Weak Calf Syndrome in Beef Cattle Herds

Introduction

Weak calf syndrome (WCS) is a herd problem. It typically describes calves that are born alive, but lack normal vigor. As a result, many of these calves die shortly after birth. Often, affected calves cannot stand and nurse by themselves. If they do stand, they are very slow in getting up and often adopt a hunched posture. Herds affected with WCS may also have stillborn calves. With intensive management, some weak calves may survive. It is difficult to correct a WCS problem during the current calving season once it has been identified with the birth of one or more weak calves. In most cases, there are multiple factors contributing to WCS during gestation including sub-optimal dam nutrition, mineral deficiencies, and infectious diseases.

Nutrition

Ultimately, optimal dam nutrition is the best management intervention to prevent WCS. Pre-partum nutrition is essential for preparing the calf for life outside the uterus. Up to 80 percent of fetal growth occurs in the last 60 days of gestation. Therefore the dam needs adequate nutrition to support 1) her own needs, 2) the tremendous growth of the fetus while in utero, and 3) additional nutrients to the calf so that it has enough reserves to be able to stand and nurse after birth.

Potential nutritional deficiencies for the dam could have detrimental effects on fetal growth and calf survival. Producers should have their winter forage evaluated to determine the nutritional quality. This is especially important as low quality forage such as corn stalks, CRP hay, and other products are being utilized in today's production environment. When compared to quality forage, feeding the same amount of poorer quality forage means that cows may not be getting adequate nutrition. The deficiencies could include lack of energy, protein, and vitamins and minerals. Severe cold will increase cow maintenance requirements as they burn calories to keep warm. A good rule of thumb is to manage the feeding program so that cows are at a body condition score (BCS) of 5 (6 for heifers) prior to calving. Heifers are more prone to producing weak calves and their BCS should be carefully monitored and adjusted if needed.

Protein is a critical nutritional component necessary for proper fetal development. Calves born from protein-restricted dams have decreased calf vigor, decreased thermal heat production, and increased time from birth to standing. Early research in Idaho indicates that adequate protein during gestation would decrease the incidence of weak calf syndrome. Late gestation cows need **2 lbs of protein** per day.

Energy is also important for the fetal calf. Fetal brown fat supplies the energy needed for the calf to survive until adequate colostrum and subsequently milk is ingested. Cows need at least 11 Mcal of energy per day normally. However, producers should increase energy intake during

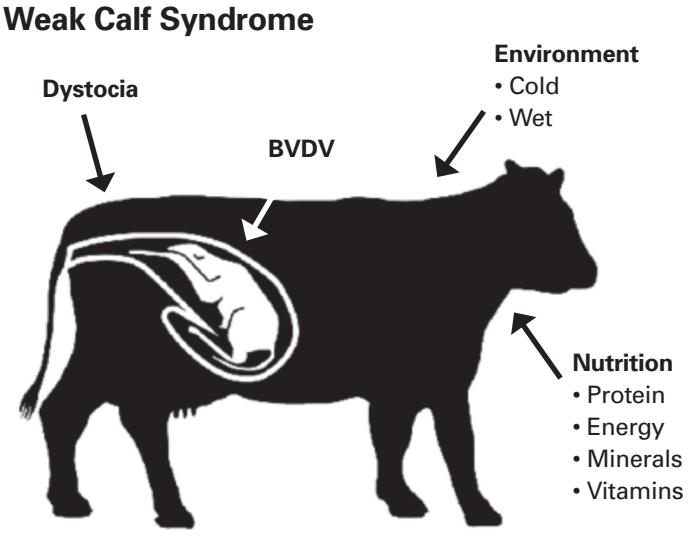

Figure 1. Causes of weak calf syndrome.

PMR 1018 September 2014

IOWA STATE UNIVERSITY
Extension and Outreach

extreme cold weather. Producers need to adapt and feed their cows to fit the environmental conditions. It is important to recognize that although pregnant cows can be roughed through much of the winter, this practice should not include late gestation. Calves born to cows that were losing weight during late gestation will have lower energy stores and longer interval from birth to standing. Additionally, these cows will take longer to breed back.

Micro-minerals

Selenium and iodine deficiencies may also be associated with WCS. Supplemental sources of selenium may be necessary in areas where selenium is deficient. Once supplementation starts, it will take approximately four to six weeks to build adequate selenium levels in the liver of the cow. Weak calves can still be observed from other causes when selenium is adequate and supplemental selenium in these instances is not beneficial. Excessive selenium can be toxic.

Manganese is commonly low in fetal and neo-natal calf livers. Research has indicated that fetal livers do not accumulate manganese and liver levels reflect maternal circulating manganese levels. Low manganese has been associated with skeletal deformities, but what role manganese has, if any, in weak calf syndrome is unknown.

Vitamins

Vitamin A deficiency is associated with weak and stillborn calves. Cows can store up to four months' supply of vitamin A in their livers when intake is plentiful from the carotene in green forage. However, carotene begins to deteriorate in hay soon after harvesting and poor quality or drought-stressed forage has essentially zero carotene. Iowa State University Veterinary Diagnostic Laboratory (ISU-VDL) submission data indicated that almost all weak or stillborn calves in the spring of 2013 had less than 1 ppm of vitamin A in liver tissue (Table 1). Normal levels of vitamin A for fetal calves are 2-4 ppm and neonatal calves after ingesting colostrum should have levels greater than 12 ppm. Third trimester cows that are consuming low quality forage need supplemental vitamin A in their diet or by injection. Cows should intake 30,000 to 45,000 IU per head per day depending on stage of pregnancy or lactation. Vitamin A can also be administered by injection of 1 to 1.5 million IU of a vitamin A product. Weak calves that are born deficient in vitamin A will benefit from an injection of 500,000 IU of supplemental vitamin A at birth.

Vitamin E levels can also be low in weak calves, especially if cows were consuming low quality forage. Vitamin E is only plentiful in green forage and is not stored in the liver as long as vitamin A. Adequate vitamin E is essential for muscle function and vitamin E deficiency has been associated with white muscle disease. What role vitamin E has in weak calf syndrome has not been determined. ISU-VDL data also indicated that weak calves in 2013 had very low levels of vitamin E (Table 1).

Infectious causes of WCS include bovine viral diarrhea virus (BVDV) and leptospirosis. BVDV is capable of causing multiple congenital problems in calves. The particular problem seen in calves will depend on the stage of gestation the cow was in at the time of infection. Calves infected in-utero may show signs of hydrocephalous, immaturity," dummies", or generalized weakness. Calves

Table 1. Weak calf syndrome liver levels (ppm) of selected vitamins and micro-minerals in 2013†

	Vitamin A*	Vitamin E	Manganese**	Copper**	Zinc**	Selenium**
Mean	3.08	1.54	1.55	84.64	74.45	0.83
Max	13	5.6	6.3	172	235	2.66
Min	0.999999	0.1	0.3	13	11	0.24
Median	0.999999	0.95	1.3	77	68	0.68
Normal Range	12-32	4-8.6	2.5-6	25-100	25-100	.25-.5

† Data based on 50 calves submitted to the ISU-VDL in 2013

* Descriptive statistics calculated with most vitamin A levels inputted as 0.999999, however lab data was reported as <1 (77% of calves were reported as <1). Therefore, true levels of vitamin A were probably closer to zero.

** Some calves may have received supplemental micro-minerals at birth

that are stillborn without evidence of dystocia should be investigated by a veterinarian. If any of these organisms are suspected contact your veterinarian to ensure that the correct diagnostic samples are submitted and the test results are used to re-evaluate your herd health program.

Dystocia

Producers should also focus on good management practices during calving. In general, birth is a traumatic event for the calf and dystocia can further exacerbate existing problems. Dystocia calves will usually have decreased calf vigor, appear weaker at birth, and take longer to stand and nurse. Additionally, excessive hypoxia (low blood oxygen) during the birthing process can cause temporary or permanent injury to the central nervous system that may prevent normal activity such as standing or nursing. As always, a clean and dry calving environment helps the calf get off to a good start by reducing environmental stressors. A calf born into a cold, wet environment will have to spend more energy keeping itself warm before it ever has a chance to stand and nurse. If calves have not stood and nursed within four hours the dam should be restrained, milked out and the colostrum fed to the calf. Histological examination of 28 weak calves in 2011 by ISU-VDL indicated that 46 percent of the weak calves had evidence of dystocia and/or hypoxia. Therefore, dystocia may be the biggest factor associated with weak calves, especially when nutrition is adequate.

Summary

Weak calf syndrome needs to be addressed well in advance of the calving season. Factors such as cow herd nutrition, micro-mineral and vitamin balance, dystocia levels, and various disease organisms can all play a role in producing this condition. Addressing nutritional needs and accounting for severe weather needs to be done prior to calving. Maintaining body condition is a good measure to use during late gestation to make sure cows are receiving adequate energy and protein. Supplementation of vitamins and minerals should be initiated mid-gestation. Close observation during calving to identify potential dystocia problems and timely intervention can reduce negative impacts that dystocia can have on neo-natal calves. Producers whose herds are experiencing WCS should work with their veterinarian to investigate underlying causes.

Authors

Prepared by G. Dewell, D.V.M., M.S., Ph.D., Beef Extension Veterinarian; S. Ensley, D.V.M., M.S., Ph.D., Veterinary Toxicologist; V. Cooper, D.V.M., M.S., Ph.D., Veterinary Diagnostician, Iowa State University, Veterinary Diagnostic and Production Animal Medicine.

Cover photo by iStock/Thinkstock.

Expert Reviewed **This publication was peer-reviewed by two independent reviewers using a double-blind process.**

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Cathann A. Kress, director, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa.