Worth the Salt

Proper nutrition is key to achieving and maintaining optimal performance of cows approaching calving.

*by **Shelby Mettlen,** assistant editor*

Any producer worth his salt knows a healthy cow herd starts with proper nutrition. An optimal body condition score of 5 (on a 9-point scale) for mature cows and 5.5-6 for first-calf heifers going into calving season directly correlates with improved nutrition, and, in turn, increased reproductive function and ultimately more calves weaned.

Core nutrients including energy, protein, calcium (Ca) and phosphorus (P), along with other limiting nutrients like magnesium (Mg), selenium (Se), zinc (Zn), copper (Cu) and vitamin A, are key to achieving optimal nutrition in gestating cows.

Growing pains

BioZyme area sales manager Andrew McPeake says it is important to make sure rations are formulated to meet or exceed the nutritional requirements of the cow during the first 60 days of gestation.

"It is imperative to ensure that the proper amounts of energy and protein are supplied," McPeake stresses. "These are needed to meet the increased demands during lactation and subsequent breeding."

Both McPeake and Ron Lemenager, Purdue University Extension beef cattle specialist, agree that energy is the most limiting factor in beef cattle production, followed by protein. Additionally, both experts agree that cows and first-calf heifers must be in their best body condition at calving when nutrient requirements are increasing as a result of late-gestation fetal growth and then initiation of lactation.

"Cows need energy to maintain milk production, as well [as] to initiate and maintain pregnancy," McPeake says. "Energy requirements increase significantly during the last third of pregnancy."

Lemenager adds that energy requirements "increase again as cows approach peak lactation, about 60 days postpartum."

Protein is the second limiting nutrient in most rations, McPeake continues. "Without adequate amounts of protein in the diet, daily feed consumption drops off, feed passage rates decrease and overall digestive efficiency declines."

Phosphorus, commonly referred to as the "fertility mineral," is highly important to reproductive health in beef cattle. Phosphorus acts as a catalyst for metabolic processes, Lemenager explains. A deficiency of phosphorus usually presents itself subclinically, he says, and immune function and reproduction are the first functions sacrificed. Producers may see lower conception rates "and not know why," he says. "It could be caused by subclinical deficiencies in minerals," phosphorus being one of them.

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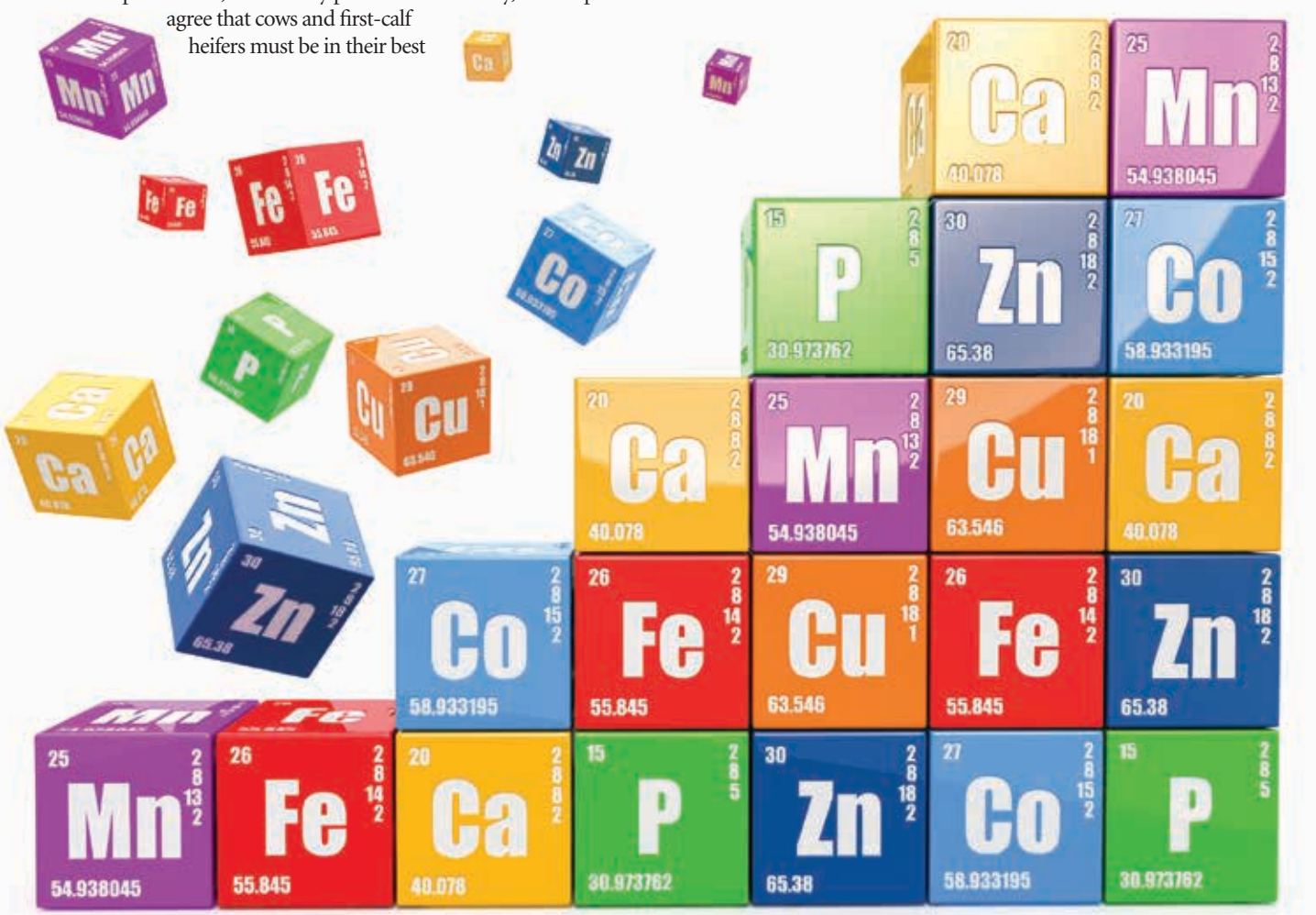

Table 1: Nutrient requirements of beef cows

Gestating cow, middle one-third of pregnancy:

		Daily nutrients per animal				
Wt., lb.	Expected calf birth wt., lb.	TDN, lb.	NE_m, Mcal	CP, lb.	Ca, lb.	P, lb.
900	63	8.3	7.3	1.2	0.028	0.023
1,000	69	9.0	7.9	1.3	0.031	0.025
1,100	75	9.7	8.5	1.4	0.034	0.028
1,200	80	10.3	9.1	1.5	0.037	0.030
1,300	86	11.0	9.7	1.6	0.040	0.033
1,400	91	11.6	10.2	1.6	0.043	0.035
1,500	96	12.2	10.8	1.7	0.046	0.038

Gestating cow, last one-third of pregnancy:

900	63	10.3	9.6	1.5	0.047	0.030
1,000	69	11.2	10.4	1.6	0.052	0.034
1,100	75	12.1	11.2	1.8	0.057	0.037
1,200	80	12.9	12.0	1.9	0.061	0.040
1,300	86	13.7	12.8	2.0	0.066	0.043
1,400	91	14.5	13.5	2.1	0.071	0.046
1,500	96	15.3	14.2	2.2	0.075	0.049

		Daily nutrients per animal				
Wt., lb.	Peak milk lb./day	TDN, lb.	NEm, Mcal	CP, lb.	Ca, lb.	P, lb.
Lactating cow, first 90 days after calving:						
900	10	12.4	11.7	1.9	0.052	0.037
900	15	13.7	13.3	2.3	0.065	0.044
900	20	15.3	14.9	2.7	0.077	0.051
1,000	10	13.0	12.3	2.0	0.055	0.039
1,000	15	14.5	14.0	2.4	0.068	0.047
1,000	20	16.0	15.6	2.8	0.080	0.054
1,100	15	15.3	14.6	2.5	0.071	0.049
1,100	20	16.8	16.3	2.9	0.083	0.056
1,100	25	18.2	17.9	3.3	0.095	0.064
1,200	15	16.1	15.3	2.6	0.074	0.051
1,200	20	17.6	16.9	3.0	0.086	0.059
1,200	25	19.0	18.6	3.4	0.098	0.066
1,300	15	16.8	16.0	2.7	0.077	0.054
1,300	20	18.1	17.6	3.1	0.089	0.061
1,300	25	19.7	19.2	3.4	0.102	0.069
1,400	20	18.9	18.2	3.1	0.092	0.064
1,400	25	20.5	19.8	3.5	0.105	0.071
1,400	30	21.8	21.5	3.9	0.117	0.078
1,500	20	19.7	18.8	3.2	0.095	0.066
1,500	25	21.2	20.5	3.6	0.108	0.073
1,500	30	22.6	22.1	4.0	0.120	0.081

Source: *Nutrient Requirements of Beef Cattle,* National Research Council (NRC), 2000.

"A deficiency of phosphorus can result in reduced milk production and consequently lower calf weaning weights," McPeake says. "Phosphorus requirements increase by 12% from mid-pregnancy to the last month of gestation. After calving, phosphorus requirements increase by 50%."

Maximization vs. optimization

In a perfect world, all producers would end the calving season with a 100% calf crop. However, George Perry, South Dakota State University Extension specialist in beef reproduction management, says a 100% calf crop "is not practical."

"Would I love to hit 100%?" he asks. "Yes. There are many, many hundreds of bulls marketed by seedstock producers each year, and I

Table 2: Nutrient requirements of pregnant replacement heifers

Pregnant yearling replacement heifer, middle one-third of pregnancy:

			Daily nutrients per animal				
Current wt., lb.	Current BCS	ADG, lb.	TDN, lb.	NE_m, Mcal	CP, lb.	Ca, lb.	P, lb.
1,000-lb. mature weight at BCS=5:							
600	5	1.0	7.2	6.6	1.2	0.057	0.023
600	5	1.5	7.8	7.4	1.4	0.066	0.028
600	5	2.0	8.5	8.4	1.6	0.077	0.033
700	6	1.0	8.2	7.6	1.3	0.058	0.025
700	6	1.5	9.0	8.7	1.5	0.068	0.030
700	6	2.0	9.9	9.8	1.7	0.078	0.034
800	7	1.0	9.2	8.7	1.4	0.060	0.027
800	7	1.5	10.1	9.9	1.6	0.069	0.031
800	7	2.0	11.0	11.0	1.7	0.077	0.035
1,200-lb. mature weight at BCS=5:							
750	5	1.0	8.3	7.6	1.4	0.062	0.026
750	5	1.5	9.0	8.5	1.6	0.073	0.032
750	5	2.0	9.8	9.5	1.8	0.083	0.037
850	6	1.0	9.3	8.6	1.4	0.064	0.028
850	6	1.5	10.2	9.6	1.6	0.074	0.033
850	6	2.0	11.0	10.8	1.9	0.084	0.038
950	7	1.0	10.3	9.7	1.5	0.067	0.030
950	7	1.5	11.1	10.8	1.7	0.075	0.035
950	7	2.0	12.0	11.9	1.9	0.083	0.038
1,400-lb. mature weight at BCS=5:							
900	5	1.0	9.4	8.5	1.5	0.068	0.030
900	5	1.5	10.0	9.4	1.7	0.078	0.035
900	5	2.0	10.9	10.5	1.9	0.088	0.040
1,000	6	1.0	10.3	9.4	1.6	0.069	0.032
1,000	6	1.5	11.2	10.6	1.8	0.080	0.037
1,000	6	2.0	12.1	11.7	2.0	0.089	0.041
1,100	7	1.0	11.3	10.6	1.6	0.072	0.034
1,100	7	1.5	12.2	11.8	1.9	0.082	0.039
1,100	7	2.0	13.2	13.0	2.0	0.091	0.043

Source: *Nutrient Requirements of Beef Cattle,* National Research Council (NRC), 2000.

always joke with them that I'd like to put them out of business. Are they worried? No."

It comes down to maximization vs. optimization, Perry says.

"Is maximization the same as optimization?" he asks. "No, it's not."

In a beef cattle operation, the diminishing rate of return involved in attempting to maximize pregnancy at 100% simply fails to overcome the hassle and expense put in by the producer, he says. A producer can achieve a 100% response to a synchronization protocol, but not after just three trips through the chute. It takes time and expense, more than what is practical for cow-calf producers.

"It's about optimizing what you have," Perry stresses.

Lemenager says a 90% calf crop weaned per cow exposed is a good benchmark. If a producer finds himself in the lower 80% range, depending on the producer's financial situation, it may be beneficial to look at altering the supplementation strategy.

Going organic

If a producer feels it is profitable to incorporate a highly fortified vitamin and mineral supplement, a product like BioZyme's Concept-Aid®, fed at least 30 days prior to calving and through breeding can help maintain proper postpartum calving interval.

The product contains Amaferm®. In research conducted by the company, these products show an increase in volatile fatty acid (VFA) production by 16% and protein by 34%. The supplement is formulated at 250% of the nutritional requirements "to ensure the

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Table 2: Nutrient requirements of pregnant replacement heifers

Pregnant yearling replacement heifer, last one-third of pregnancy:

			Daily nutrients per animal				
Current wt., lb.	Current BCS	ADG, lb.	TDN, lb.	NE_m, Mcal	CP, lb.	Ca, lb.	P, lb.
1,000-lb. mature weight at BCS=5:							
700	5	1.0	8.9	8.5	1.4	0.044	0.027
700	5	1.5	9.9	9.8	1.6	0.055	0.032
700	5	2.0	10.7	10.9	1.9	0.066	0.038
800	6	1.0	9.4	8.8	1.5	0.047	0.029
800	6	1.5	10.9	10.8	1.7	0.058	0.034
800	6	2.0	11.9	12.0	1.9	0.067	0.039
900	7	1.0	10.2	9.7	1.6	0.051	0.032
900	7	1.5	11.8	11.8	1.8	0.060	0.036
900	7	2.0	12.8	13.1	2.0	0.068	0.040
1,200-lb. mature weight at BCS=5:							
850	5	1.0	10.3	9.8	1.5	0.049	0.031
850	5	1.5	10.9	10.7	1.8	0.060	0.036
850	5	2.0	11.8	11.7	2.0	0.070	0.041
950	6	1.0	10.6	10.0	1.6	0.052	0.033
950	6	1.5	12.1	11.8	1.9	0.063	0.039
950	6	2.0	13.0	13.0	2.1	0.072	0.043
1,050	7	1.0	11.4	10.9	1.7	0.055	0.036
1,050	7	1.5	12.9	12.8	1.9	0.065	0.040
1,050	7	2.0	13.8	14.0	2.1	0.073	0.044
1,400-lb. mature weight at BCS=5:							
1,020	5	1.0	11.4	10.8	1.7	0.054	0.035
1,020	5	1.5	12.2	11.7	1.9	0.066	0.040
1,020	5	2.0	12.9	12.7	2.1	0.074	0.045
1,120	6	1.0	12.0	11.3	1.8	0.057	0.037
1,120	6	1.5	13.2	12.8	2.0	0.069	0.043
1,120	6	2.0	14.1	13.9	2.2	0.077	0.047
1,220	7	1.0	12.8	12.2	1.9	0.060	0.040
1,220	7	1.5	14.0	13.8	2.1	0.070	0.044
1,220	7	2.0	15.1	15.1	2.3	0.079	0.049

Source: *Nutrient Requirements of Beef Cattle,* National Research Council (NRC), 2000.

Table 2: Nutrient requirements of pregnant replacement heifers

Lactating first-calf heifer, first 90 days after calving:

			Daily nutrients per animal				
Current wt., lb.	Current BCS	ADG, lb.	TDN, lb.	NE_m, Mcal	CP, lb.	Ca, lb.	P, lb.
1,000-lb. mature weight at BCS=5:							
700	5	0.0	11.0	10.8	1.9	0.051	0.035
700	5	0.5	12.9	13.1	2.4	0.072	0.046
700	5	1.0	14.7	15.4	2.9	0.091	0.057
800	6	0.0	12.2	12.0	2.0	0.054	0.037
800	6	0.5	14.1	14.3	2.5	0.074	0.048
800	6	1.0	16.0	16.7	3.0	0.093	0.058
900	7	0.0	12.7	12.5	2.1	0.057	0.040
900	7	0.5	15.1	15.6	2.6	0.077	0.050
900	7	1.0	17.1	18.0	3.1	0.094	0.060
1,200-lb. mature weight at BCS=5:							
850	5	0.0	12.3	12.0	2.0	0.057	0.039
850	5	0.5	14.1	14.1	2.6	0.076	0.049
850	5	1.0	16.1	16.6	3.1	0.097	0.061
950	6	0.0	13.3	12.9	2.1	0.059	0.041
950	6	0.5	15.3	15.4	2.7	0.079	0.052
950	6	1.0	17.2	17.8	3.2	0.098	0.062
1,050	7	0.0	14.3	14.2	2.2	0.062	0.043
1,050	7	0.5	16.3	16.7	2.7	0.082	0.054
1,050	7	1.0	18.3	19.1	3.2	0.099	0.064
1,400-lb. mature weight at BCS=5:							
1,020	5	0.0	13.5	13.1	2.2	0.061	0.043
1,020	5	0.5	15.4	15.4	2.7	0.082	0.054
1,020	5	1.0	17.4	17.8	3.3	0.102	0.065
1,120	6	0.0	14.6	14.2	2.3	0.064	0.045
1,120	6	0.5	16.6	16.6	2.8	0.084	0.056
1,120	6	1.0	18.6	19.1	3.3	0.103	0.066
1,220	7	0.0	16.7	16.7	2.7	0.077	0.053
1,220	7	0.5	18.8	19.3	3.2	0.097	0.064
1,220	7	1.0	20.8	21.8	3.7	0.115	0.074

Source: *Nutrient Requirements of Beef Cattle,* National Research Council (NRC), 2000.

highest-producing 25% of the cow herd is not nutritionally challenged."

Chelated minerals, or organic minerals, are usually metal ions like zinc, copper or manganese, Lemenager says, and are bound to an organic compound like an amino acid or protein complex. This chemical structure allows the nutrients to be of higher bioavailability to cattle.

So, do producers need them?

Probably not, Lemenager says.

"You will see increased tissue levels of the minerals, but not necessarily an increase in physiological function if cows have had continual access to a high-quality commercially available inorganic mineral supplement," he explains.

However, if producers have been lax with their mineral programs for a period of time, feeding an organic mineral can help deficient cows catch up quicker.

Following calving and approaching breeding season, producers have the option to use what some companies call a "breeder pack," a mixture of minerals containing chelates and higher concentrations of vitamin A, vitamin E, copper, selenium and zinc.

Lemenager says if producers are receiving cattle from a drought-stricken area, it's not a bad idea to start them on a supplementation strategy that includes a chelated mineral to ensure the cows don't fall even further behind on weight, energy, protein and mineral.

"As an insurance policy to kind of get these cows back into adequate mineral status, I'd probably put them on a chelated mineral," he says.

Feeding a mineral product like Concept-Aid that contains a combination of organic and inorganic trace minerals helps "ensure that the cow, and the rumen microbes responsible for digestion, have more than sufficient access to copper, zinc and manganese to ensure proper breeding success even in the presence of potential antagonisms such as iron, sulfur and molybdenum," McPeake says.

Organic trace minerals most important to reproductive function are copper, zinc and manganese. Concept-Aid is formulated with proteinated (chelated) forms of these minerals "to ensure maximum bioavailability to the animal," McPeake says. "BioZyme has experienced tremendous growth in its Concept-Aid mineral line as more producers are implementing estrus synchronization, artificial insemination (AI) and even embryo transfer technologies. When producers make the decision to add as much value as possible to their herds, they also understand the nutritional investment required to achieve the level of success they desire."

Condition at calving

Condition at calving is a major factor determining how long the postpartum anestrus period will be. If a cow fails to cycle and breed within 80-85 days of calving, she risks sliding her calving date back or coming up open the following year.

"If I have to have a cow in perfect condition during the course of a 12-month production cycle, I need her to be in good condition at calving time," Lemenager says.

"We need to be approaching a [body condition score of] 5 on our mature cows and probably a 5.5 or 6 on our first-calf heifers," he says. "At least moving in that direction will help you reproductively."

Because first-calf heifers are the most vulnerable to nutritional deficiency, he says it's important to focus on first-calvers. Lemenager further explains that if a young cow is maintaining weight and gaining a small amount due to fetal growth, she will lose body condition.

"A young cow, maintaining weight, is losing body condition because she needs to grow," Lemenager explains. "She needs to be gaining weight above that required for fetal growth. If I've just got her in maintenance mode, she's going to get thin on me."

As the wicked weather of spring calving approaches, Lemenager adds that it is important to adjust management practices to ensure cows are as comfortable as possible as they prepare to drop calves.

"Probably the toughest environment we can ask a cow to work in is about 33°, raining, and mud with a 20- to 30-mile-per-hour wind," he says.

Wet hair coat removes insulation, mud reduces dry matter intake by hindering movement toward the feeder and the wind chill increases her body energy requirements. Lemenager urges producers to house their cattle in areas with good drainage to minimize mud and provide a windbreak to keep the wind chill factor down.

Making adjustments

Lemenager says it's important for producers to keep in mind that a cow doesn't consume a mineral because she knows she's deficient in it. She eats the mineral because she has a craving for salt. Read the label, he urges, and if the label doesn't suggest providing free-choice salt in addition to the commercial mineral supplement, don't provide it.

As forage quality changes over the course of the year and as hay quality changes over the course of the winter period, producers will see a change in mineral consumption as a result. Lemenager says producers need to stop and think about the rate at which the mineral they provide is being consumed. Mixing in additional salt is a way to correct for periods of overconsumption.

"If I'm feeding a 50-pound bag and I've got X number of cows and they're consuming ¼ pound per day, I need to know how long that bag will last," he explains. "If it's disappearing in half the amount of time, then maybe what I need to do is add a little bit of salt."

Lemenager suggests adding 10%-20% salt if intake is too high, and as forage quality increases and mineral intake decreases, decrease the amount of salt added.

If producers have neglected their mineral programs, it can be tough to catch up when calving season is upon us. However, monitoring mineral levels and body condition scores, and supplementing cows where it's needed most can help cattlemen move in the right direction. Just don't forget to pass the salt!

Monitoring Hay Quality for Mineral Content

2015 is behind us, but 2016 will be a year to watch for mineral toxicities and deficiencies when feeding last year's hay crop.

Weather-wise, 2015 was a tough act to follow. It was a year of severe weather and flooding in many of the country's high-volume cattle-producing states. Purdue University Extension Beef Cattle Specialist Ron Lemenager says the overabundance of rainfall early in the year should prompt cattle producers to take a closer look at their forage quality.

"We had a lot of rain, so a lot of our producers delayed harvest, waiting for a window of opportunity to cut dry hay," he explains. "During that waiting period, forage maturity advanced, so we've got a lot of low-quality forage."

Low-quality forage contains an increased concentration of fiber, which is more difficult for cows to digest. This leads to a decrease in dry-matter intake (DMI), thus leading to decreased nutrient intake.

Energy and protein

Since the first hay cutting could represent up to 50% of producers' total tonnage of hay for the year, Lemenager stresses that nutritionally, hay is of significantly lower quality this year than it is in normal years. Energy is the first limiting nutrient in beef cattle diets, followed closely by protein, he explains.

"Mineral concentration doesn't change too much, but the availability of those minerals decreases," he says. "What really suffered with delayed hay harvest is the energy value. As fiber increased, energy content decreased. I think a lot of our producers are going to be short on energy for their cows, particularly with the first cut of hay."

Phosphorus

The next limiting nutrient producers should watch is phosphorus. While it is important to have adequate phosphorus in the diet, Lemenager cautions producers to double-check their herds' phosphorus intakes. If producers are using a byproduct like distillers' grains or corn gluten feed as a supplement, they bring a significant amount of phosphorus to the diet and it is critical that the calcium-to-phosphorus ratio be evaluated.

"If you read the textbook, it says [to feed] about a 2:1 ratio — two parts calcium to one part phosphorus," Lemenager says. "I think we can go down to about a 1.5:1 ratio. If we can meet that, I think we're in pretty good shape."

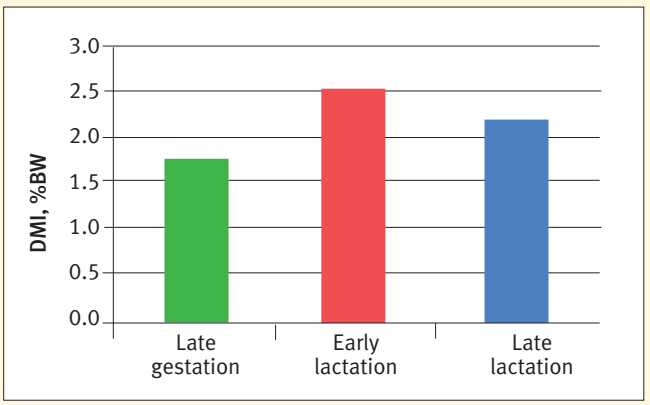
Vitamin A

Low-quality forages are often deficient in vitamin A, Lemenager points out. If producers are feeding a commercial mineral mix, he urges them to make sure the vitamin A content is adequate.

On a free-choice basis, cows will consume about ¼ pound (lb.), or 4 ounces (oz.), of mineral per day, he explains. Cows need 40,000-60,000 international units (IU) of vitamin A per day, so if they're eating ¼ lb. per day and producers are shooting for 40,000 IU, the mineral mix should contain at least 160,000 IU per lb.

"Four times the 40 or four times the 60 is what you need to be looking for when it comes to mineral tags because of these low-quality forages, particularly if producers are feeding some year-old hay," Lemenager says. "Vitamin A content decreases about 10% per month in storage, so if we're feeding hay cut last year, after eight months, we're losing a fair amount of vitamin A content, and it was probably short in the first place compared to normal because it wasn't as green and leafy."

Fig. 1: Dry-matter intake (DMI), expressed as percent of body weight (BW), of beef cows consuming low-quality forage during three different stages of production



Source: Johnson et al., 2003.

Geographic concerns

Copper. "Copper is highly important from a reproductive standpoint," Lemenager stresses. Depending on geographic area in the country, copper and selenium concentrations in the forages can be either deficient or toxic, which is an issue to be aware of when selecting a mineral supplement.

"As we think about copper levels, there are other minerals that can create antagonisms," Lemenager says. "Depending on how the forages were harvested, we could have some fairly high levels of iron or ash content because we brought in a lot of dirt."

High iron levels can create a mineral complex that makes copper less available to the animal. Producers must overcome this by adding more copper. Another factor that impacts copper requirements is milk production. Cows with the genetic potential for higher milk production have higher copper requirements, Lemenager says.

Selenium. Another mineral of geographic concern is selenium. States that touch the Great Lakes tend to be marginally deficient in selenium to start with, Lemenager says, and producers in the area might need to think about adding additional selenium or purchasing a mineral mix with a higher concentration of the mineral.

Limit feeding

When hay is in short supply, Lemenager says it can be beneficial to limit cow access time to the bale feeder. It's like going to the buffet, he says.

"If a cow has 24 hours of access time to a round bale, she'll try to find the piece of chocolate in the middle of that bale," he says. "She's going to bypass the broccoli and the Brussels sprouts. If cows are limited to six or eight hours of access time per day, she's going to focus more on eating so she'll waste less hay and still eat the same amount of dry matter per 24-hour period."

If hay intake is limited, it is important for producers to supplement the herd's diet with mineral. As hay intake is limited, mineral intake will tend to increase, and as this occurs, salt will likely need to be added to the mineral mix to prevent overconsumption.

— by Shelby Mettlen