



# CATTLE SENSE

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## /// The New Nutrition

Every meeting or conference I've attended this winter has echoed the same message: we are just beginning to realize how much we *don't* know about beef cow nutrition . . . and that some of the things we thought we knew just aren't so! Research is generating new information, new technology, and new ways of looking at nutritional management that offer valuable insights now, and promise far-reaching impacts in the future.

Feeding the cowherd, we are finding, can be about much more than meeting basic maintenance requirements, with extra nutrients thrown in to support late pregnancy and milk production. In fact, the way we choose to feed beef cows today can have long-lasting impacts on the quality and consistency of the beef we produce, the productivity and efficiency of the cowherd, the overall health of the cattle population, and the efficiency of resource utilization.

### Fetal Programming and Beef Quality

Back in basic animal breeding, we were all taught that phenotype (the actual animal we end up with) is a combination of genetics and environment. And what we are now finding out is that **fetal** environment can be a big part of that, influencing how that animal's genes are going to be ultimately expressed before it is even born. One area that is clearly impacted by gestation nutrition is ultimate carcass value of offspring.

The eating quality of beef is primarily determined by tenderness and marbling, and these characteristics are, in turn, set by size of muscle fibers (small is good), connective tissue (more is tough), and deposition of intramuscular fat (also good!). Conversely, external fat is undesirable. All of these can be influenced by the nutrition received by the dam during pregnancy. That is because during gestation, uterine conditions influence which stem cells differentiate into muscle, fat, or connective tissue cells. Nutritional restriction during early pregnancy causes a fetus to develop more fat cells in depots outside of muscles. Cows that are underfed during mid- and late-gestation can have calves with fewer and larger muscle fibers, and more extensive development of connective tissue. Late fetal and early postnatal nutrition has a major impact on hyperplasia – the development of fat cells throughout muscles, which determines future marbling potential.

Research has also shown that underfeeding ewes or cows can lead to lower weights in their offspring – not only at birth, but, other factors equal, all the way to slaughter. These animals also had lighter carcass weights, with lower quality grades. There are still many questions and details that need to be addressed by future research in this area, but it is apparent that the quality and consistency of our final product can be significantly impacted by events that happen long before feedlot placement.

### The Next Generation

The diet available to pregnant cows also impacts the reproductive efficiency of their offspring. This was clearly demonstrated in research done at the University of Nebraska, where crossbred cows were wintered on low-quality forage, with or without protein supplementation. All animals were then managed similarly through weaning. The cows on the better plane of nutrition weaned heavier calves,

and, not surprisingly, the heifer calves born to this group reached puberty earlier than those born to unsupplemented cows. The progeny of the supplemented cows also had better breeding performance.

<b>Performance of Beef Heifers Born to Dams Offered Different Levels of Gestation Nutrition (Identical Post-weaning Nutrition and Management for the Heifers Themselves)</b>		
Dam Treatment:	Given Protein Supplement	No Protein Supplement
Calf Adjusted 205-day wt, lb	497	480
Days to Puberty	352	365
Heifer wt at preg check, lb	880	849
Overall pregnancy rate, %	93	80
Heifers calving in first 21 days, %	77	49

Overfeeding bred females can also have negative impacts on the fetus they are carrying. Work done with sheep showed that obese ewes gave birth to ewe lambs that weighed less, and more importantly, that subsequently developed smaller mammary glands and produced less milk for their own young.

On a different note, these developmental impacts on phenotype also have the potential to significantly skew breeding and culling decisions. Performance data may not accurately portray the genetic value of an animal if it developed under nutritional stress in the womb.

### Health Considerations

When an infant-- be it human, lamb, or calf—experiences nutritional restrictions during pregnancy, fetal development is altered in many ways. Various experiments have found changes in structure and relative size of different organs, altered energy metabolism and nutrient partitioning, and increased predisposition to metabolic, cardiovascular and endocrine disease, as well as obesity, in these individuals. This can be compounded by the light birth weights and reduced colostrum quantity and quality associated with inadequate gestation nutrition.

Work done in New Mexico showed a direct tie between cow supplementation and feedlot medical cost and health status of their offspring. In the Nebraska study cited above, the steer calves were placed in a feedyard, where there were clear differences in the percent of animals pulled for medical treatment (0-3% for steers born to supplemented dams, 11-12% of those born to unsupplemented cows).

Other investigators have begun exploring the possible role of specific feeds or nutrients in fetal development. It is possible that feeding “nutriceutics” like functional proteins or specific yeast fractions may actually enhance lifetime health status of offspring. In the future, preventive health may be as much a part of designing feeding programs as gains or body condition!

### The Big Picture

While the industry has historically played down the importance of early- and mid-gestation nutrition, and emphasized the role of finishing diets in carcass quality, these perspectives are being challenged. As we refine and implement the growing body of information on fetal programming, more focus will be on how we manage the cowherd – year round. There is exciting potential to positively impact efficiency (which means fewer feed and water inputs, and waste output, per unit of beef), animal health (with subsequent reductions in the use of drugs), and consistently positive eating experiences (which helps build demand), all through cowherd nutrition. For now, though, we can just focus on keeping our breeding females in good condition at every stage in the production cycle, knowing we are doing even more good than we probably realize.