

**Marbling potential:**

# Is That All There Is

Certified Angus Beef LLC (CAB). A portion of the paper will be presented at the American Society of Animal Science (ASAS) meeting in Saint Louis, Mo., July 27, and all of it may be viewed at [www.cabfeedlots.com](http://www.cabfeedlots.com).

“As an industry, we have assumed that a lot of what we do in management makes little difference, because genetics set the upper limit,” Berger says. “There are genetic limits, but they aren’t as big as we used to think, if we start young.”

Studies of consecutive Angus-cross heifer calf crops show those fed high-concentrate diets early in life outperformed their year-older siblings in some respects when all were finished in adjacent pens. The long yearlings gained faster, but were up to 20% less efficient in converting feed to gain, partly because marbling reached an early plateau and did not increase with backfat.

Whether Wagyu or Simmental crosses with Angus, the heifer studies show that when calf feds are managed properly, they will grade better than yearlings. “When calf feds are managed to express their genetic potential to marble, they will grade as well or better than yearlings,” Berger says. The Simmental-cross study showed early-weaned grass yearlings deposited very little marbling, while backfat increased during the finishing phase. By contrast, their calf-fed sisters deposited marbling at a steady rate.

**Increasing cooperation among beef industry segments could overcome obstacles to quality grade.**

Story by  
**STEVE SUTHER**

You can’t spin straw into gold. In a beef industry of weakly linked islands, you just had to accept that 83% of apparently Angus-type cattle were never going to qualify for the *Certified Angus Beef*® (CAB®) brand or its \$50 million in annual premiums. Blame it on genetics.

Not so fast. Those 800-pound (lb.) grass yearlings on the market every July may have had the deck stacked against them. Past nutrition and management — even the summer sun — may explain more than genetics in accounting for the typically mediocre grade. Given every chance and a different season, they could go 90% USDA Choice and earn sizable CAB grid premiums.

University of Illinois (U of I) animal scientist Larry Berger and graduate student Nathan Pyatt analyzed past studies on nutritional and management factors affecting marbling deposition for

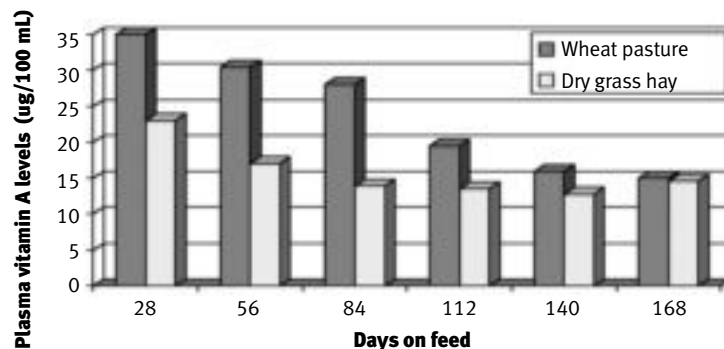
**Keys to marbling**

To further test the hypothesis that early weaning and high-concentrate diet hold the key to greater expression of marbling potential, Pyatt and Berger used 192 high-percentage Simmental steers.

Marbling expected progeny differences (EPDs) of sires ranged from -0.24 to 0.51 in the Simmental sire summary, but the mean was near the breed average of 0.057. The steers were weaned at 88 days and placed immediately on a 90%-concentrate diet based on whole-shell corn. At 14 months (mo.), the 1,400-lb. steers graded 85.5%

**Fig. 1: Plasma vitamin A levels of cattle in the feedlot after grazing wheat pasture or dried grass**

Cattle grazing wheat pasture had greater circulating plasma vitamin A at placement, requiring more than 84 days to diminish levels to placement concentrations of hay-fed steers. Only at 140 days did plasma vitamin A levels approach those observed as increasing marbling in other trials.



Source: Kohlmeier and Burroughs, 1970.

C choice or better and 77% Yield Grade (YG) 1 and 2. Steers with similar genetics in the Simmental database averaged less than 55% C choice.

If genetics were the only driver, EPD should have explained a larger portion than 20%, Berger comments.

Breed-average Angus have greater marbling potential than their Simmental counterparts, but how many average pens of Angus steers can beat that combination? Berger points to the high-concentrate diets fed early in life as triggering earlier marbling deposition. The program maximizes marbling potential while making the most of the calf-fed yield grade advantage.

**Wean early**

Producers may wean calves off heifers after only six months if a drought comes along, but any earlier is usually considered extreme. It's not nearly as difficult as many people think, Berger says. It's more of a psychological problem for producers than any kind of problem for the cattle. After weaning more than 1,000 university calves at 90 to 150 days of age, Berger sees fewer health and management problems than we see at 200 days. They don't get sick when we wean them.

At 200 days, they are losing their colostral immunity, but their own system is still immature and most susceptible to respiratory disease and other problems. It's kind of ironic that an industry was built on weaning at seven months we didn't ask the animals, he points out.

The Illinois early-weaned calves are typically not creep-fed. Whether 90 or 150 days old, they get 3 lb. of 80% - to 90% -concentrate diet on Day 1, with no access to hay. We have yet to founder or lose one to acidosis, Berger says. The whole-shell [corn] diet is more forgiving than processed corn, and we never have overconsumption.

The research analysis did consider effects of creep-feeding on marbling, and Berger says a high-energy creep can help. However, roughages still dominate total diet and can limit positive effects on

marbling. Again, the early-weaned calves on a high-concentrate diet stood out by achieving premium C choice grade.

To understand why calves benefit later from early starch, consider how fat (adipocyte) cells come to be as either flecks of marbling or excess baggage.

Metabolism and volatile fatty acid production in the rumen are keys to understanding the function. Rumen fermentation tends to yield acetate from hay and propionate from grain.

Datta says the earlier in life calves get high-energy feed, to start high-propionate fermentations, the more likely they are to facilitate the conversion of preadipocytes to adipocytes, Berger says. What happens at 400 and 500 pounds affects the marbling they exhibit at 1,200 pounds.

Too many producers still roughed cattle through the winter with only supplemental protein and forage before going out to a summer stocker phase. When the feedlot manager gets them at 850 pounds and they go 50% C choice, he asks, is that all they had? Probably not, Berger comments. By the fact that they never had a high-propionate fermentation until they went into the feedlot for 100 days, we have compromised their potential. Even though the genetic potential for higher marbling deposition may have been there, the metabolic fuels haven't been supplied to allow that expression.

Berger points to Holsteins as self-evident proof because they are genetically similar cattle that will grade more than 80% C choice on exclusively high-concentrate diets, or struggle to hit 50% C choice after grazing.

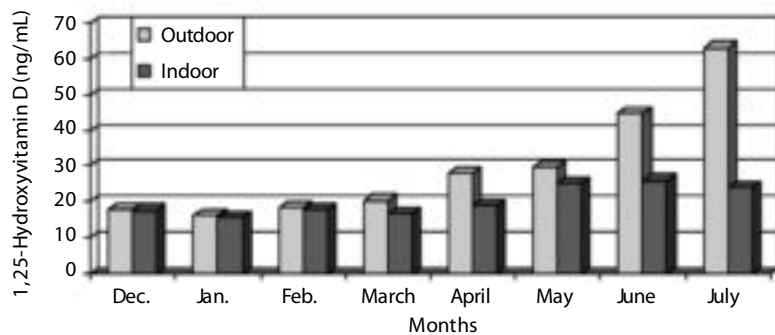
Higher-grading cattle are harvested from early winter into late spring, but is that simply a function of calf feeds dominating the summer harvest mix? Only to the extent that those calves may have entered the feedlots with grading potential compromised by health, environment, management or nutrition.

(Continued on page 24)



Fig. 2: Effects of day length on plasma vitamin D<sub>3</sub>

Vitamin D may be just as important as vitamin A in preventing adipocyte differentiation. Unfortunately, most of the circulating vitamin D in feedlot cattle comes from endogenous synthesis and not the diet. Indoor cattle show the baseline plasma vitamin D<sub>3</sub> levels; the trial was conducted in Canada. Day-length differences are relatively great.



Source: Hidioglou et al., 1979.

**Is That All?** *(from page 23)***Vitamin connection**

“A lot of calf feds are harvested by midsummer,” Berger notes. After that, as grazed yearlings make up an increasing share, Berger suggests too much vitamin A and D may keep the lid on grading potential. “They have been on a high-carotene diet, and data suggests it takes 80 to 90 days for the vitamin A to play out,” he explains. Research also shows a strong negative correlation between quality grade and levels of vitamin D, the “sunshine vitamin” that builds up in summer and early fall.

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**If there is a chance to enhance grade with any supplemental vitamin, vitamin C may be most promising.**

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Japanese work, in particular, reports vitamins A and D as significant marbling blockers, yet many receiving rations automatically include supplemental vitamin A. “Cattle coming in off grass or wheat have gobs of A in their livers,” Berger says. “To give them more just because it’s cheap, I think we’re shooting ourselves in the foot.”

If there is a chance to enhance grade with any supplemental vitamin, vitamin C may be most promising. Unfortunately, the rumen breaks down 90% of vitamin C before it can reach uptake sites in the lower gut, but Illinois researchers are looking at alternative delivery means.

Genetics can overcome some of the nutritional and environmental challenges, and not all grazing programs compromise grade, Berger says. “If cattle are gaining enough, energy may be high enough. I’m not saying [that] if they’ve been on wheat for 60 days it’s a problem. But those out there gaining less than 1.5 pounds per day for months may be compromised,” he says. “Dietary energy must be high enough to avoid cattle that are so lean they have to restore depleted fat depots before they start differentiating and developing new fat cells on feed.”

The high protein in wheat pasture can be friendly to grade if there is enough energy. “We have data to show the early-weaned calves on 16% protein ultimately grade better, compared to 12% protein, but it takes high energy in the diet to allow the higher protein to be utilized,” Berger says.

The industry’s traditional window for weaning age may be the most critical time to avoid shorting calves on energy needs, but the Illinois work says there are no windows of invulnerability. “For healthy cattle, high-propionate fermentation is the biggest variable in marbling deposition,” Berger concludes.