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Calf Note #151 – Colostrum somatic cells and calf health

Introduction

Colostrum is produced in the udder of the cow during the final stages of gestation. If the cow carries an intramammary infection (i.e., mastitis), there is a real risk that the colostrum may contain high concentrations of somatic cell (a high somatic cell count, or **SCC**) or even contain infective mastitis pathogens. The objective of this Calf Note is to summarize some recent research regarding the effects of mastitis on colostrum and, especially, the calf after consuming colostrum from mastitic cows.

Previous published work

Maunsell et al. (1998) reported that colostrum from cows with persistent or transient mammary infections differed from colostrum from uninfected cows. Table 1 shows several changes in composition (protein, fat, SCC and pH) in colostrum from persistently infected cows (cows were sampled three times – 14 and 7 d

before predicted calving and within 3 hr of calving). A persistent infection was defined as a positive for organisms (>50 cfu/ml) on two of the three samplings. Transient infection was defined as a positive in one of three samplings. Changes in colostrum composition from cows with transient infections was less, suggesting that severity of mastitis may affect the severity of changes in colostrum content.

Ferdowski Nia et al., 2009 evaluated three groups of cows – cows with low SCC in colostrum (average SCC = 960,000 cells per ml), medium (2,138,000) and high SCC (5,051,000). These researchers collected colostrum to determine whether SCC (an indication of mammary infection) and mastitis would affect either colostrum quality or calf health.

	Persistent		Transient	
	Infected	Uninfected	Infected	Uninfected
Volume, L	2.3*	2.6	2.5	2.6
IgG, g/L	79	80	78	78
IgG, g	175*	208	192	199
Protein, %	17.3*	25.5	21.0*	25.2
Protein, g	406*	480	441	459
Fat, %	3.0*	3.9	3.4	4.0
Fat, g	124	140	118	129
SCC, ln cells/ml	15.3*	13.7	14.5*	13.6
pH	6.49*	6.43	6.46	6.42

* $P < 0.05$.

Table 1. Effect of intramammary infections on colostrum quality. From Maunsell et al. (1998).

Before discussing the results of the study, it's valuable to put the SCC in this study into perspective. Unlike normal milk, colostrum usually contains large numbers of immune cells, and SCC (which measures white blood cells in milk) will normally be very high. The researchers (Ferdowski Nia et al.) assume that very high counts were indicative of mastitis in the cows. While there are not a lot of data to support this assumption, we do know that mastitis is generally associated with elevated SCC counts, even in colostrum.

The researchers found some significant changes in colostrum quality with increasing SCC. High SCC colostrum was associated with lower fat and higher pH in the colostrum (Table 2). Also, the serum IgG in cows was higher as SCC counts increased, suggesting the cows with higher SCC were indeed fighting mammary infections. However, there was no difference in concentration of IgG in colostrum or in the total mass of IgG produced (concentration ×

Item	Lower	Medium	Greater	SEM	Linear	Quadratic
Colostrum volume, kg	5.3	5.9	4.7	0.7	0.45	0.34
Density, g/ml	1.07	1.06	1.07	0.03	0.72	0.45
pH	6.28	6.36	6.40	0.03	0.06	0.32
Fat, %	5.9	6.0	4.5	0.5	0.04	0.42
Protein, %	16.2	17.4	17.2	0.7	0.51	0.27
Lactose, %	2.7	2.4	1.9	0.3	0.17	0.74
SNF, %	18.9	20.7	21.3	1	0.23	0.28
Total solids, %	25.4	26	26.1	0.7	0.65	0.64
IgG, mg/ml	73.0	79.8	82.1	8	0.55	0.68
Total IgG mass, g	428.2	443.2	365	43	0.48	0.65
Dam serum IgG at parturition, mg/ml	17.8	22.9	30.1	2.8	0.01	0.63
Calf serum IgG at birth, mg/ml	0.01	0.02	0.01	0.03	0.39	0.29
Calf serum IgG at 3 h, mg/ml	16.2	16.6	11.4	2	0.10	0.43
Calf serum IgG at 42 d, mg/ml	29.3	28.8	25.1	3.6	0.46	0.86

Table 2. Colostrum composition from cows with low, medium and high somatic cell counts in colostrum collected after calving. From: Ferdowski Nia et al., 2009.

volume). In calves, serum IgG concentration at 3 hours of age were lower when fed colostrum from cows with highest SCC (Table 2).

Performance of calves fed colostrum with varying SCC varied markedly (Table 3). Average daily gain from 0 to 30 days and 0 to 60 days declined with increasing amounts of SCC in colostrum. Fecal scores were greater and overall health score was indicative of greater disease when calves consumed high SCC colostrum.

What do these data suggest? Clearly, the data suggest that quality of colostrum goes far beyond simply measuring IgG concentration. Colostrum coming from cows with mastitis (as indicated

by high SCC counts) seems to have a significant effect on the performance of calves. The composition of colostrum changes as well.

Summary

Cows with mastitis will produce colostrum with elevated SCC. This colostrum will vary in composition but more importantly, the health of calves may be affected by the quality of colostrum. It's possible that cows with mastitis may produce colostrum containing pathogens which may cause scours in newborn calves. Not all colostrum appears to be created equal.

Item	Lower	Medium	Greater	SEM	Linear	Quadratic
Birth BW, kg	40.7	41.8	41.5	1.4	0.84	0.64
BW 30 d	46.4	46.3	43.9	1.2	0.17	0.69
BW 60 d	70.1	67.8	65.4	1.9	0.12	0.67
BW gain 0-30 d	5.7	4.9	2.5	0.7	0.01	0.88
BW gain, 30-60 d	23.8	21.1	21.4	1.5	0.44	0.27
BW gain 0-60 d	29.4	26.0	23.9	1.6	0.05	0.35
Fecal score	5.6	6.2	11.2	1.3	0.01	0.45
Health status	5.9	7.3	9.3	1.3	0.11	0.75
Wither height, birth, cm	71.9	73.1	72.8	1.1	0.69	0.48
Wither height, 60 d, cm	81.2	82.2	81.8	0.9	0.79	0.44
Body length, birth, cm	34.2	34.9	35.1	0.8	0.56	0.74
Body length, 60 d, cm	45.2	44.9	43.8	1.0	0.37	0.91

Table 3. Performance of calves fed colostrum from cows with lower, medium and higher somatic cell counts in colostrum. From: Ferdowsi Nia et al., 2009.

References

- Ferdowsi Nia, E., G. R. Ghorbani, H. R. Rahmani, M. Alikhani, M. Mohammad Alipour and A. Nikkhah. 2009. Increased colostrum somatic cell counts reduce pre-weaning calf immunity, health and growth. *J. of Animal Physiology & Animal Nutrition*. 94:628-634.
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