in assistance (calving ease score > 1) required by primiparous cows delivering heifer calves compared to bull calves (64% versus 74%; Table 8). In 2008, primiparous PMET cows had significantly higher average calving ease scores than NP cows (2.46 versus 1.96; Table 5). In 2009, there was no difference in average calving ease scores in primiparous cows delivering either heifer or bull calves (Table 5). There was not a significant difference in assistance (calving ease score > 1) required by primiparous cows delivering heifer calves compared to bull calves (43% versus 48%; Table 8). In 2009, there was no difference in average calving ease scores in primiparous PMET and NP cows (Table 5). Primiparous

Table 5. Comparison of average calving scores[a] within 2008 and 2009 for primiparous cows having either heifer or bull calves or PMET or NP.

Year	Group/number	Calving ease	Group/number	Calving ease	*P**
2008	Heifers (138)	1.86	Bulls (155)	2.17	*P*<0.01
2009	Heifers (130)	1.60	Bulls (71)	1.73	*P*=0.33
2008	PMET[b] (37)	2.46	NP[c] (256)	1.96	*P*<0.01
2009	PMET[b] (13)	1.69	NP[c] (188)	1.65	*P*=0.86

[a]Calving ease scores: 1 – calving event that required no assistance; 2 – calving event that required one person to assist; 3 – calving event that required two or more people to assist; 4 – calving event when the fetal extractor was used; 5 – calving event when surgery or a fetotomy was done by the veterinarian
[b]PMET – a sick cow diagnosed by a veterinarian with puerperal metritis and prescribed penicillin
[c]NP – a cow not diagnosed by a veterinarian with puerperal metritis and prescribed penicillin or culled in the first 1-10 days-in-milk
*P** value – based on T-test

Table 6. Comparison of average calving scores[a] within 2008 and 2009 for multiparous cows having either heifer or bull calves or PMET or NP.

Year	Group/number	Calving ease	Group/number	Calving ease	*P**
2008	Heifers (212)	1.37	Bulls (240)	1.42	*P*=0.49
2009	Heifers (244)	1.16	Bulls (266)	1.34	*P*<0.001
2008	PMET[b] (30)	1.73	NP[c] (470)	1.40	*P*=0.02
2009	PMET[b] (32)	1.66	NP[c] (527)	1.25	*P*=<0.001

[a]Calving ease scores: 1 – calving event that required no assistance; 2 – calving event that required one person to assist; 3 – calving event that required two or more people to assist; 4 – calving event when the fetal extractor was used; 5 – calving event when surgery or a fetotomy was done by the veterinarian

[b]PMET – a sick cow diagnosed by a veterinarian with puerperal metritis and prescribed penicillin

[c]NP – a cow not diagnosed by a veterinarian with puerperal metritis and prescribed penicillin or culled in the first 1-10 days-in-milk

*P** value – based on T-test

Table 7. Comparison between 2008 and 2009 percent of primiparous or multiparous cows requiring assistance during delivery.

	2008	2009	
Primiparous			
Bulls	74%	48%	*P*=0.005
Heifers	64%	43%	*P*=0.0002
All	69%	44%	*P*<0.0001
Multiparous			
Bulls	30%	24%	*P*=0.09
Heifers	26%	13%	*P*=0.003
All	29%	20%	*P*=0.003

*P** value – based on chi-square

Table 8. Comparison within 2008 and 2009 of percent of primiparous or multiparous cows requiring assistance during delivery.

Year	Primiparous				
2008	Heifers	64%	Bulls	74%	*P*=0.08
2009	Heifers	43%	Bulls	48%	*P*=0.56
	Multiparous				
2008	Heifers	26%	Bulls	30%	*P*=0.39
2009	Heifers	13%	Bulls	24%	*P*=0.003

*P** value – based on chi-square

cows had significantly lower average calving ease scores in 2009 compared to 2008 for both delivered heifer (1.60 versus 1.84) and bull calves (1.73 versus 2.17; Table 3). Primiparous cows required significantly less assistance (calving ease scores >1) in 2009 compared to 2008 for both delivered heifer (43% versus 64%) and bull calves (48% versus 74%; Table 7). Overall, there was a significant decrease in the number of primiparous cows having either heifer or bull calves requiring assistance in 2009 compared to 2008 (44% versus 69%; Table 7).

Multiparous Cows

Outcome variables from 489 multiparous calvings in 2008 were compared to 531 calvings in 2009 in multiparous cows (Table 2). Six multiparous cows in 2008 and 19 multiparous cows in 2009 culled within the first 10 days were excluded from the data set. There were no differences in the proportions of multiparous cows with MET, PMET, or stillborn calves in 2008 compared to 2009.

In 2008, there was no difference in average calving ease scores for multiparous cows delivering either heifer or bull calves (Table 6), and there was no difference in assistance required (calving ease score >1) in multiparous cows delivering either heifer or bull calves (26% versus 30%; Table 8). In 2008, multiparous PMET cows had significantly higher calving ease scores than NP cows (1.73 versus 1.4; Table 6). In 2009, multiparous cows delivering heifer calves had significantly lower average calving ease scores than those delivering bull calves (1.16 versus 1.34; Table 6), and significantly fewer multiparous cows required assistance (calving ease >1) delivering heifer calves compared to bull calves (13% versus 24%; Table 8). In 2009, multiparous PMET cows had significantly higher average calving ease scores than NP cows (1.66 versus 1.25; Table 6). Multiparous cows had significantly lower calving ease scores in 2009 compared to 2008 for

delivered heifer calves (1.16 versus 1.37), but not bull calves (1.34 versus 1.42; Table 4). In 2009 compared to 2008, significantly fewer multiparous cows required assistance (calving ease >1) delivering heifer calves (13% versus 26%), but there was no significant difference in assistance required by multiparous cows delivering bull calves (24% versus 30%; Table 7). Overall, the number of multiparous cows having either heifer or bull calves requiring assistance in 2009 decreased significantly compared to 2008 (20% versus 29%; Table 7).

Discussion

Dairy farms have different strategies to handle cow prepartum movement to the maternity pen.[8] Commonly, prepartum cows are housed in either free stalls or on a bedded pack, and are moved to the maternity pen one to two days prior to parturition or allowed to calve on the bedded pack. An alternative strategy used on some large dairy farms is to move cows directly to the maternity pen from the close-up dry cow group when parturition is imminent. The disadvantages of this system are that more careful and frequent monitoring is required of the close-up dry cows to detect the onset of labor, and calves have a greater chance of being born in a dirty environment in the free stalls compared to the cleaner maternity pen.

Previous reports have suggested that if cows are moved to the maternity pen at the onset of labor, they should be moved in stage 2 labor instead of early labor, but this strategy has not been evaluated in a commercial setting.[8] The current study compared outcomes in 2008 from one large dairy that moved cows in early labor (stage 1) to the maternity pen, to outcomes in 2009 when cows were moved in stage 2 labor after employees received obstetrics training and specific guidelines to follow regarding when cows should be moved to the maternity pen.

The variables MET and PMET were outcomes selected to describe the severity of uterine infection in cows by management protocols already in place on the farm in 2008. Cows with mild to moderate uterine infections would have been detected by the farm protocol previously in place, as routine systemic treatment of cows with CCFA based on fever of greater than 103.5°F (39.7°C) has been shown to decrease the incidence of metritis diagnosed.[10] Cows presented to the veterinarian and subsequently coded with MET requiring PMET were cows with more serious uterine infection. The reported frequency of metritis in the literature ranges from 2.2% to 37.3%, with a median of 10%.[5] In our study, with routine postparturient monitoring and treatment already in place, the frequency of MET after employee training and maternity protocol modification in 2009 was 10.5% in multiparous cows and 14.7% in primiparous cows. In a study of one large dairy in northeast Florida with 1,000 cows where all cows were monitored from three to 13 days for puerperal metritis, the overall incidence of puerperal metritis was 21.0%.[1] The criterion used for the diagnosis of puerperal metritis in that study was the presence of a watery, brown, fetid discharge from the vulva noted after palpation per rectum of the uterus in either cows with a rectal temperature ≥102.9°F (39.4°C) or in cows that appeared sick during the first three to 13 days postpartum. In our study with routine postparturient monitoring and treatment already in place, the frequency of puerperal metritis as described by the outcome variable PMET was 6.6% in primiparous and 6.2% in multiparous cows in 2009 after employee training and maternity protocol modification. Our results tend to suggest less risk of subsequent diagnosis of severe metritis in cows on a routine postpartum monitoring and systemic treatment program.

Although diverse factors influence the frequency of stillbirths, the outcome variable of "proportion stillborn calves" was compared since dystocia has been reported as the cause of approximately half of stillbirths.[9]

There were no differences in the outcome variables MET, PMET, and stillborn calves examined for multiparous cows in 2008 and 2009. These data would suggest that, at least in multiparous cows, cows could be moved to the maternity pen in either stage 1 or stage 2 labor. However, PMET cows had higher average calving ease scores compared to NP in both 2008 and 2009, suggesting that PMET was an outcome of a more difficult calving on this farm. The proportion of stillborn calves of 3.9% in 2008 and 3.3% in 2009 in this study is lower than the range of 5 to 6.6% stillbirths reported by Meyer *et al*[9] in multiparous cows from 1985 to 1996, suggesting that it was not detrimental to calf survival to move multiparous cows just prior to parturition in stage 1 or 2 at this farm. Although average calving ease scores were lower and less assistance was required for multiparous cows having heifer calves in 2009 compared to 2008, there was no difference in the number of heifers born alive. After training and modification of the maternity pen protocol for 2009, 20% of multiparous cows required assistance compared to 29.4% reported by Lombard *et al*.[7]

More primiparous cows had severe uterine infection requiring PMET in 2008 compared to 2009, and the effect was only in primiparous cows that gave birth to bull calves. In 2008, 17.1% of primiparous cows having bull calves received PMET compared to 7.4% in 2009. As in the case of multiparous cows in 2008 and 2009, primiparous PMET cows in 2008 had significantly higher average calving ease scores than NP. In contrast to 2008, there was no difference in average calving ease scores in primiparous cows having either heifer or bull calves in 2009, suggesting that the decrease in PMET in primiparous cows having bull calves in 2009 was due to

less difficulty encountered in delivering bull calves from primiparous cows moved to the calving pen in stage 2 labor. Unfortunately, calf weights were not recorded on this farm, but presumably this effect was due to heavier bull calves compared to heifer calves, as bull calves tend to weigh 4.6 lb (2.1 kg) more than heifer calves[12] and calf birth weight is a predictor of calving difficulty.[4] After training and modification of the maternity pen protocol, 44% of primiparous cows calving in 2009 required assistance compared to 51.2% reported by Lombard *et al.*[7] The proportion of stillborn calves in primiparous cows was 14.3% in 2008, which was not different from the 12.6% in 2009 and similar to 13.2% stillbirths reported by Meyer *et al*[9] in primiparous cows from 1985 to 1996. In our study, primiparous cows had fewer bull calves born in 2009 compared to 2008 because of the use of sexed semen, which began in late 2008. However, the mean incidence of stillbirths for sexed semen is comparable to conventional semen among Holstein heifers delivering female calves.[3] A significant association of the sex of the calf with stillbirths in primiparous cows was not seen in this herd, but has been reported previously. Meyer *et al*[9] found bull calves were more likely to be stillborn compared to female calves in primiparous cows, and Lombard *et al*[7] reported that bull calves were more likely to be stillborn regardless of parity. Thompson *et al* reported that large calves had greater mortality at first parity, and small calves had a greater mortality at parities greater than one.[13]

Results from this study suggest that moving primiparous cows just prior to parturition (either stage 1 or 2) to a maternity pen did not have a detrimental effect on the proportion of stillborn calves. However, moving primiparous cows to the maternity pen in stage 2 compared to stage 1 labor resulted in lower average calving ease scores for primiparous cows delivering either heifer or bull calves, and less severe uterine infection in primiparous cows giving birth to bull calves in this herd.

An objective assessment of a dairy worker training program should be done. In our experience, an improvement in an outcome variable that employees can see after training and implementation of a new protocol works best. Discussion of results with both employees and managers after training helps fine-tune protocols. For example, implementation of protocols that decrease cases of mastitis or calf diarrheas or death are easily observed by the employees. Employees will agree that having to do fewer treatments on sick animals is a positive outcome for both them and the animals. Admittedly, this study was not a controlled research study, as it did not include both a treatment and control group. This study used the incidence of vaginal swelling, IPI, and puerperal metritis in primiparous cows as a monitor of employee compliance with the protocol. The variable PMET was used as an outcome variable because the owner wanted to decrease the number of cows treated with penicillin for uterine disease. Employees were told that adherence to the new calving protocols would make their job easier because delivering calves would be easier for them, and cows would also be healthier. Follow-up discussions with employees confirmed that, particularly in primiparous cows, waiting until stage 2 to deliver calves was helpful and they spent less time assisting cows. Although the major change to the maternity protocol at this farm was to move cows to the maternity pen in second stage labor instead of first stage labor, employees were provided with a review of obstetrics principles and given a clear protocol to follow as to when to examine and assist a cow. The improvements in 2009 results compared to 2008 could be due to a combination of training and the revised maternity protocol. No interventions were made to change any of the treatment protocols in 2008 and 2009, so the outcome variables MET, PMET, and stillborn calves were measured the same way each year.

This study demonstrated that the veterinarian is ideally suited to provide employee training. They have knowledge of both medical procedures and specific health problems on the farm, enabling them to provide farm-specific training. In this case, the veterinarian identified that many primiparous cows had IPI and puerperal metritis postpartum, requiring treatment with systemic penicillin. A farm-specific training program was developed that addressed both obstetrics training and the farm protocol for moving cows to the maternity pen, which resulted in fewer primiparous cows with severe uterine infection. This study supports the notion that obstetrics training programs should address all the following: movement of cows to the maternity pen, the three stages of labor, common dystocia presentations, when and how to provide assistance to the cow, and when to seek professional intervention.

As dairy farms have increased in size, the prevailing trend has been for farm employees to deliver health care to the cows. We prefer to provide both hands-on training and classroom training to the managers and the employees. Our obstetrics training has evolved to include an on-farm practical laboratory using, in most instances, an anesthetized newborn heifer calf. We simulate the major dystocias and ensure the employees use correct hand movements to correct the dystocia.

Some provision for turnover of employees and potential language barriers needs to be addressed in training programs. Language barriers are best addressed by either having bilingual managers and veterinarians, or providing a translator for the manager and veterinarian. In most instances the herd manager does the initial training of new employees, and we schedule a training program for new employees on an as-needed basis a few times a year. In our experience, dairy employees involved

in managing dairy cows at calving benefit from obstetrics training programs delivered by farm veterinarians with knowledge of the procedures, protocols, and outcomes on the farm. Having well-trained farm employees managing dairy cows at calving time will improve postpartum dairy cow health and welfare.

Conclusion

This case report illustrates how a veterinary farm-specific training program aimed at teaching employees how to properly manage cows at parturition improved cow health on this 700-cow Holstein dairy farm. Employees from this dairy farm received obstetrical training, and the calving protocol was changed to move cows from the close-up dry cow group to the maternity pen during the second stage of labor instead of the first stage of labor. Average calving ease scores and the outcome variables of proportion of cows with veterinary diagnosed metritis, veterinary prescribed penicillin for metritis, and stillborn calves in 2009 were compared to the herd records in 2008. Average calving ease scores were lower for multiparous cows having heifer calves, less heifer calves delivered required assistance, and there were no differences in the other outcome variables, suggesting that multiparous cows could be moved to the maternity pen in either stage 1 or stage 2 labor. In primiparous cows in 2009 compared to 2008, there was a significant decrease in the proportion of cows delivering bull calves that received veterinary prescribed penicillin treatment for puerperal metritis, average calving ease scores, and percent of either heifer or bull calves delivered requiring assistance in 2009, suggesting an advantage to waiting until stage 2 labor to move primiparous cows to the maternity pen. Overall, moving cows directly to the maternity pen in stage 2 labor from the close-up pen was an acceptable cow movement strategy on this dairy.

Endnotes

[a]Statistix Analytical Software, version 3.5, Tallahassee, FL

[b]Excede®, Pfizer, NY, NY

[c]Pen-aqueous®, AgriPharm Dealer Distribution of America, Memphis, TN

[d]Dairy Comp 305, Valley Agricultural Software, Tulare, CA

[e]Excel software, Microsoft Office 2003, Redman, WA

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