Managing the Pregnant Cow for Optimum Calf Health

March 2013

Bovine Respiratory Disease Complex Series

FAST FACTS

- Survey data suggests that respiratory disease accounts for approximately 29.1% of all calf death losses in the United States
- Protection and prevention of BRD in beef herds is a combination of vaccines, antibiotics, and management practices

The bovine respiratory disease complex (BRD) sometimes called shipping fever and pneumonia is an economically important disease and a leading cause of death loss in beef cattle in North America. Survey data suggests that respiratory disease accounts for approximately 29 percent of all calf death losses in the United States (NAHMS, 2011). Bovine respiratory disease is manifested as a complex of several types of infection with specific causative organisms, clinical signs and the related economic impacts. Organisms reported to be associated with BRD include: infectious bovine rhinotracheitis (IBR), bovine viral diarrhea (BVD), bovine respiratory syncytial virus (BRSV), and parainfluenza type 3 (PI_3). In addition, bacterial agents such as *Mannheimia haemolytica, Pasteurella multocida, Haemophillus somnus* and mycoplasma are contributing factors (Snowder et al., 2006).

Risk Factors for Bovine Respiratory Disease

While many factors contribute to increasing the incidence of BRD in young cattle, the strength of the host's immune system plays an important role (Ackermann et al., 2010). Factors such as immunological background, inadequate immunoglobulin transfer; environmental factors such as climate, weather, temperature, humidity, air and air quality; age, weight, gender; nutritional and management stresses such as shipping, disposition and genetics as well as epidemiological influences all play a role in incidence of BRD (Snowder et al., 2005 and Taylor et al., 2010). Protection and prevention of BRD in beef herds is a combination of vaccines, antibiotics, and management practices (Snowder et al., 2005).

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Beef Cow Nutrition and Health

Feed inputs typically represent the highest costs in cow/calf operations (Neibergs and Nelson, 2008). Managing the cow herd for maximum profitability can be challenging. Utilizing low-cost feeds to reduce feed costs is common practice. However, ensuring that the requirements for energy, protein, and macro and micro-nutrients are being met is crucial to maintain reproductive performance of the cow and produce a healthy calf.

Feeding poor quality hay, pasture or crop residue commonly provides protein levels below recommendations set by the National Research Council (NRC) for pregnant or lactating cattle. In addition, the restriction of protein may decrease feed intake and digestion of the forage due to less efficient digestion by the rumen microbial populations. Reductions in intake and digestibility have the implications of reducing the total amount of feed energy delivered to the cow.

Table 1 contains information about the quality of common forages:

Table 1. Relative quality of selected forages[1]

	Chemical Component[2]				
Forage	**CP**	**NDF**	**TDN**	**ME[3]**	**NE_m[3]**
	---------- % of dry matter ----------			---------- mcal/lb ----------	
Corn stalks	6.5	65.0	65.9	2.38	1.50
Wheat straw	3.5	78.9	41.0	1.48	0.64
Orchardgrass hay (late bloom)	8.4	65.0	54.0	1.95	1.11
Fescue hay (full bloom)	12.9	67.0	58.0	2.10	1.24
Alfalfa hay (early bloom)	19.9	42.0	62.0	2.24	1.38

FAST FACTS

- Reductions in intake and digestibility reduces the total amount of feed energy delivered to the cow.

[1]Adapted from NRC 2000.
[2]CP = crude protein; NDF = neutral detergent fiber; TDN = total digestible nutrients; reported as % of dry matter.
[3]ME = metabolizable energy; NE_m = net energy for maintenance.

Table 2 provides insight into the changing nutrient requirements of beef cows.

Table 2. Nutrient density requirements of beef cows at various stages of production[1,2]

	Months since calving											
Nutrient	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
DM	26.8	27.8	28.4	27.4	26.5	25.7	24.2	24.1	24.0	23.9	24.1	24.6
CP	10.1	10.69	9.92	9.25	8.54	7.92	5.99	6.18	6.50	7.00	7.73	8.78
TDN	58.7	59.9	57.6	56.2	54.7	53.4	44.9	45.8	47.1	49.3	52.3	56.2
ME[3]	0.98	1.00	0.96	0.94	0.91	0.89	0.75	0.76	0.79	0.82	0.87	0.94
NE_m[3]	0.59	0.61	0.57	0.55	0.53	0.51	0.37	0.38	0.41	0.44	0.49	0.55

[1]Adapted from NRC 2000; 1,200 lb mature weight cow, 20 lb peak milk production.
[2]CP = crude protein %; DM = dry matter %; TDN = total digestible nutrients; CP and TDN reported as % of dry matter.
[3]ME = metabolizable energy; NE_m = net energy for maintenance; ME and NE_m expressed as mcal/lb.

FAST FACTS

- Forage testing is a valuable tool to utilize in determination of the chemical composition of feeds and how it relates to the feeding value.

The practical lesson to be learned from Tables 1 and 2 is that knowing the quality of the feed or combinations of feed combined with the nutrient requirements of the average type cow in the herd allows producers to make judgments about whether the nutrient requirements are being met. If the requirements are not being met, then supplementation strategies may be employed.

Forage Testing

Knowing the nutritional composition of the feed is a key factor in determining if the cows' nutrient requirements are being met and being able to correct for nutritional imbalances. In other words producers need to "know what they have" before they can determine "what they need" in terms of supplementation of the base feeds. Forage testing is a valuable tool to utilize in determination of the chemical composition of feeds and how it relates to the feeding value.

Sending representative samples to a laboratory certified by the National Forage Testing Association (NFTA) will assist in ensuring an accurate assessment of the feed is obtained. Information about the benefits of testing, certified labs, and sampling methods and equipment can be found at www.foragetesting.org.

FAST FACTS

- Low-quality forages generally contain less than 7% crude protein.
- Metabolism and other life-sustaining activities in beef cattle rely on adequate amounts of macro and micro-minerals.

Implications of Inadequate Maternal Nutrition on Calf Health In terms of calf health, maternal nutrition is related to calf morbidity and mortality (Corah et al., 1975). Conditions during critical times in fetal development can ultimately affect pre-weaning calf health as well as health and susceptibility to disease during later phases of beef cattle production. It has been suggested that inadequate maternal nutrition can reduce neonatal survival and reduce feed/forage utilization later in life. Inadequate nutrition delivered to the fetus may also permanently affect postnatal growth of the offspring (Wu et al., 2006; Funston et al., 2010).

Protein Nutrition

When producers utilize low-quality forages to reduce production costs, nutritional imbalances may arise. Low-quality forages generally contain less than 7% crude protein (McCollum and Horn, 1990; Moore and Kunkle, 1995). In beef cow nutrition, protein is generally regarded as the first limiting nutrient (Köster, 1995). Therefore, even when all other nutrients are meeting the cows' requirements, maximum performance cannot occur due to the lack of adequate protein in the diet. Providing a protein supplement to beef cows grazing low-quality pastures and crop residues during late pregnancy to meet their nutrient requirements has resulted in a greater proportion of calves weaned indicating a reduction in death loss due to supplementation of the cows (Stalker et al., 2006). In another study it was noted that the proportion of pre-weaned calves treated for respiratory or gastrointestinal disease did not differ for the supplemented versus those that were not supplemented with protein during late pregnancy. However, from weaning to slaughter, the proportion of calves treated for respiratory or gastrointestinal disease was less for cows receiving protein supplement in late gestation (Larson et al., 2009).

Mineral Nutrition

Metabolism and other life-sustaining activities in beef cattle rely on adequate amounts of macro and micro-minerals. These nutrients play important roles in bone formation, as components of hormones and their secretion, enzyme components and activators, water balance, amino acid components, glucose tolerance, components of vitamins and as antioxidants. At least 17 minerals are known to be required by beef cattle (NRC, 2000). The micro-mineral status of cows before calving has been shown to be important for subsequent calf health. These include zinc (Zn), chromium (Cr), selenium (Se), iron (Fe), and manganese (Mn). Sufficient mico-minerals to ensure fetal growth are transferred from the cow to the calf via the placenta. These minerals are involved in colostrum quality as well the amount of immunoglobulins produced (Linn et al., 2011). Studies have uncovered immune related problems in calves deficient in Zn, Cu, Se, and Cr (Galyean et al., 1999). It has not been thoroughly investigated but it is likely that restriction of trace minerals during pregnancy could also be detrimental to the calves' immune systems leading to increased incidence of diseases such as BRD (Funston et al., 2010).

FAST FACTS

- Micromineral status of the cow before calving can affect the health of her calf

Meeting the mineral requirements involves both an accounting of the minerals supplied by the forage and determining if a deficiency exists, then providing mineral supplements to correct for dietary imbalances. Provision of supplemental minerals is a common practice on beef cattle operations. Evaluation of systemic (blood) levels of trace minerals in cattle is an effective method of monitoring herd trace mineral status.

Nutrition and Immune Response

To date very few studies have looked at the effect of restricted protein diets fed to pregnant cows and immune function of the calf. Proteins consist of amino acids that make up the building blocks for enzymes, antibodies and other functional proteins that allow the immune system to function (Maas 2002).

Bovine colostrum (i.e., milk secreted by the mother during the first few days after birth) is part of the innate host defense and is characterized by high concentrations of the immunoglobulin IgG (Stelwagen et al., 2009). Colostrum contains immunoglobulins that are passively transferred to the calf and are important in protection against disease challenge and the lack of this protection at 24 hr after birth can result in increased calf morbidity, and respiratory tract morbidity in the feedlot later in life (Wittum, and Perino, 1995). Calves with inadequate serum immunoglobulins are at greater risk for disease and mortality, and additional costs are incurred due to the requirement for treatment and lower weight gains (Filteau et al. 2003).

Conclusions

The Bovine Respiratory Disease Complex is a multi-factorial disease with both short- and long-term implications for beef cattle operations. A variety of stressors are implicated in its occurrence and management strategies directed toward the predisposing factors of BRD is indicated in its control. Beef cow nutrition not only affects the health and performance of the cow, but has long-term implications for the calf from birth to weaning and later in life. Care must be taken to ensure the nutrient requirements of beef cows are being met. The provision of nutrients to the pregnant cow has been shown to influence calf viability and mortality, immunity, reproduction, performance, and carcass traits.

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