

BY GILDA V. BRYANT

Brown Fat?

Imagine That!

Good nutrition for gestating cows makes all the difference when calving time comes around. Calves born to well-nourished, healthy mothers in good mineral status and body condition have a head start in life, especially if they have adequate amounts of brown fat.

Located primarily around the kidneys, brown fat or *brown adipose tissue* (BAT) is a light tan to reddish-brown color due to the dense accumulation of blood vessels and mitochondria, those microscopic structures that produce energy in cells. In a healthy calf, the amount of BAT runs around 1.5 percent of its body weight and it will remain func-

tional for the first two to three weeks of life.

"Newborn calves lose considerable amounts of heat to the environment as they have a large skin surface area relative to body mass, and limited insulation when they are wet with amniotic fluid," explains Gordon Carstens, PhD, Associate Professor of Animal Nutrition at Texas A&M University. "Calves are very susceptible to hypothermia, especially when they are born in cold and wet conditions. Fortunately, newborn ruminant animals have lots of brown fat, which is a specialized tissue capable of generating lots of heat to help the newborn maintain its core body temperature during cold stress."

A new calf needs all the help he can get, and one of the best ways to make that happen is to balance the nutrition of the cow before she calves.



CHESSA SMITH

Carsten continues, "Newborn animals have a remarkable ability to generate heat with maximal heat production rates following cold stress. About half of this cold-induced heat comes from shivering in muscle tissue with the remainder coming from brown fat thermogenesis (production of heat within an animal), also known as *non-shivering thermogenesis*."

Brown fat is amazing stuff. When the calf becomes stressed by cold temperatures, BAT is activated by the hormones, *norepinephrine and thyroxine (T4)*.

"There's good evidence that calves born to pregnant dams that are underfed the last trimester will have less brown fat relative to body weight, or less functional brown fat," Carsten adds, "Research has suggested that inadequate levels of **copper and selenium** fed to pregnant dams may impair brown fat thermogenesis of newborn animals."

BROWN FAT RESERVES

How can a producer ensure that calves are born with ample brown fat reserves?

"From a nutritional standpoint we've got to make sure **protein, fats, vitamins, minerals, water and energy** are balanced," advises Terry Engle, PhD, Assistant Professor of Animal Science at Colorado State University. "That's the key. If you have a deficiency of any one of the 'big six', you'll have a wreck."

"**Energy and proteins** are huge," explains Engle. "If you lack these, you can have the best mineral supplements in front of the cattle and it's going to be a challenge for those animals to deal with assimilating those nutrients. If you have protein and enough energy and come in with the right amount of vitamins and minerals, then you're in pretty good shape. But if one of those, energy or protein, is low, that's where the challenge is going to come in."

"The average energy intake of the cow is usually around two percent of her body weight," says Robert Coffey, DVM, who practices with Overton Veterinary Services in Colorado and Nebraska. "That's one way to deter-

HELPING CALVES IN TROUBLE

By Gilda V. Bryant

"Take that fairly thin cow that is down on her luck," Robert Coffey, DVM, explains. "She starts to calve, runs out of energy, and lays there. The placenta separates in the uterus. The calf is more stressed inside the cow, and starts to have breathing distress."

During a prolonged birth, the calf will be weak, lying on the ground for twenty to forty minutes while its body temperature drops two or three degrees. More than likely it won't have enough functional brown fat stores to maintain core body temperature.

"The calf is not up nursing," Dr. Coffey adds, "Doesn't have adequate body fat stores to give him enough energy. That chilling process causes a premature shutdown of the gut wall. If he did get up and nurse or was drenched with colostrum, that calf body temperature has dropped a couple of degrees from normal. He may not absorb those nutrients or antibodies as well as the calf that hits the ground running."

It's critical to move that calf to the truck cab. Coffey advises, "Turn that heater up, start rubbing him down—do everything in your power to stimulate circulation and the shivering reflex. Once the calf is back at the barn,

blow it dry with a blow dryer and drench it with colostrum from the mama cow or a USDA-approved dry colostrum product."

Gordon Carstens, TAMU, adds, "Colostrum provides a source of energy for animals to support shiver and BAT thermogenesis."

"It's important to remember that within six to twelve hours, calves go through a gut closure," Coffey says. "The small intestine no longer directly absorbs immunoglobulins (antibodies) and nutrients. They must go through a digestive process to be effective. That few hours after birth, normal colostrum milk intake is essential."

A well-planned mineral and supplement program along with quality feed are all essential to getting a healthy calf on the ground.



mine how many groceries it's going to take to keep her moving along."

For most cows, it takes twenty-five to thirty pounds of good quality prairie hay and two to three pounds of protein cubes to maintain good condition over the winter.

The total health of the newborn calf from a mineral perspective occurs dur-

ing the last trimester. "If you have a March 1 calving date, you've got to be thinking about a good mineral program in December or the first part of January, otherwise that calf will be born in a deficient state," advises Coffey.

Vitamin A is vital for bone formation, growth, healthy vision, skin and hooves, as well as maintenance and



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energy metabolism. **Vitamin E** is crucial for muscle growth and structure, immunity and cold tolerance. Both of these nutrients are limited in dried grasses. Since the calf gets 99 percent of Vitamins A and E from colostrum or first milk, it's critical that cows are supplemented with these vitamins 60-90 days prior to calving.

In addition to vitamins A and E, gestating cows should receive trace minerals of **copper, zinc, cobalt, iodine** and **selenium**. Selenium and iodine are crucial to BAT metabolism. Macro elements of **calcium, phosphorus,** and **magnesium** maintain strong bones, and are necessary for calving ease.

"Supplementing these cows properly 60-90 days prior to calving is absolutely essential to cow health. It will affect that calf from birth to weaning to the feed yard," Coffey says.

Craig Bieber raises cattle on the Bieber Red Angus Ranch in the tall grass and rolling hill country near Leola, South Dakota. He says, "We feed a mineral that we designed with a nutritionist to compliment our forages here on the ranch. It took us a number of years to do that. We got started because we had health problems in some calves back in the '80's."

He adds, "We manage mineral consumption to the point where we want to make sure cattle are consuming three to four ounces of mineral every day on a weekly basis. We manage intake closely—if they aren't consuming, we will use additives that get the cows to eat the appropriate mineral amount. We feel it's important that good balanced nutrition, especially trace minerals, needs to be there and available to prevent all kinds of health situations on down the road."

"From a nutritional standpoint, we've got to make sure they're balanced," advises Engle. "We balance things with pencil and paper to the fifth decimal place and that's not the way it works out when you're feeding cattle. It's a balancing act." **WR**

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