DAIRY VETERINARY NEWSLETTER

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Updates from the NMC Meeting – New Information Regarding Three Management Practices

The recent NMC (formerly National Mastitis Council) meeting included 3 presentations that addressed some important practical questions regarding mastitis control and calf milk quality practices. A summary of each can be found in the Proceedings of the 2013 NMC Annual Meeting (beginning page numbers shown below):

Comparison of Three Dry Cow Treatment Products for Intramammary Infection Cures and New Cases

Arruda et al. (pg. 105) studied 4364 quarters of 1091 cows in 6 dairy herds in California, Wisconsin, Minnesota and Iowa. Cows were randomly assigned at dry off to be treated with either Quartermaster (QM) (penicillin G and dihydrostreptomycin), Spectramast (SM) (ceftiofur hydrochloride), or Tomorrow (TM) (cephapirin benzathine). Aseptic quarter milk samples were collected pre-dry off, 0-6 DIM [sic], and 7-13 DIM for culture using NMC laboratory methods. Clinical mastitis cases were "recorded by herd staff".

Logistic regression (outcomes were presence of intramammary infection [IMI] at dry off, cure of IMI that had been present at dry off, new IMI during first 13 DIM next lactation) and Cox's proportional hazards regression (outcome clinical mastitis during first 100 DIM) were used as statistical analytical methods.

Variables studied included dry cow treatment (DCT), herd, region (not defined, probably Midwest and West unless each state was a region?), lactation number (whether 1, 2, 3rd-plus or some other definition not shown), previous lactation Linear Score of SCC, previous lactation total milk production, dry period length, teat end score and udder hygiene score (both not defined) at dry off and post-calving. Because of time and space limitations, whether any of the above variables were significant was not presented, other than the choice of DCT. For example, lactation number and previous lactation LS might be significantly associated with cure rates and possibly other mastitis outcomes. However, what is important is that if they were, they would have been adjusted for with these statistical methods, so that the association of for example cure of IMI with choice of DCT would account for the effects of the other significant variables. Some results are shown in Table 1:

Table 1. Modified, and data from, Arruda et al., NMC 2013 Proceedings pg. 106, Comparison of quarter level outcomes among three dry cow therapy products.

	Quartermaster	Spectramast	Tomorrow	P-value
IMI present 0-6 DIM	15.4%	13.4%	15.3%	0.34
IMI present 7-13 DIM	15.4%	15.0%	13.7%	0.37
Cure of IMI present at dry off	**88.9%**	**88.0%**	**89.7%**	**0.79**
New IMI 0-6 DIM	14.1%	11.9%	13.8%	0.27
New IMI 7-13 DIM	14.2%	13.5%	12.6%	0.60

It can be seen that IMI in early lactation, whether defined as new or presumably persisting through the dry period (probably based on the pre-dry off and post-calving culture results which were not presented due to time and space considerations), and the cure of IMI that were present at dry off did not differ among the three DCT groups.

There was also a survival distribution function graph from the Cox's proportional hazards regression, showing when and how many quarters were detected with clinical mastitis during the first 100 DIM of the next lactation. The percentage of *quarters* that contracted clinical mastitis (low if you are used to looking at cow data; rate of IMI is always lower for quarters than cows) was QM 5.3%, SM 3.8%, TM 4.1%, and the graph showing time until clinical mastitis was not significantly different among DCT, P = 0.27. I would not, and do not recall other studies doing this either, attribute clinical mastitis as far as 100 DIM to the effect of DCT, but nevertheless it was not significant. It would be interesting to see the data for, as an example, clinical mastitis during the first 14 DIM compared among the DCT.

One thing that I find interesting about this study is that there was no apparent evaluation of the culture results just before dry off. Presumably the breakdown of pathogens isolated was not different among cows in the three treatment groups, or will be evaluated in the future, but they were not mentioned including in the models for this study. One of the models above was stated to evaluate presence of (*any and all*) IMI at dryoff to see if that differed among the cows selected for each DCT, but whether that differed was not reported. Presumably it did not.

Overall I think this was a good study, and considering the important data that was presented, presence of IMI and bacteriological cure of IMI that were present at dry off, the authors' conclusion that "there was no difference in efficacy among the three DCT products evaluated" appears valid.

Is There an Ideal Time Range for Culturing Milk of Cows Post-calving for Best Mastitis Detection?

Azizoglu et al. (pg. 119) studied 160 quarters of 42 Holstein cows during the first 28 days after calving. None of the cows were treated for mastitis during that time. "The objective was to assess the best time of sampling to monitor early lactation infections."

Duplicate aseptic quarter milk samples were cultured using NMC laboratory methods, at 2, 4, 14 and 28 DIM. In order to be defined as an IMI, both samples had to be positive for the same pathogen. Two pathogens (coagulase-negative staphylococci and *Bacillus* spp. other than *B. cereus*) were defined as minor pathogens and had to be detected with at least 100 CFU/ml; all other pathogens were defined as IMI if found at any level in both samples.

The authors state that samples at 2 and 4 DIM "- - were grouped and designated as 'early'. A quarter sample [was] - - infected if it showed a positive culture result either on day 2 or 4." It is not clear whether one sample at 2 DIM and one sample at 4 DIM positive for the same pathogen counted as an IMI. I suspect that either both 2 DIM, or both 4 DIM samples had to be positive for the same pathogen in order to be infected "early".

There were 38/160 quarters (24%) detected with IMI at least once; 33/38 quarters (87%) were infected at the "early" samplings at 2 or 4 DIM but the other 5 were only infected later and were not discussed further. The analysis focused on the 33 quarters infected at either 2 or 4 DIM to see what happened to those IMI over time. Results are shown in Table 1:

Table 1. *Modified from figure* in Azizoglu et al., NMC 2013 Proceedings pg. 120

2 or 4 DIM	14 DIM	28 DIM
127 Uninfected (quarters)	N/A	N/A
33 IMI	**13 Self Cured (40%)**	N/A
	20 Still IMI (60%)	3 Self Cured (15%)
		17 Still IMI (85%)

The 38 infected quarters had 20 minor pathogens, 18 major pathogens. No further identification of bacteria isolated was presented. Of the 17 quarters remaining infected until 28 DIM (9 minor, 8 major), 16 (94%) had the same pathogen each time, and none showed any signs of clinical mastitis. Whether any of the 16 quarters that self cured (13 by 14 DIM, 3 more between 15 and 27 DIM) ever had clinical mastitis was not shown.

It has often been observed that IMI in early lactation have a high spontaneous cure rate, being eliminated without treatment. The authors stated, "One possible explanation for higher - - self-curing of a quarter in the first weeks of lactation could be [the] composition of colostrum following parturition - - rich in nutrients, antibodies, immune cells and growth factors as well as antimicrobial components - - ".

The authors continue, "The study suggests that intervention decisions based on culture of samples collected before [5 DIM] may result in some error in management due to the apparent self-cures. - - the optimal time for assessing infection with limited error is likely to be between days 5 and 14 post-calving."

When I look at this data I see a need for further study; I imagine the authors do also. The authors are pointing out something important, that if milk is collected very shortly after calving (post-colostral, usually 2 DIM or so) and then cultured for mastitis pathogens, a substantial proportion of the IMI detected will likely be eliminated without treatment. It is a common recommendation to culture fresh cows' milk as soon as it is post-colostral. These results suggest that if the goal is to detect more "real, persistent" IMI possibly needing treatment decisions and especially dry cow, calving and fresh cow management modifications, it is probably better to culture cows a few days later than 2 to 4 DIM. However, most of the self-cures had occurred by 14 DIM, few happened between then and 28 DIM. If one actually waits until 7, 10 or 14 DIM to culture fresh cows' milk, a substantial proportion of the IMI found in many herds are new infections. If the goal is to intervene in early lactation IMI and also to evaluate dry or fresh cow management as described above, it may be more ideal to culture milk from cows at approximately 7 DIM. There was no sampling in this study between 5 and 14 DIM; it would be very interesting to see what the results in terms of self-cures would have been at 7 DIM. This was a useful study regarding fresh cow culture timing, raising new questions.

UV Light Treatment of Waste Milk for Calves

Crook et al. (pg. 129) presented information regarding something fairly new, ultraviolet (UV) light for waste milk treatment. Some other studies citing economic and calf health benefits of pasteurized waste milk were referenced. The presentation described UV treatment, including the SurePure SP4 system, manufactured in South Africa. The system has four UV-C turbulator chambers (they make milk flow turbulently, attempting to expose all of the opaque liquid to light), each containing one germicidal mercury UV lamp at 254 nm wavelength. Technical specifications and manufacturer contact information were provided. Milk is passed over the four lamps multiple times. Energy costs were described as "substantially less" for UV than pasteurization.

Waste milk was studied from 6 California dairies with "different native bacterial populations", not described further in the presentation because of time and space limitations. Pasteurization at 63° C (145° F) for 30 min in a commercial batch pasteurizer was compared with UV treatment, described as mentioned above, taking approximately 3 min for each batch of milk. Unfortunately, the number of batches of milk, batches per farm, and any description of the bacterial populations were not shown. The authors apparently knew the history of bacteria types isolated from the farms as indicated earlier; however, studies of bacterial reduction in calf milk and on-farm monitoring of bacteria counts often include no speciation of bacteria. This is a reasonable representation of the inference population, the way bacteria counts are used to monitor calf milk (or other milk) quality on farms.

Before and after either UV treatment or pasteurization, aerobic plate counts (APC) and total coliform counts (TCC) were determined. Bacteria counts were transformed to $\log_{10}$ of cfu/ml for statistical analysis. Statistical methods were not described; ANOVA may have been used to compare the continuous variable of $\log_{10}$ reduction among the two categories of treatment. Results are shown in Table 1:

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Table 1. Modified, and data from, Crook et al., NMC 2013 Proceedings pg. 130, Pathogen reduction of bacteria in non-saleable waste milk. (APC = aerobic plate count, TCC = total coliform count)

	Average APC	APC Range	Average TCC	TCC Range
Starting $\log_{10}$	5.56	4.05 – 7.81	4.04	1.98 – 6.48
	Mean $\log_{10}$ reduction	Range - $\log_{10}$ reduction	Mean $\log_{10}$ reduction	Range - $\log_{10}$ reduction
UV treated	2.2	0.8 – 3.1	3.0	1.9 – 4.4
Pasteurized	2.4	0.6 – 3.8	4.0	2.0 – 6.5

The log reductions show that approximately 99% (APC) and 99.9 to 99.99% (TCC) of bacteria were eliminated from waste milk by both methods. The authors state that "There was no significant difference in pathogen reduction for UV treatment compared to batch pasteurization. - - Benefits of a UV system include lower energy and water use [and] shorter treatment time - -.". If any of our readers have experience with clients using UV treatment of waste milk for feeding to calves, I would be interested to hear about them. Some of the participants in the above study are also investigating combinations of high temperature short time (HTST) pasteurization and UV light for treatment of waste milk on dairy farms.

Please let us know your comments and also suggestions for future topics. I can be reached at (435) 760-3731 (Cell), (435) 797-1899 M-Tues, (435) 797-7120 W-F or David.Wilson@usu.edu.

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